# Diagnostic Technical Manual

## F28 Stage V

# 1 How to use this manual

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This manual is to help dealers and technicians in the installation, servicing and repair of machine equipment. It is important to follow the instructions correctly and to use the special tools to do the procedures in the specified the repair time.

## 1.1. CONTENTS

Refer to the table of contents at the start of each chapter for a list of the sections of the chapter.

## 1.2. SERVICE TOOLS

Where it is necessary to use a service tool to do an operation, the instruction refers to the related tool. To enable the technician to make the service tools, the measurements and illustrations for each tool are at the end of the applicable sections.

## 1.3. REPAIRS AND THE REPLACEMENT OF PARTS

During replacement operations, it is very important to use approved original parts. The warranty does not apply to the machine after the installation aftermarket parts. The installation of the incorrect parts can have a dangerous effect on the safety of the machine.
All tractors parts have a manufacturer guarantee. It is mandatory for dealers, agents and technicians to supply the approved parts.
Always obey these points during the repair and installation of replacement parts and accessories:

- The local regulations in some countries prevent the installation of parts that do not obey the specifications of the machine manufacturer.
- Always obey the torque values in the service manual.
- Use a locking device when it is specified. Always replace a locking device that has damage.

# 2 Safety

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# 2.1. REPAIR SAFETY

Always bear safety in mind when repairing or servicing the tractor.

## 2.1.1. Procedure

- Use tools and lifting devices in the correct way.
- Make sure that every tractor part is supported firmly, when removing components or splitting the tractor. While supporting the tractor, always check the center of gravity of the frame part. For example, the wedges must always be fitted between the front axle and engine to prevent axle oscillation when splitting the front frame of the tractor.
- Wear suitable protection when handling harmful chemicals.

**WARNING: Take all necessary safety precautions when handling toxic or harmful chemicals (such as fuel, oil, grease or fluids).**

- Be careful while handling pressurized circuits in the tractor.

**WARNING: Opening pressurised circuits can be dangerous if the pressure is not released carefully.**

# 2.2. SAFETY INSTRUCTIONS – ENGINE

## 2.2.1. General

- The warnings cannot show all the dangerous situations that can occur.
- Make sure that you tell the applicable personnel if a dangerous situation occurs.
- Use only the approved equipment for the specified and general procedures.
- Examine tools for damage and that they are in correct work condition.
- Before you move loads, make sure that you know the:
  - Weight
  - Size
  - Path has no blockages.
- Make sure that you use only approved lift equipment. And that the supports are applicable for the size and dimensions.
- All the supports show the maximum capacity they are specified for.
- Only approved personnel are to use such tools.
- Stay at a safe distance from the load and do not do work below it.
- In the remove and install operations, always obey the specified instructions. Make sure that all the removed components do not accidentally hit other personnel.
- With procedures that 2 or more personnel are necessary. To prevent accidents make sure that the work area is free of objects that can cause injury to the personnel. And do not do any procedure that can cause injury to the personnel.
- No none approved personnel in the work area.
- Know the necessary data of the operation and safety of the machine before you do work on it.
- Obey all safety warnings.
- Make sure that personnel are not away from components that are in movement.
- When work on an assembly off the ground, make sure that you use the applicable supports. Engage the manual and automatic safety devices of the hydraulic lift.
- Obey all local regulations when you work with flammable materials, example natural gas.
- Remove the expansion tank cap only when the engine is cold and do it gradually to release the pressure in the system.
- Refuel the machine outdoors. Make sure that the area does not have source of ignition and do not smoke.
- Obey all local regulations when you stow dangerous materials. Example flammable or fluids that cause corrosion.
- Use applicable containers to stow dangerous materials.
- Do not change (drill or burn) pressurized containers and make sure that they are in correct working condition and replace if necessary. Discard all cloths soaked in dangerous materials in applicable containers.
- Only use manufacturer approved components.
- A clean work area is a safer work area, make sure that you clean all spills immediately.
- Make sure that all electrical equipment is in correct work condition and obey all local regulations.

## 2.2.2. Personnel

- When necessary put on your Personnel Protection Equipment (PPE).
- Make sure that all loose clothes do not catch on parts that move.

- Remove all jewelry before you do maintenance or repairs.
- The work area must have applicable airflow when you engage the engine. For example, an extractor fan.
- Do not breathe in the fumes from paint (welding), they are dangerous. Do the operation outdoors or in areas of sufficient airflow.
- When necessary put on applicable breather equipment. For example, if there is paint dust.
- Hot water or steam from the engine and radiator can cause burns.
- Do not touch the fluids that are in the machine systems.

### 2.2.3. Machine

- When you install components, make sure that they are clean and in correct work condition.
- Make sure that you use applicable containers for components that you remove. For example, bolts or nuts.
- Only use fasteners that are in correct work condition.
- Replace all removed parts that are nylon material.
- Do not let rubber components touch corrosive materials such as diesel fuel or petrol.
- To prevent damage to the electrical components. Make sure that you put a cover on all connectors and control units before you pressure wash the machine.
- Make sure that you tighten all fasteners to the specified torque. Speak to your approved dealer if necessary.
- Before you weld:
- Disconnect all electronic control units, the power cable from the battery positive terminal and all connectors.
- Remove paint with approved agents and clean applicable surfaces with soap and water.
- Use applicable fire-resistant materials to prevent damage to components in which fluids or other flammable materials flow when welding.
- Remove ECUs when temperatures are more than 80o C. For example, if the machine is put in a dryer oven.

### 2.2.4. Environment

- Obey all local regulations when you discard fluids.

## 2.3. SAFETY INSTRUCTIONS – FRONT AXLE AND TRANSMISSION

### 2.3.1. General

- Obey all safety instructions, how to prevent an accident, instructions and all local regulations at all times.
- Risks to different parts and components will decrease and the work condition for the personnel will also be safer.
- Do not use flammable material to clean parts when the parts are at an increased temperature, it can cause fire.
- Deep impacts can cause failure to the mechanical and electromagnetic components.
- Manufacturers approval is necessary to change the safety signs and decals.
- Always operate in a clean and dry environment.
- Keep a safe distance from the machine when applicable, for example during a test operation.

### 2.3.2. Maintenance

- Before you start maintenance or repair work. Make sure that all tools and equipment are in correct work condition.
- Only approved personnel are to do the maintenance and repair operations.
- In the condition of an component failure, replace the damaged components.
- During the lubrication operations, use the specified maintenance times.
- During the torque operations use the specified torques.
- Clean carefully the work environment and the machine before you do the maintenance operations.
- The work area must have sufficient illumination to do the procedures safely.
- Do not smoke when you do maintenance procedures on the machine.

### 2.3.3. Personal

- Be careful not to breathe chemical material in dangerous concentrations. Only use sprays and solvents in an area with sufficient airflow.
- Put on the correct protection when necessary.
- Use applicable ear protection to prevent injury to your ears.
- Use the correct clothes when you do work on the machine. Make sure that long hair is also safely tied up.
- Make sure that applicable first aid equipment is available to use at all times.
- Keep all emergency telephone numbers near to your telephone. If an incident occurs it can be important to get medical aid quickly.
- Keep your hands, feet and clothes away from parts that move.
- Do all maintenance operations when the machine is stopped.

- The work environment must always have good air flow.
- Do not breathe in poisonous material used during the machine maintenance. Always use the correct personal protective equipment.

### 2.3.4. Fire

- Always be prepared for fires:
- - Make sure that you keep the fire extinguisher near you.
- - Before you start the maintenance operation, identify the fire extinguisher nearest to you.
- Before you weld or heat a part, remove the paint from area to be welded or heated.
- Do not use sprays or other flammable materials near the welding area or near heat sources.
- When you use flammable material, you must remove them with soap and water before you weld.
- Remove all containers of flammable material from the work area.

### 2.3.5. Environment

- The work environment must always have good air flow:
  - If vents are not available, open the doors and the windows in the work area.
  - Only use work areas that have the correct dust and fume air filtration systems in position.
- Pollution by dangerous materials:
  - Lubricant and the cleaning/painting operations are special waste.
  - Make sure that you use the correct container to collect liquid and solid waste.
  - Discard all liquid and solid waste in the specified procedure.
  - Obey all local regulations.

## 2.4. SAFETY INSTRUCTIONS – ELECTRONICS

### 2.4.1. General

- When you have to do maintenance on the electrical/electronic circuit, disconnect the batteries from the circuit. Disconnect the chassis ground cable first from the negative terminal of the battery.
- Before you connect the batteries to the system, make sure that you sufficiently insulate the system.
- Disconnect all external recharging equipment from the electrical socket before you remove the recharging equipment from the battery terminals.
- Do not cause sparks to see if voltage is in a circuit.
- Do not use a test lamp to measure circuit continuity. Use the correct control equipment only.
- Make sure that the wiring of electronic devices (length, type of cable, location, straps, connection of screen braiding, grounding, etc.) are to the correct standard for the system.
- Make sure that you carefully restore the system after repair or maintenance work.
- When you measure ECUs, on plug connectors and electrical connections, use the correct test lines only. Only use special plugs and plug-type bushes.
- Do not use not approved equipment such as bare metal wires, screwdrivers, pins or equivalent. This can cause a short circuit and can cause damage to plug-type connections. This can then cause contact problems.

### 2.4.2. Machine

- Do not use fast chargers to start up the engine. Startup must only be done with more batteries or
- applicable equipment.
- Incorrect polarization of voltage supply to the electronic control units (for example, incorrect polarization of batteries) can cause damage the control unit.
- Disconnect the batteries from the system before you charge them with an external unit. When you connect them to the system, only tighten the connectors (temperature sensors, pressure sensors, etc.) to the specified torque.
- Isolate the circuit before you disconnect the junction connector from an electronic control unit.
- Do not directly supply electrical current to components controlled by an electronic control unit with usual machine voltage.
- Make sure that the cable routing is such that they are not tight and as near to the chassis/body as they can be.
- When you complete maintenance on the electrical circuit, install the electrical connectors and wires to the correct position.
- Electromagnetic disturbances can cause interference when you programme keys.
- When you programme a key:
  - Make sure that there are no sources of electromagnetic disturbance near the keys or in the cab.
  - Keys not in the programming panel must be a minimum of 1 m away from the machine.

# 2.5. SAFETY INSTRUCTIONS – HYDRAULICS

## 2.5.1. General

- If the high-pressure hydraulic oil touches the skin, this will cause dangerous injuries. Get medical aid immediately if the hydraulic oil goes into your skin.
- Stop the machine and let it cool before you examine the hydraulic fluids. Use caution when you remove the pressure taps.
- Do not open hydraulic pipe connections while the machine operates. Release the hydraulic pressure before you do maintenance or repairs.
- Tighten all connections before you pressurize the system.
- Examine for leaks with a piece of wood or cardboard. This will prevent injury to the hands and the body.
- High pressure hydraulic fluid can cut the skin, cause bad burns or injury to the eyes.
- If hydraulic fluid causes injury to personnel, get medical aid quickly.
- If fuel goes into the skin you must remove it quickly or dangerous injury will result. Get medical aid immediately.

## 2.5.2. Welding

- Do not apply heat by welding, soldering or use a flame near pressurized fluid lines or other flammable materials.
- You can accidentally cut pressurized lines when heat goes in to more than the local flame area.
- You can make flammable spray when you put heat near pressurized fluid lines, this can cause burns to personnel.

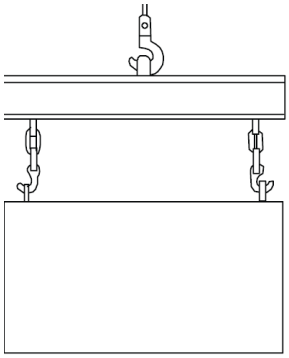
# 2.6. HANDLING HEAVY COMPONENTS

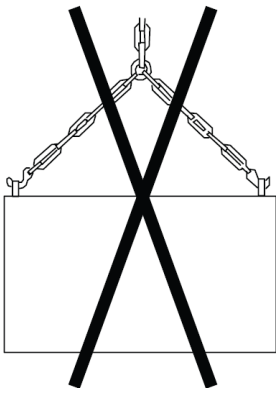
## 2.6.1. Before starting the procedure

Unless instructions tell differently, we recommend that you use an adjustable lifting equipment in as many lifting operations as possible.

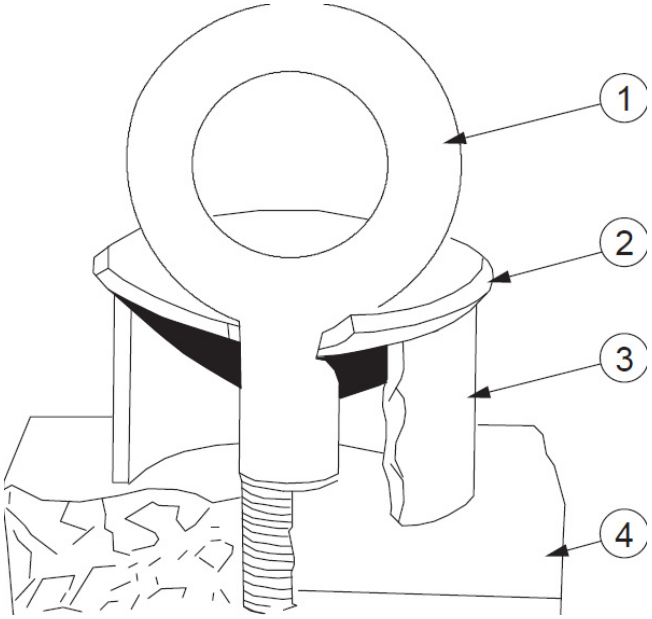
## 2.6.2. Procedure

- Make sure that the supporting slings are parallel to each other.
- Make sure that the supporting slings are as vertical as possible in relation to the lifted object.
- Use a triangular lifting configuration only when the capacity of the slings is much bigger than the weight of the lifting load.





- Note that the eyebolt capacity is decreased when you lift a component at an angle less than 90°. This is the angle between the lifting slings and the removed or lifted object.




1. Eyebolt
2. Eyebolt support
3. Sleeve
4. Load

- When necessary, you can use an eyebolt support for the forged eyebolt. You can weld the sleeve to the plate, but it is not mandatory.

**WARNING: If a part resists removal, check that all nuts and bolts have been removed and that there is no interference from adjacent parts.**

- Do not do repair work on the lifted object when it is still attached to the lifting slings.

## 2.7. CLEANING COMPONENTS

To ensure long life of a machine, it is important to keep dirt and foreign material out of its vital working components. Enclosed compartments, seals and filters have been provided to keep the supply of air, fuel and lubricant clean. These protective devices must not be removed.
Cleaning and covering precautions should be taken while disconnecting hydraulics, fuel, lubricating oil or lines and while removing access covers or inspection plates.

### 2.7.1. Procedure

- Clean the point of disconnection and the surrounding area.
- Cap, plug or tape the line or opening to prevent the ingress of foreign material.
- Clean and inspect all parts.
- Make sure that all passages and holes are clear.
- Cover all parts to keep them clean.
- Make sure parts are clean when they are reassembled.
- Keep new parts in their wrapping until they are actually needed.

## 2.8. ASSEMBLING COMPONENTS

### 2.8.1. Before starting the procedure

**NOTE: Before fitting new parts, remove rust-preventive compound from all machined surfaces.**
**NOTE: Do not fit any components other than those originally intended for a particular purpose. The use of other than original AGCO Parts replacement parts invalidates the responsibility of AGCO Power Inc. for meeting the emission requirements.**

### 2.8.2. Procedure

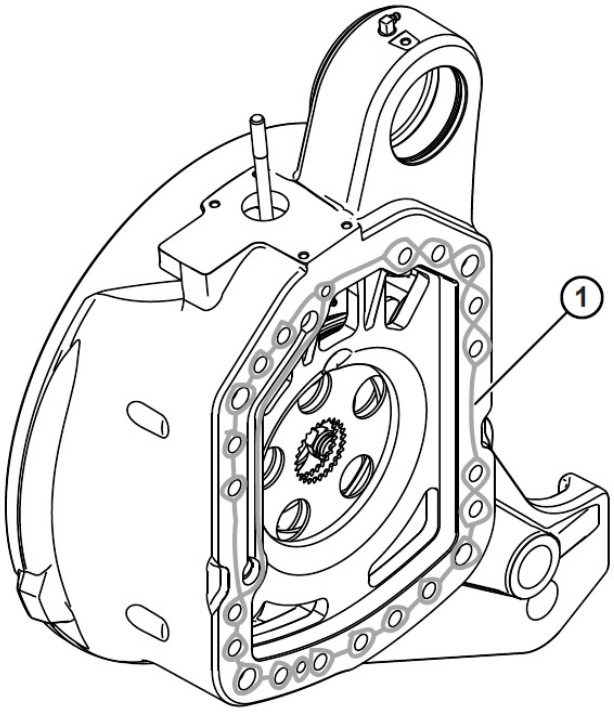
- Complete each step-in sequence when reassembling a machine.
- Never partially assemble one part then start to assemble another.
- Make all recommended adjustments.
- Make sure that nothing has been overlooked.
- Always check the job on completion.

- Recheck the various adjustments before putting the machine back into service.

## 2.9. APPLYING SEALANTS

### 2.9.1. Procedure

- Clean the surface from old sealant and grease.
- Apply a continuous bead of sealant on one counterpart surface.




1. Sealant

- Encircle all holes in the surface. Make sure that you do not plug oil lines and drillings with the sealant.
- Fit the parts as soon as possible.

## 2.10. ASSEMBLING ROTATING PISTON RINGS

**IMPORTANT: It is recommended to replace rotating piston rings with new ones every time they are removed.**

### 2.10.1. Procedure

- Make sure there are no dents in the piston ring.
- Make sure that the walls of the groove are undamaged and straight.

## 2.11. ASSEMBLING SHIMS

### 2.11.1. Procedure

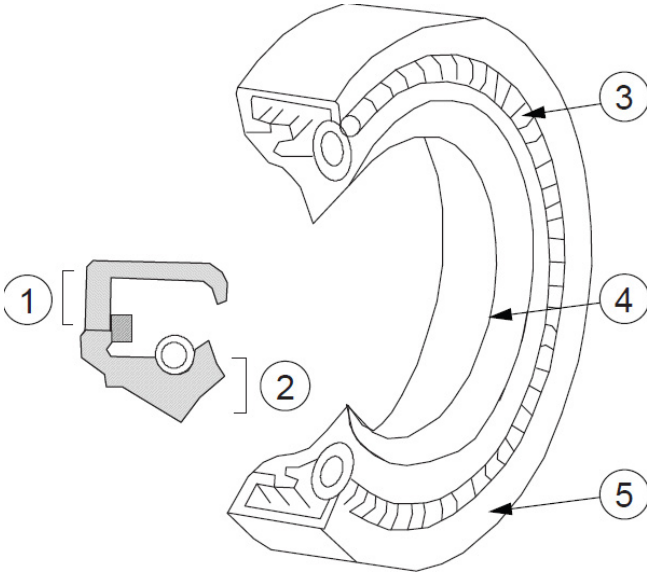
- Tie the shims together.
- Mark the locations of the shims before removal.
- Keep the shims clean.
- Do not bend the shims.

## 2.12. ASSEMBLING GASKETS

### 2.12.1. Procedure

- Make sure that the holes in gaskets are lined up with lubricating oil passages in the mating parts.

## 2.13. ASSEMBLING LIP TYPE RUBBER SEALS




1. Heel
2. Toe
3. Case
4. Sealing element
5. Ring spring

### 2.13.1. Procedure

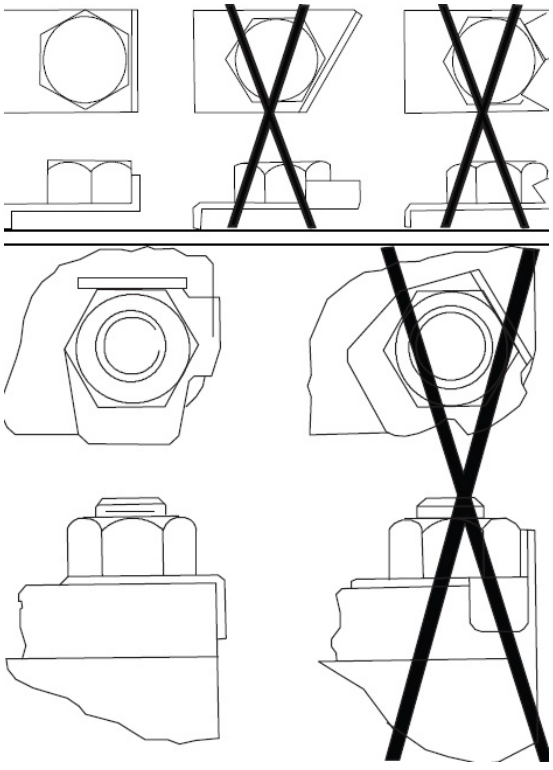
- Lubricate the lips of lip type rubber seals with oil before fitting.
- Do not use grease on seals, except for grease seals.

## 2.14. ASSEMBLING CABLES AND WIRES

### 2.14.1. Procedure

- Label each cable or wire when removing or disconnecting a group of cables or wires to ensure correct assembly.

## 2.15. ASSEMBLING LOCKING DEVICES

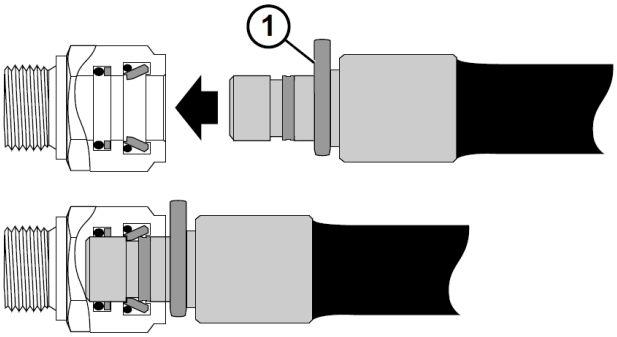


### 2.15.1. Procedure

- Prevent slackening of nuts and bolts.
- Slackening can be prevented by mechanical means such as lock washers, tab washers and cotter pins, or by Loctite type locking agents.
- Install flat retainers properly.
- Bend one end of the retainer against the edge of the part.
- Bend the other end against one of the nut or bolt head.
- Fit new retainers in compartments which house moving parts.
- Place a flat washer between the lock washer and the aluminium housing.

**NOTE: Never fit a lock washer under a nut or screw to which a specified torque has to be applied.**
**NOTE: Always thoroughly degrease components before applying locking agents.**

## 2.16. CONNECTING AND DISCONNECTING WEO CONNECTORS




1. Assembly stop

### 2.16.1. Procedure

To connect:

- Fit the assembly stop on the male part.
- Push the male part until the assembly stop reaches the female part.
- Pull back to verify the connection.

To disconnect:

- Remove the assembly stop.
- Push the male part completely into the female part and pull out.
- Fit the assembly stop.

## 2.17. STARTING THE ENGINE AFTER MAJOR MAINTENANCE

### 2.17.1. Before starting the procedure

Some parts in the exhaust system can be damaged easily by the increased amount of oil and impurities after maintenance work. The system can have excess oil after a major engine overhaul, for example when the pistons are lubricated during the assembly.

**IMPORTANT: Excessive oil can damage the catalysts.**

### 2.17.2. Procedure

Do not connect the exhaust system to the engine.
Run the engine for 1-2 minutes on high idle, that is, at full engine speed without load. Running the engine burns the extra oil and impurities from the engine.

**CAUTION: Make sure the room is ventilated. Use hearing protectors.**

#### 2.17.2.1 Connect the exhaust system to the engine.

## 2.18. SAFETY PRECAUTIONS FOR THE ELECTRICAL SYSTEM

Follow the safety precautions for the electrical system.

**IMPORTANT: Make sure that the main power is turned off before disconnecting or reconnecting the battery.**
**IMPORTANT: Disconnect the negative lead of the battery first and connect it last.**
**IMPORTANT: Always connect the battery with the correct polarity.**
**IMPORTANT: Disconnect the negative battery lead before removing the alternator.**
**IMPORTANT: Never open the charging circuit while the engine is running.**
**IMPORTANT: Ensure good ventilation when charging.**
**IMPORTANT: Do not connect any additional electrical equipment, as this may damage components of the existing electrical system.**
**IMPORTANT: All electronic equipment is sensitive to electrostatic discharge (ESD). Take all necessary measures to minimize or eliminate the risk of equipment being damaged by ESD.**

# 3 Technical data

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# 3.1. GENERAL SPECIFICATIONS

## 3.1.1. Engine

| Model | Model 75 | Model 95 | Model 105 |
|---|---|---|---|
| Engine type | F6BFL413A*V002 | F6BGL413A*V015 | F6BGL413A*V015 |
| Engine power at 2300 rpm | 55 kW / 75 hp | 67.4 kW / 91 hp | 75.6 kW / 103 hp |
| Number of cylinders | 4 | 4 | 4 |
| Displacement | 2797 cm³ | 2797 cm³ | 2797 cm³ |
| Bore | 99 mm | 99 mm | 99 mm |
| Stroke | 90.8 mm | 90.8 mm | 90.8 mm |
| Maximum torque engine | 1500 rpm | 1500 rpm | 1500 rpm |
| Maximum torque | 358 Nm | 382 Nm | 416 Nm |
| Mechanical clutch | 304.8 mm single plate | 304.8 mm single plate | 304.8 mm single plate |

## 3.1.2. Electrical system

| | |
|---|---|
| Battery | 12 V - 80 Ah |
| Alternator | 14 V - 100 A |
| Starter motor | 3.2 kW |

## 3.1.3. Transmission 12+12 speeds

| | |
|---|---|
| Type | Mechanical |
| Reverser | Synchro |
| High and low range | - |
| Number of gears | 4 |
| Number of ranges | 3 |
| Machine speed | 30 km/h |

## 3.1.4. Transmission 24+24 speeds

| | |
|---|---|
| Type | Mechanical |
| Reverser | Synchro |
| High and low range | Synchro |
| Number of gears | 4 |
| Number of ranges | 3 |
| Machine speed | 40 km/h |

## 3.1.5. Transmission 24+12 speeds

| Type | Electro-hydraulic |
|---|---|
| Reverser | Power |
| High and low range | Power |
| Number of gears | 4 |
| Number of ranges | 3 |
| Machine speed | 40 km/h |

## 3.1.6. Steering system 4WD

| | |
|---|---|
| Maximum system pressure | 190 bar |

| | |
|---|---|
| **Flow** | 100 cm³ |

## 3.1.7. Air-conditioning system

| | |
|---|---|
| **Capacity** | 800 g |
| **Refrigerant** | R 134a |

## 3.1.8. Brake system

| | |
|---|---|
| **Oil reservoir** | 0.5 L |

## 3.1.9. Tank capacities

| Model | Tank | Platform, standard | Cab, narrow | Cab, standard |
|---|---|---|---|---|
| **75** | Front tank | 72.9 L | 72.9 L | 72.9 L |
| **75 with front PTO** | Front tank | 51.1L | 51.1L | 51.1 L |
| | Auxiliary tank | - | 34.5 L | 34.5 L |
| **95** | Left tank | 25.7 L | 34.5 L | 34.5 L |
| | Right tank | 46.7 L | - | - |
| | AdBlue tank | 9.6 L | 9.6 L | 9.6 L |
| **105** | Left tank | 25.7 L | 34.5 L | 34.5 L |
| | Right tank | 46.7 L | - | - |
| | AdBlue tank | 9.6 L | 9.6 L | 9.6 L |

## 3.1.10. Bulb specification

| | |
|---|---|
| **High beam lamp** | 12 V - 60W HB3 |
| **Rear work lamp bulb (platform models)** | 12 V - 55W H3 |
| **Head lamps** | 12 V - 60/55W H4 and 12 V 4W T4W |
| **Rear lamps** | 12 V - R5W |
| **Turn signal lamps** | 12 V - R21W |
| **Beacon lamp** | 12 V - 50W H1 |
| **Cab work lamp** | 12 V - 55 W H3 |
| **License plate lamp** | 12 V - 10 W |
| **Cab internal lamp** | 12 V - 2x10 W |

## 3.1.11. Brakes

| | |
|---|---|
| **Control** | Integrated mechanical and hydraulic functions |
| **Brake configuration** | Wet disc |

## 3.1.12. Differential lock

| | |
|---|---|
| **Type** | Mechanical, with shaft |
| **Engage/disengage** | Hydraulic |

**NOTE: The local regulations can limit the value specified in the tire load index chart.**

## 3.1.13. Rear axle

| | | |
|---|---|---|
| **Type** | | Planetary gear |
| **Ratio** | | 6:01 |
| **Flange space** | **Platform** | 1242 mm |
| | **Cab, narrow** | 972 mm |
| | **Cab, standard** | 1242 mm |

| | |
|---|---|
| **Circle diameter of the wheel fasteners** | Circle diameter of the wheel fasteners 203 mm |
| **Diameter of the wheel disc center** | 152 mm |
| **Number of wheel fasteners** | 8 on each wheel |
| **Wheel fastener type** | M18 x 1.5 mm |
| **Maximum load capacity on the rear axle** | 3100 kg |
| **Circle diameter of the wheel fasteners** | 203 mm |

## 3.1.14. Rear PTO

| | | | |
|---|---|---|---|
| **Standard PTO speed** | 540 rpm | 540e rpm | 1000 rpm |
| **Engine speed** | 1938 rpm | 1648 rpm | 1962 rpm |
| **PTO shaft diameter** | 35 mm | 35 mm | 35 mm |
| **Number of splines** | 6 | 6 | 21 |
| **Direction of rotation** | Clockwise | Clockwise | Clockwise |
| **Gear ratio: Engine speed / PTO rpm** | 3.6 | 3 | 1.9 |

## 3.1.15. Ground speed PTO

| | | | |
|---|---|---|---|
| **Standard PTO speed** | 540 rpm | 540e rpm | 1000 rpm |
| **Ratio - rotation of the PTO shaft to 1 turn of the wheel** | 9.077 | 10.670 | 16.605 |

## 3.1.16. Front PTO

| | |
|---|---|
| **Standard PTO speed** | 1000 rpm |
| **Engine speed** | 1940 rpm |
| **PTO shaft diameter** | 35 mm |
| **Number of splines** | 6 |
| **Direction of rotation** | Clockwise |
| **Gear ratio: Engine speed / PTO rpm** | 1.9 |

## 3.1.17. Front axle

| | **Narrow** | **Standard** |
|---|---|---|
| **Type** | 4WD | 4WD |
| **Maximum steering angle** | 55° | 52° |
| **Rake** | 6° | 7° |
| **Differential type** | Limited slip | Limited slip |
| **Flange gap** | 990 mm | 1326 mm |
| **4WD engage** | Electro-hydraulic | Electro-hydraulic |
| **Differential lock** | Automatic | Automatic |
| **Number of wheel fasteners** | 6 | 8 |
| **Fastener type** | M18 | M18 |
| **Diameter of the wheel disc center** | 162 mm | 221 mm |
| **Circle diameter of the wheel fasteners** | 205 mm | 275 mm |

| | | |
|---|---|---|
| **Maximum load capacity** | 2200 kg | 2200 kg |

### 3.1.18. Hydraulic system

| | | |
|---|---|---|
| **Hydraulic pump - Auxiliary spool valves/ rear lift** | **Maximum pump piston displacement** | 25 cm³ |
| | **Capacity** | 66.8 L/min |
| **Hydraulic pump - Steering/transmission** | **Maximum pump piston displacement** | 11 cm³ |
| | **Capacity** | 29.8 L/min |
| **Hydraulic pump - Rear lift (optional)** | **Maximum pump piston displacement** | 11 cm³ |
| | **Capacity** | 29.8 L/min |

**NOTE: NOTE:The local regulations can limit the value specified in the tire load index chart.**

## 3.2. TORQUE VALUES FOR FASTENERS

Refer to the tables for the recommended torque values:

- 1 and 2 for mm threads.
- 3, 4, 5 and 6 for in threads.

Specified torque figures are in the text where it is necessary.
Tables 1, 3 and 5 show the usual torque values to apply to zinc-plated fasteners for:

- Standard nuts, coarse or fine threads with or without a flat washer or a lock washer.
- Weld nuts that have a height of more than or equal to 0.8 d.

Tables 2, 4 and 6 show the decreased torque values to apply to fasteners for:

- Zinc-plated self-locking nuts, phosphated or zinc-flake-coated nuts.
- Screws, thin nuts and weld nuts that have a height of less than 0.8 d.

To do a check of these torque values, loosen the fastener a quarter of a turn and then tighten again.
These values apply to dry assemblies. If the threads are lubricated, decrease the torque.

### 3.2.1. (1) Torque values for zinc dichromate-plated or white zinc-plated threads (mm)

| Fastener | Tensile grade / torque Nm | | | | | |
|---|---|---|---|---|---|---|
| | ISO 4.6 (SAE 1-BS B) | | ISO 8.8 (SAE 5-BS S) | | ISO 10.9 (SAE 8-BS V) | |
| | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| M3 | 0.5 | 0.7 | 1.3 | 1.7 | 1.8 | 2.4 |
| M4 | 1.2 | 1.6 | 3.1 | 4.1 | 4.3 | 5.7 |
| M5 | 2.2 | 3 | 6 | 8 | 8.5 | 11.5 |
| M6 | 4 | 5 | 10 | 14 | 14 | 20 |
| M8 | 9.5 | 12.5 | 25 | 35 | 36 | 46 |
| M10 | 19 | 25 | 50 | 70 | 72 | 96 |
| M12 | 33 | 43 | 90 | 120 | 120 | 160 |
| M16 | 84 | 110 | 200 | 260 | 300 | 400 |
| M20 | 160 | 210 | 420 | 560 | 600 | 800 |
| M24 | 280 | 360 | 720 | 960 | 1000 | 1300 |
| M30 | 540 | 720 | 1400 | 1800 | 2100 | 2800 |
| M36 | 950 | 1250 | 2500 | 3300 | 3600 | 4800 |

### 3.2.2. (2) Decreased torque values for phosphated or zinc-flake-coated

## threads (mm)

| Fastener | Tensile grade / torque Nm | | | | | |
|---|---|---|---|---|---|---|
| | ISO 4.6 (SAE 1-BS B) | | ISO 8.8 (SAE 5-BS S) | | ISO 10.9 (SAE 8-BS V) | |
| | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| M3 | 0.4 | 0.6 | 1 | 1.4 | 1.5 | 1.9 |
| M4 | 1 | 1.3 | 2.5 | 3.3 | 3.4 | 4.6 |
| M5 | 1.8 | 2.4 | 4.8 | 6.4 | 6.8 | 9.2 |
| M6 | 3.2 | 4 | 8 | 11 | 12 | 16 |
| M8 | 7.6 | 10 | 20 | 28 | 29 | 37 |
| M10 | 15 | 20 | 40 | 56 | 57 | 77 |
| M12 | 26 | 34 | 72 | 96 | 100 | 130 |
| M16 | 68 | 88 | 160 | 210 | 240 | 320 |
| M20 | 130 | 170 | 340 | 450 | 480 | 640 |
| M24 | 230 | 290 | 570 | 770 | 800 | 1040 |
| M30 | 430 | 570 | 1100 | 1400 | 1700 | 2200 |
| M36 | 760 | 1000 | 2000 | 2600 | 2900 | 3800 |

### 3.2.3. (3) Torque values for zinc dichromate-plated or white zinc-plated threads (in)

| Fastener | Tensile grade / torque lbf-ft | | | | | |
|---|---|---|---|---|---|---|
| | SAE 1 (ISO 4.6-BS B) | | SAE 5 (ISO 8.8-BS S) | | SAE 8 (ISO 10.9-BS V) | |
| | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| #6 | 0.9 | 1.3 | 1.8 | 2.4 | 2.5 | 3.3 |
| #8 | 1.7 | 2.3 | 3.4 | 4.4 | 4.7 | 6.3 |
| #10 | 2.5 | 3.3 | 4.7 | 6.3 | 6.7 | 8.9 |
| 1/4 | 6 | 8 | 11 | 15 | 16 | 22 |
| 5/16 | 12 | 16 | 22 | 30 | 31 | 43 |
| 3/8 | 22 | 30 | 39 | 53 | 55 | 75 |
| 7/16 | 35 | 47 | 64 | 86 | 90 | 120 |
| 1/2 | 54 | 72 | 100 | 130 | 140 | 180 |
| 5/8 | 110 | 140 | 200 | 260 | 280 | 370 |
| 3/4 | 190 | 250 | 350 | 460 | 490 | 660 |
| 7/8 | 310 | 410 | 560 | 760 | 800 | 1060 |
| 1 | 460 | 620 | 840 | 1120 | 1200 | 1600 |
| 1 1/8 | 480 | 640 | 1050 | 1390 | 1700 | 2200 |
| 1 1/4 | 680 | 900 | 1500 | 2000 | 2400 | 3200 |
| 1 1/2 | 1200 | 1600 | 2600 | 3400 | 4100 | 5400 |

### 3.2.4. (4) Decreased torque values for phosphated or zinc-flake-coated threads (in)

| Fastener | Tensile grade / torque lbf-ft | | | | | |
|---|---|---|---|---|---|---|
| | SAE 1 (ISO 4.6-BS B) | | SAE 5 (ISO 8.8-BS S) | | SAE 8 (ISO 10.9-BS V) | |
| | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| #6 | 0.7 | 1 | 1.5 | 1.9 | 2 | 2.6 |
| #8 | 1.4 | 1.8 | 2.7 | 3.5 | 3.8 | 5 |
| #10 | 2 | 2.6 | 3.8 | 5 | 5.3 | 7.1 |
| 1/4 | 4.8 | 6.4 | 8.8 | 12 | 13 | 18 |
| 5/16 | 9.6 | 13 | 18 | 24 | 25 | 34 |
| 3/8 | 18 | 24 | 31 | 42 | 44 | 60 |

| Fastener | Tensile grade / torque lbf-ft | | | | | |
|---|---|---|---|---|---|---|
| | SAE 1 (ISO 4.6-BS B) | | SAE 5 (ISO 8.8-BS S) | | SAE 8 (ISO 10.9-BS V) | |
| | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| 7/16 | 28 | 38 | 51 | 69 | 72 | 96 |
| 1/2 | 43 | 57 | 80 | 104 | 110 | 140 |
| 5/8 | 90 | 110 | 160 | 210 | 220 | 300 |
| 3/4 | 150 | 200 | 280 | 370 | 390 | 530 |
| 7/8 | 250 | 330 | 450 | 610 | 640 | 850 |
| 1 | 370 | 500 | 670 | 900 | 960 | 1280 |
| 1 1/8 | 390 | 510 | 840 | 1100 | 1360 | 1760 |
| 1 1/4 | 540 | 720 | 1200 | 1600 | 1920 | 2560 |
| 1 1/2 | 960 | 1300 | 2100 | 2700 | 3280 | 4320 |

## 3.2.5. (5) Torque values for zinc dichromate-plated or white zinc-plated threads (in)

| Fastener | Tensile grade / torque lbf-ft | | | | | |
|---|---|---|---|---|---|---|
| | SAE 1 (ISO 10.9-BS B) | | SAE 5 (ISO 8.8-BS S) | | SAE 8 (ISO 10.9-BS V) | |
| | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| #6 | 0.6 | 1 | 1.3 | 1.8 | 1.8 | 2.4 |
| #8 | 1.3 | 1.7 | 2.5 | 3.2 | 3.4 | 4.6 |
| #10 | 1.8 | 2.4 | 3.4 | 4.6 | 4.9 | 6.6 |
| 1/4 | 4.4 | 5.9 | 8 | 11 | 12 | 16 |
| 5/16 | 9 | 12 | 16 | 22 | 23 | 31 |
| 3/8 | 16 | 22 | 29 | 39 | 41 | 55 |
| 7/16 | 26 | 35 | 47 | 63 | 66 | 88 |
| 1/2 | 40 | 53 | 74 | 96 | 100 | 130 |
| 5/8 | 81 | 103 | 150 | 190 | 210 | 270 |
| 3/4 | 140 | 180 | 260 | 340 | 360 | 490 |
| 7/8 | 230 | 300 | 410 | 560 | 590 | 780 |
| 1 | 340 | 460 | 620 | 830 | 880 | 1180 |
| 1 1/8 | 350 | 470 | 775 | 1025 | 1200 | 1600 |
| 1 1/4 | 500 | 660 | 1100 | 1470 | 1800 | 2400 |
| 1 1/2 | 880 | 1180 | 1900 | 2500 | 3000 | 4000 |

## 3.2.6. (6) Decreased torque values for phosphated or zinc-flake-coated threads (in)

| Fastener | Tensile grade / torque lbf-ft | | | | | |
|---|---|---|---|---|---|---|
| | SAE 1 (ISO 10.9-BS B) | | SAE 5 (ISO 8.8-BS S) | | SAE 8 (ISO 10.9-BS V) | |
| | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| #6 | 0.5 | 0.8 | 1 | 1.4 | 1.5 | 1.9 |
| #8 | 1 | 1.4 | 2 | 2.6 | 2.7 | 3.7 |
| #10 | 1.5 | 1.9 | 2.7 | 3.7 | 3.9 | 5.3 |
| 1/4 | 3.5 | 4.7 | 6.6 | 8.8 | 9 | 13 |
| 5/16 | 7 | 9.4 | 13 | 18 | 18 | 25 |
| 3/8 | 13 | 18 | 23 | 31 | 32 | 44 |
| 7/16 | 20 | 28 | 37 | 51 | 53 | 71 |
| 1/2 | 32 | 42 | 59 | 77 | 82 | 106 |
| 5/8 | 65 | 83 | 120 | 150 | 160 | 220 |
| 3/4 | 110 | 150 | 210 | 270 | 290 | 390 |

| Fastener | Tensile grade / torque lbf-ft | | | | | |
|---|---|---|---|---|---|---|
| | SAE 1 (ISO 10.9-BS B) | | SAE 5 (ISO 8.8-BS S) | | SAE 8 (ISO 10.9-BS V) | |
| | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| 7/8 | 180 | 240 | 330 | 450 | 470 | 630 |
| 1 | 270 | 370 | 500 | 660 | 710 | 940 |
| 1 1/8 | 280 | 380 | 620 | 820 | 1000 | 1300 |
| 1 1/4 | 400 | 530 | 880 | 1180 | 1400 | 1900 |
| 1 1/2 | 700 | 940 | 1500 | 2000 | 2400 | 3200 |

## 3.3. TORQUE VALUES FOR HYDRAULIC CONNECTIONS

Refer to the tables for the recommended torque values:

- 1 - Hydraulic unions with a 37° flare.
- 2 - EO2 hydraulic unions.
- 3 - Hydraulic unions with a straight thread mm.
- 4 - Hydraulic unions with a straight thread in.
- 5 - Steel unions with a sealed thread.

Specified torque figures are in the text where it is necessary.
The specifications for these torques apply to zinc plated unions for hoses and hydraulic pipes including:

- Straight thread unions.
- Unions with a 37° flare.
- ORB unions.

These values apply to dry assemblies. If the threads are lubricated, decrease the torque.

**IMPORTANT: Do not use a pipe wrench or a torque wrench to tighten the unions for pipes. Use the correct pipe wrench, flat open-end wrench or Allen key to prevent damage to the pipe and union.**

### 3.3.1. (1) Torque values for hydraulic unions with a 37° flare

| Outer diameter of pipe | | Thread (in) | Torque Nm (tensile grade SAE J 514) | |
|---|---|---|---|---|
| mm | in | | Minimum | Maximum |
| 4 | 1/8 | 5/16 - 24 UNF | 8 | 9 |
| 5 | 3/16 | 3/8 - 24 UNF | 11 | 12 |
| 6 | 1/4 | 7/16 - 20 UNF | 15 | 16 |
| 8 | 5/16 | 1/2 - 20 UNF | 19 | 21 |
| 10 | 3/8 | 9/16 - 18 UNF | 24 | 28 |
| 12 | 1/2 | 3/4 - 16 UNF | 49 | 53 |
| 16 | 5/8 | 7/8 - 14 UNF | 77 | 85 |
| 20 | 3/4 | 1-1/16 - 12 UN | 107 | 119 |
| 22 | 7/8 | 1-3/16 - 12 UN | 127 | 140 |
| 25 | 1 | 1-5/16 - 12 UN | 147 | 154 |
| 32 | 1-1/4 | 1-5/8 - 12 UN | 172 | 181 |
| 40 | 1-1/2 | 1-7/8 - 12 UN | 215 | 226 |
| 50 | 2 | 2-1/2 - 12 UN | 332 | 350 |

### 3.3.2. (2) Torque values for EO2 hydraulic unions

| Pipe dimension mm | Torque Nm +10% |
|---|---|
| 6 x 1 | 17 |
| 8 x 1 | 25 |
| 10 x 1 | 35 |
| 12 x 1 | 45 |
| 12 x 1.5 | 48 |
| 15 x 1.5 | 70 |
| 18 x 2 | 105 |

| Pipe dimension mm | Torque Nm +10% |
|---|---|
| 22 x 2 | 160 |
| 25 x 2 | 210 |
| 28 x 2 | 205 |

## 3.3.3. (3) Torque values for hydraulic unions with a straight thread (mm)

| Thread mm | Torque Nm +10% / 0% (tensile grade ISO 6149-3) |
|---|---|
| M8 x 1 | 8 |
| M10 x 1 | 15 |
| M12 x 1.5 | 25 |
| M14 x 1.5 | 35 |
| M16 x 1.5 | 40 |
| M18 x 1.5 | 45 |
| M22 x 1.5 | 60 |
| M27 x 2 | 100 |
| M33 x 2 | 210 |
| M42 x 2 | 205 |
| M48 x 2 | 260 |
| M60 x 2 | 315 |

## 3.3.4. (4) Torque values for hydraulic unions with a straight thread (in)

| Thread (in) | Torque Nm (tensile grade SAE J 514) | |
|---|---|---|
| | Minimum | Maximum |
| 5/16 - 24 UNF | 8 | 9 |
| 3/8 - 24 UNF | 11 | 12 |
| 7/16 - 20 UNF | 18 | 20 |
| 1/2 - 20 UNF | 23 | 26 |
| 9/16 - 18 UNF | 29 | 33 |
| 3/4 - 16 UNF | 49 | 53 |
| 7/8 - 14 UNF | 59 | 64 |
| 1-1/16 - 12 UN | 93 | 102 |
| 1-3/16 - 12 UN | 122 | 134 |
| 1-5/16 - 12 UN | 151 | 166 |
| 1-5/8 - 12 UN | 198 | 218 |
| 1-7/8 - 12 UN | 209 | 231 |
| 2-1/2 - 12 UN | 296 | 325 |

## 3.3.5. (5) Torque values for steel unions with a sealed thread (in)

| Pipe diameter (in) | Torque Nm | |
|---|---|---|
| | Minimum (*) | Maximum |
| 1/8 | 20 | 30 |
| 1/4 | 40 | 50 |
| 3/8 | 60 | 80 |
| 1/2 | 110 | 140 |
| 3/4 | 160 | 200 |
| 1 | 210 | 270 |
| 1-1/4 | 250 | 310 |

(*) The minimum value does not apply if a sealant product is applied to the thread.

# 4 Identification

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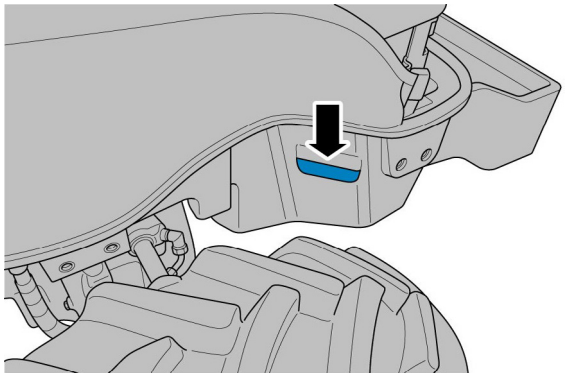
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# 4.1. IDENTIFICATION PLATE / SERIAL NUMBER PLATE LOCATIONS

Each machine has the identification plates recorded in this section. The identification number on the plates is a numeric or alphanumeric ID that identifies the component or assembly in an issuing database. These serial numbers are necessary for warranty claims, when you order components or to identify a tractor or component. In addition, they are necessary for law enforcement to find your machine if stolen. Make sure that you keep the data on the identification plates clean and replace an identification plate with damage. Accurately record the serial number in the text boxes supplied.

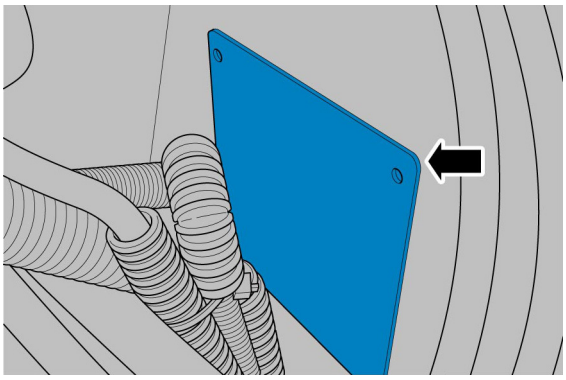
## 4.1.1. Vehicle identification number

The vehicle identification number is on the right side of the front support.



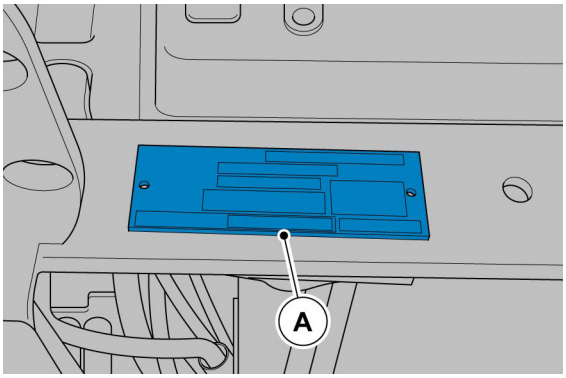
## 4.1.2. Product identification number

Because of the different local regulations in some countries. The location and dimensions of the product identification plate can be different.



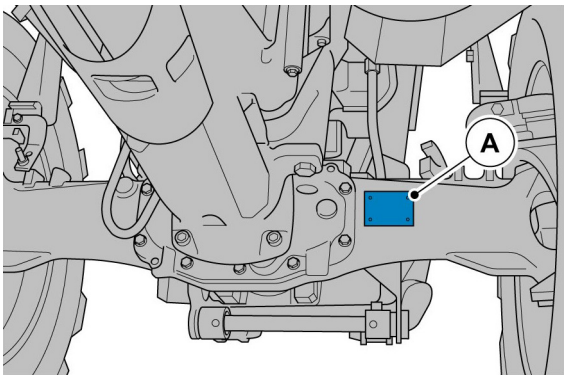
## 4.1.3. Safety structure plates

The safety structure plates are on the frame or pilasters in the position highlighted. The location of the safety structure plate can be different because of the vehicle model, chassis version and equipment configuration



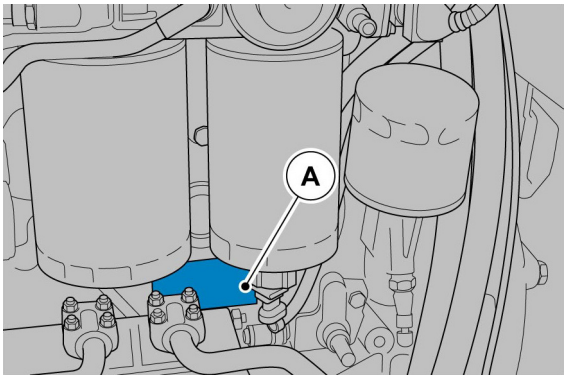
## 4.1.4. Front axle

The serial number plate for the front axle is on the rear right side of the axle.



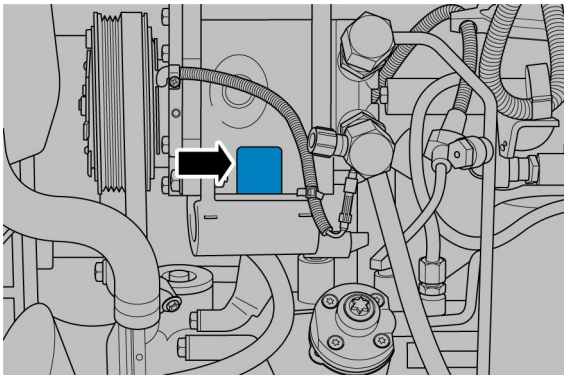

## 4.1.5. Engine

The serial number plate for the engine is on the left side of the engine.



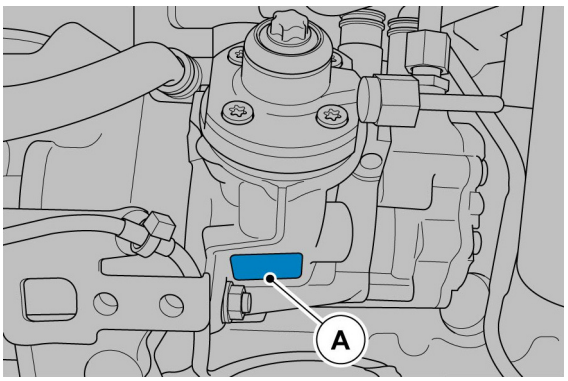

## 4.1.6. Air conditioning compressor

The serial number plate for the air conditioning compressor is on the compressor on the left side of the engine.



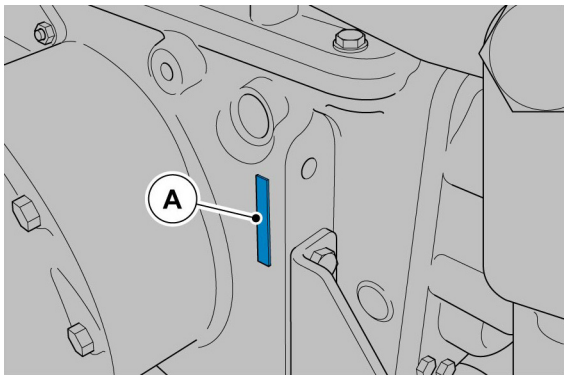
## 4.1.7. Fuel injection pump

The serial number plate for the fuel injection pump is on the pump on the left side of the engine.



## 4.1.8. Transmission

The serial number plate for the transmission (drive train) is on the rear of the machine below the left corner of the PTO housing.



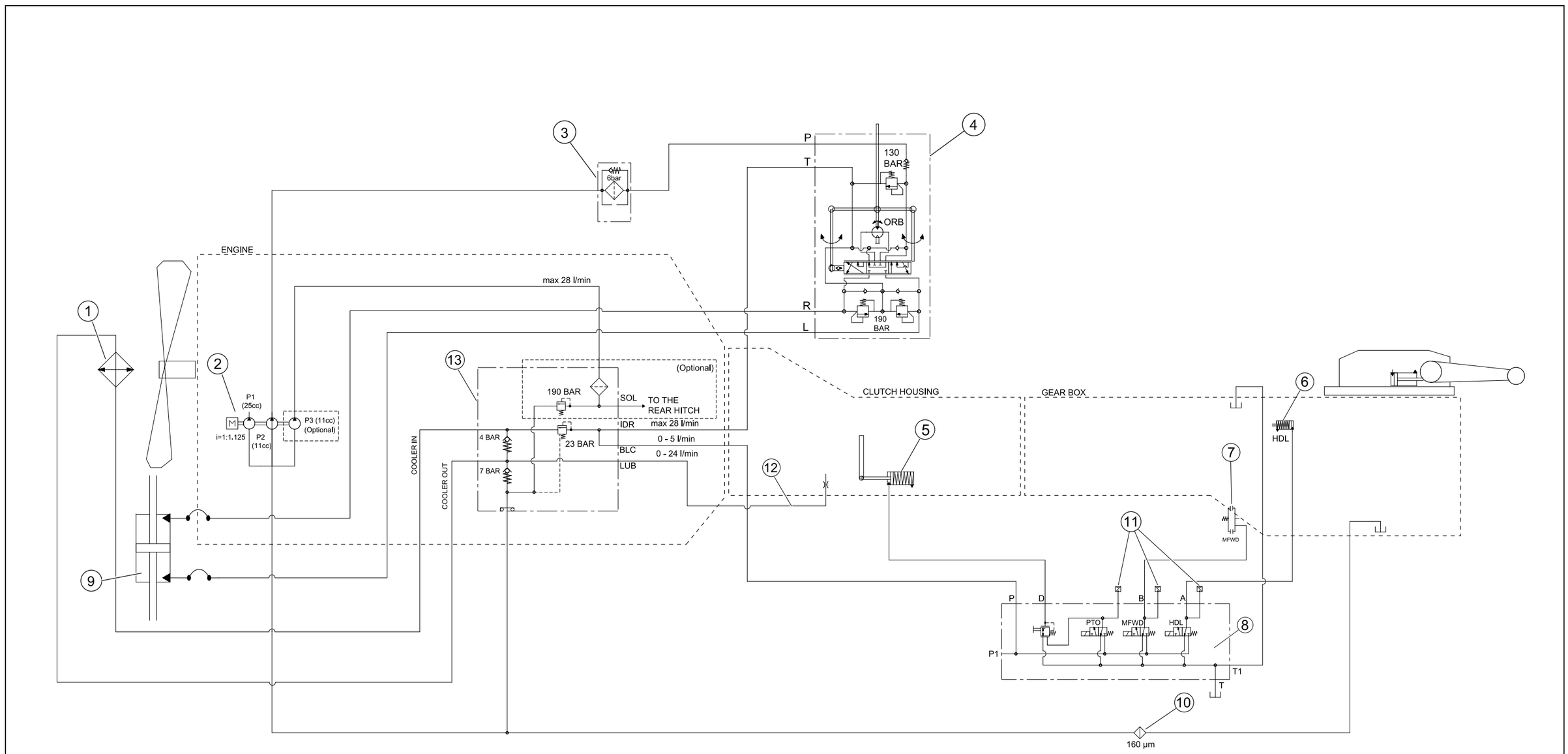
# 5 Hydraulic system

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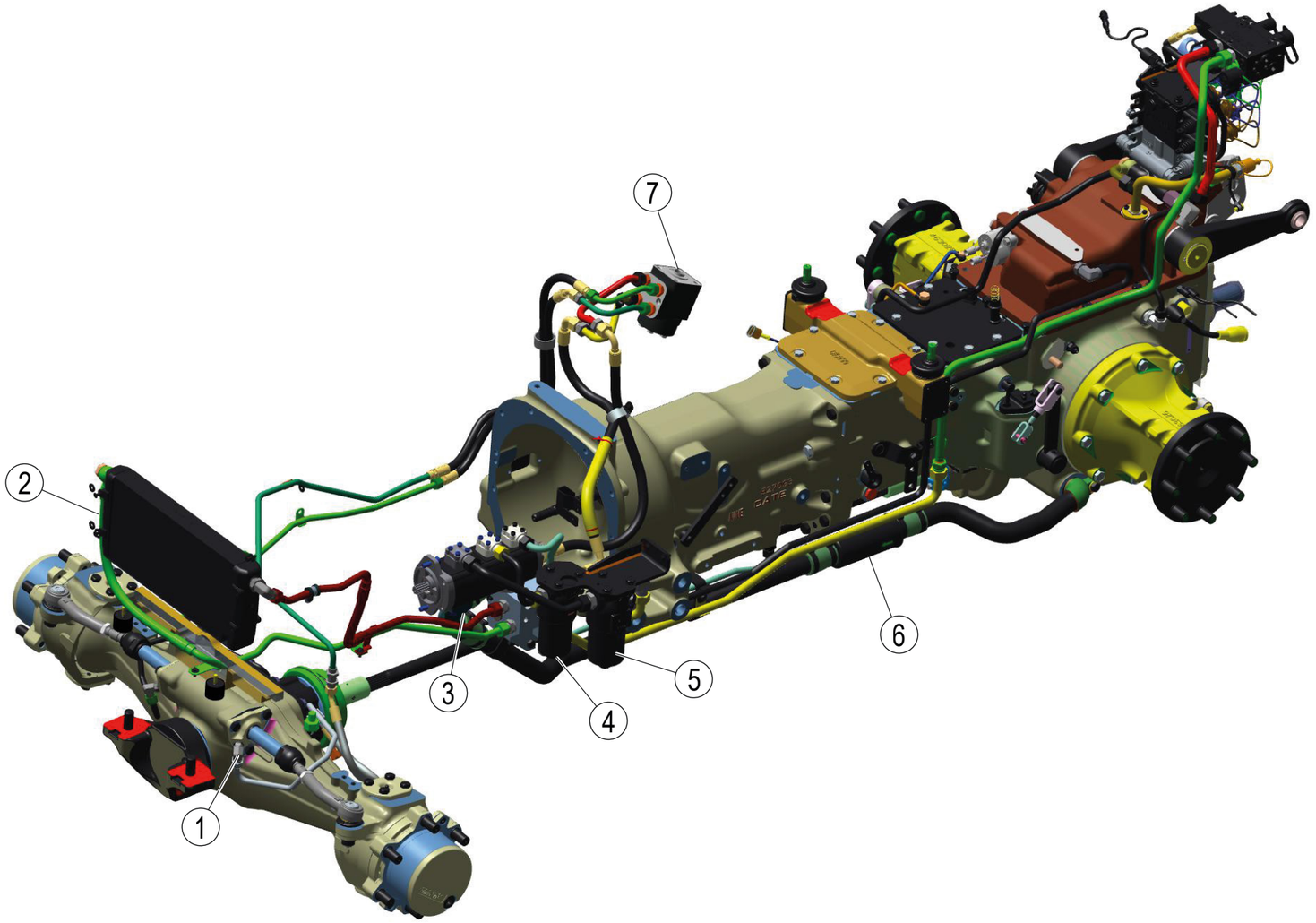
# 5.1. HYDRAULIC DIAGRAMS

## 5.1.1. Hydraulic schematic for mechanical transmission 24+24 version



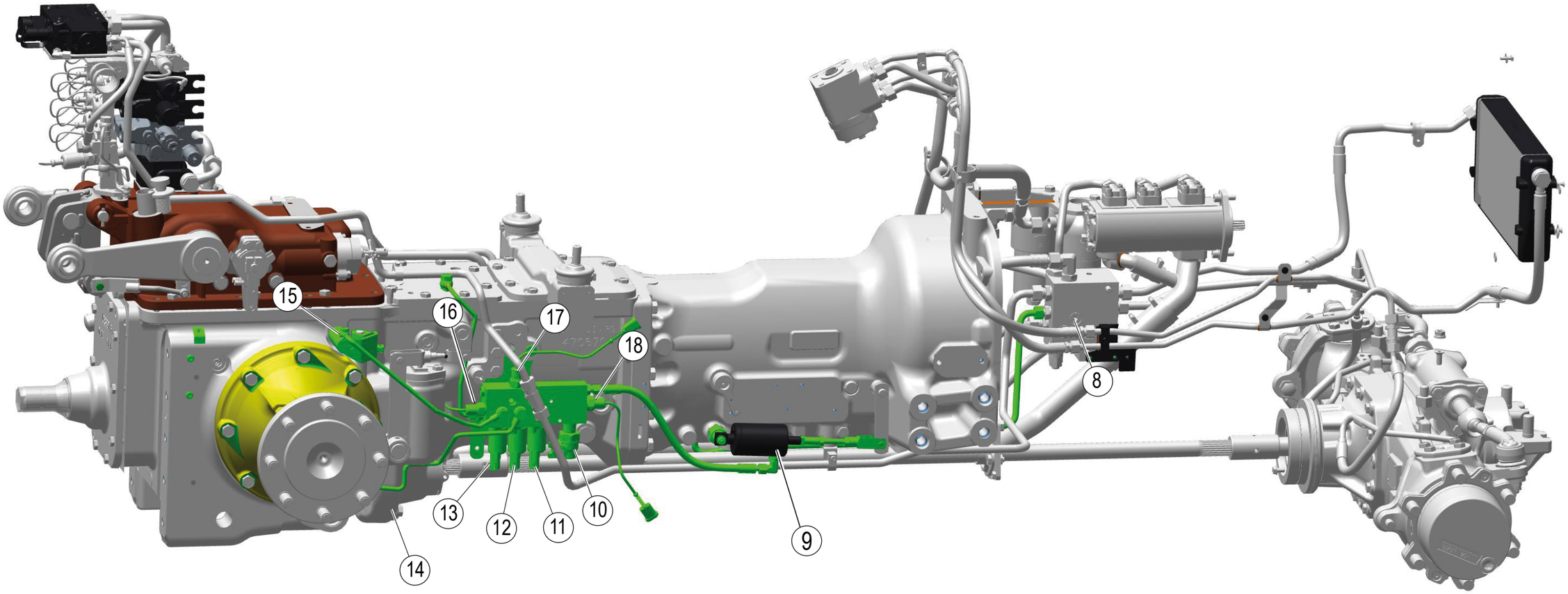

DTM_GS_STGV_0028

| | | |
|---|---|---|
| 1) Oil Cooler | 6) Differential lock hydraulic control piston | 11) Pressure switch |
| 2) Hydraulic pumps | 7) 4WD drop box | 12) Lubrication line 8 bar |
| 3) Transmission pressure filter | 8) 4WD-REAR PTO-DIFF.LOCK, with PTO engagement valve block | 13) Multifunction valve block |
| 4) Steering unit rotary control valve | 9) Steering cylinder | |
| 5) Rear power take-off clutch hydraulic cylinder | 10) Hydraulic pump suction filter (160 micron) | |




DTM_GS_STGV_0005

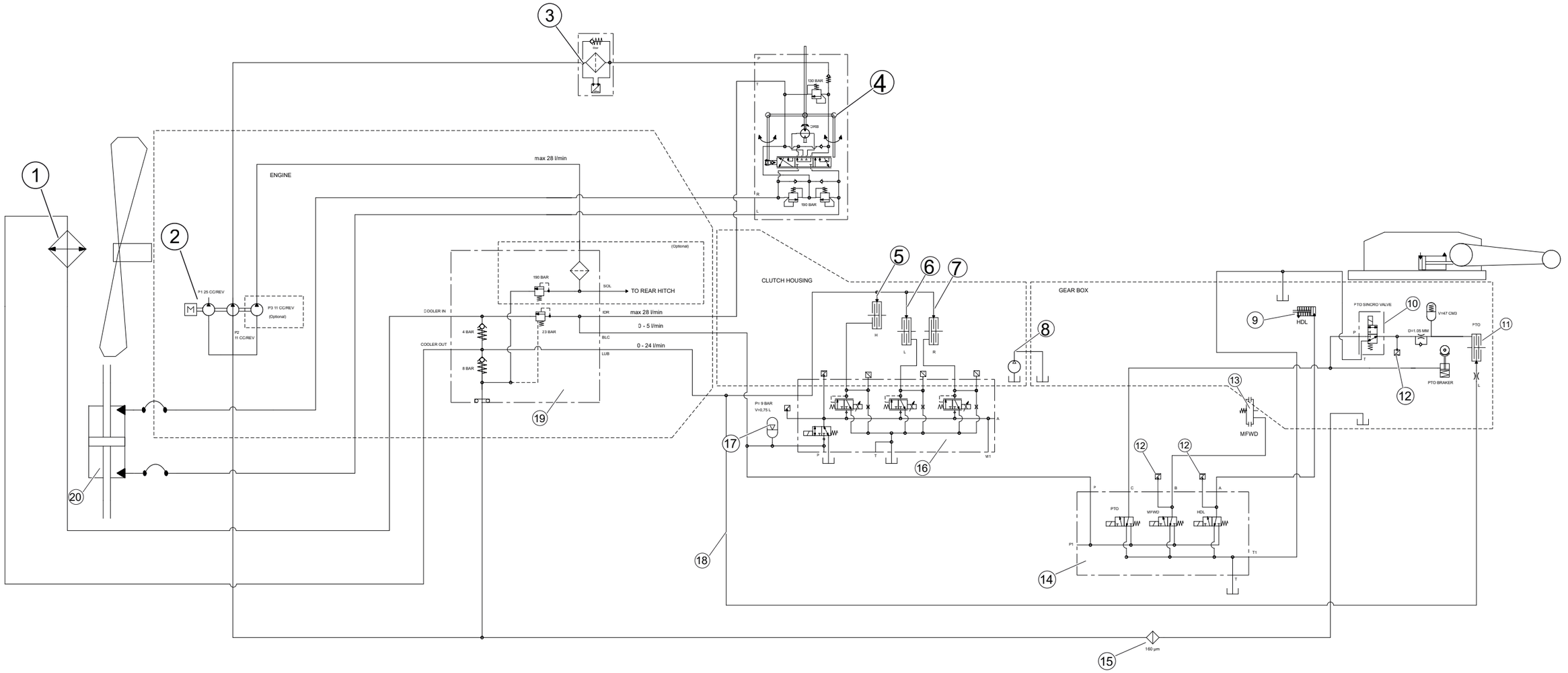
| | | |
|---|---|---|
| 1) Steering cylinder. | 4) Transmission pressure filter. | 7) Steering unit rotary control valve. |
| 2) Transmission oil cooler. | 5) Rear scv's pressure filter | |
| 3) Hydraulic pump. | 6) Suction filter. | |




DTM_GS_STGV_0006

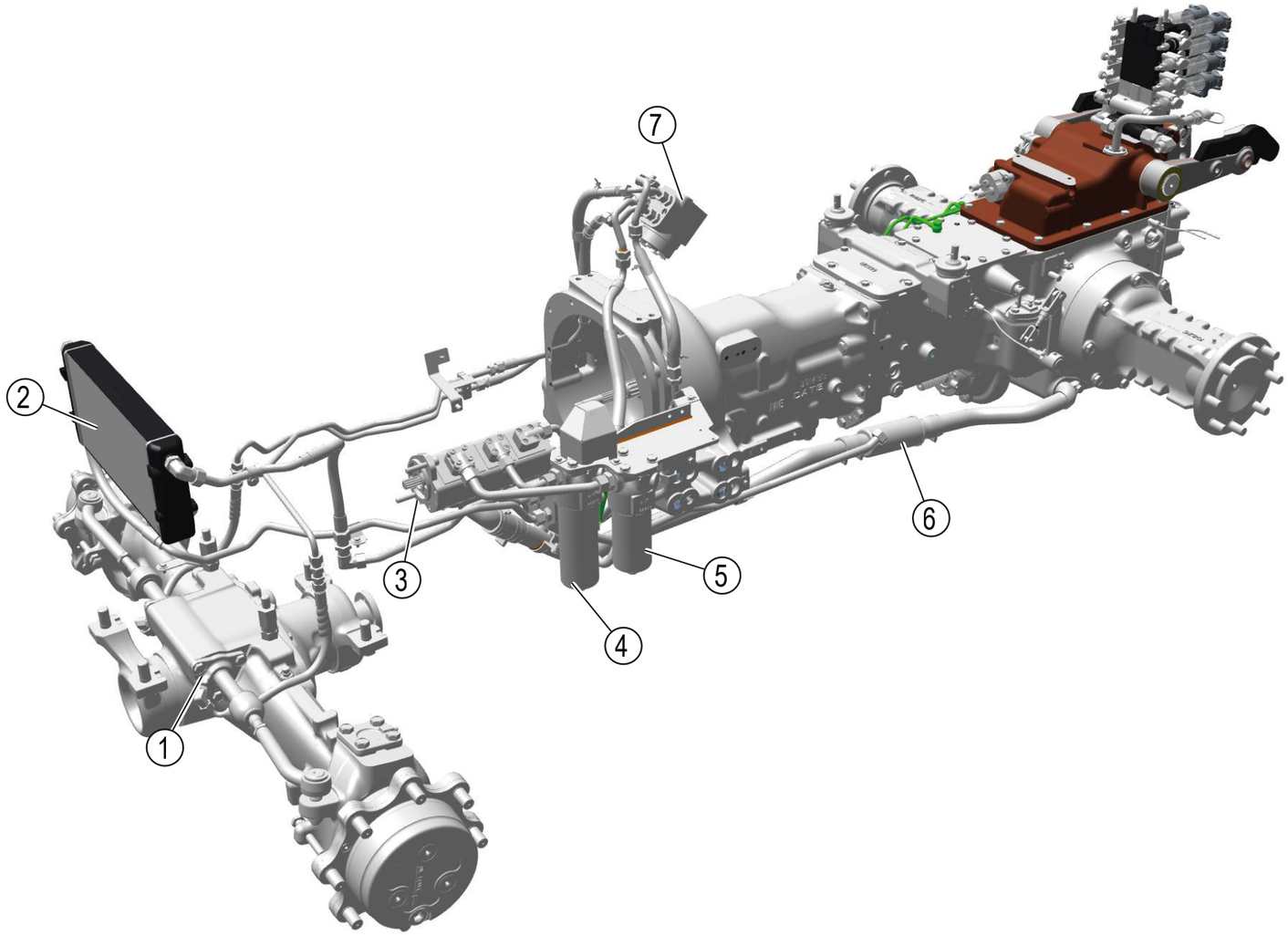
| | | |
|---|---|---|
| 8) Multifunction valve block depending on the hydraulic pump configuration:<br>- On 2 Pump configuration it includes: oil cooler by-pass valve(4bar); Lubrication valve (8bar); 23bar valve for 4WD, Dif. Lock, PTO engagement.<br>- On 3 Pump configuration it includes: oil cooler by-pass valve(4bar); Lubrication valve (8bar); 23bar valve for 4WD, Dif. Lock, PTO engagement; Rear hitch safety valve (190bar); Hydraulic filter for the rear hitch (125micron). | 9) Rear power take-off clutch hydraulic cylinder. | 14)Four-wheel drive clutch. |
| | 10) Rear Power take-off mechanical engagement control valve. | 15)Differential lock hydraulic control piston. |
| | 11) Rear Power take-off safety solenoid valve. | 16) Differential lock pressure switch. |
| | 12) Four-wheel drive solenoid valve. | 17) Four-wheel drive pressure switch. |
| | 13) Differential lock solenoid valve | 18) Rear Power take-off pressure switch. |

## 5.1.2. Hydraulic circuit for Hydraulic transmission 24+12 version



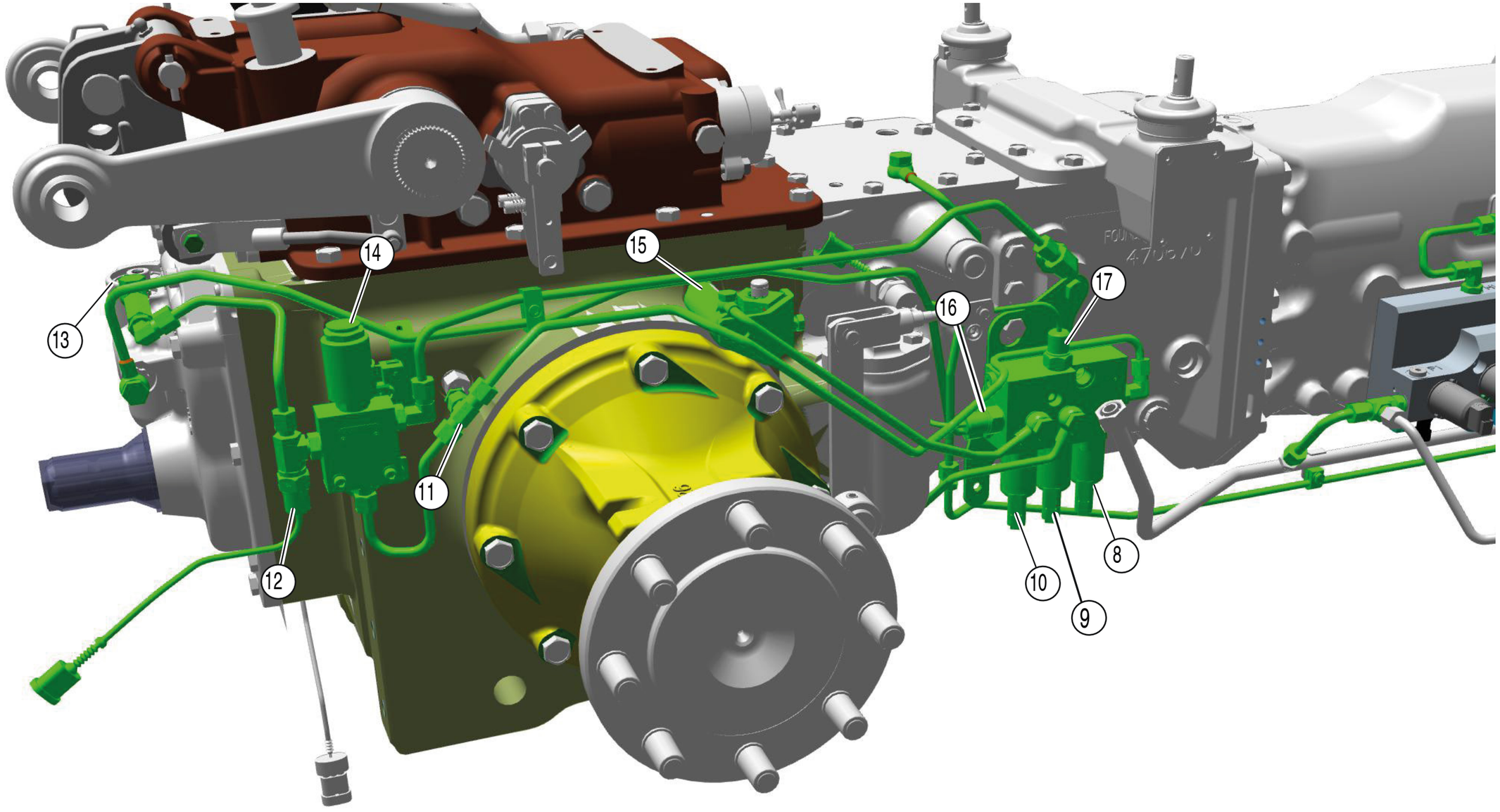

DTM_GS_STGV_0027

| | | | |
|---|---|---|---|
| 1) Oil Cooler | 6) Forward low clutch | 11) Rear PTO clutch | 16) Transmission valve block |
| 2) Hydraulic pumps | 7) Reverse clutch | 12) Pressure switch | 17) Hydraulic accumulator (0,75L 9bar) |
| 3) Transmission pressure filter with clogging sensor | 8) Gerotor pump | 13) 4WD drop box | 18) Lubrication line 8 bar |
| 4) Steering unit rotary control valve | 9) Differential lock hydraulic control piston | 14) 4WD-REAR PTO-DIFF.LOCK valve block | 19) Multifunction valve block |
| 5) Forward high clutch | 10) Rear Power take-off solenoid valve (Main) | 15) Hydraulic pump suction filter (160 micron) | 20) Steering cylinder |



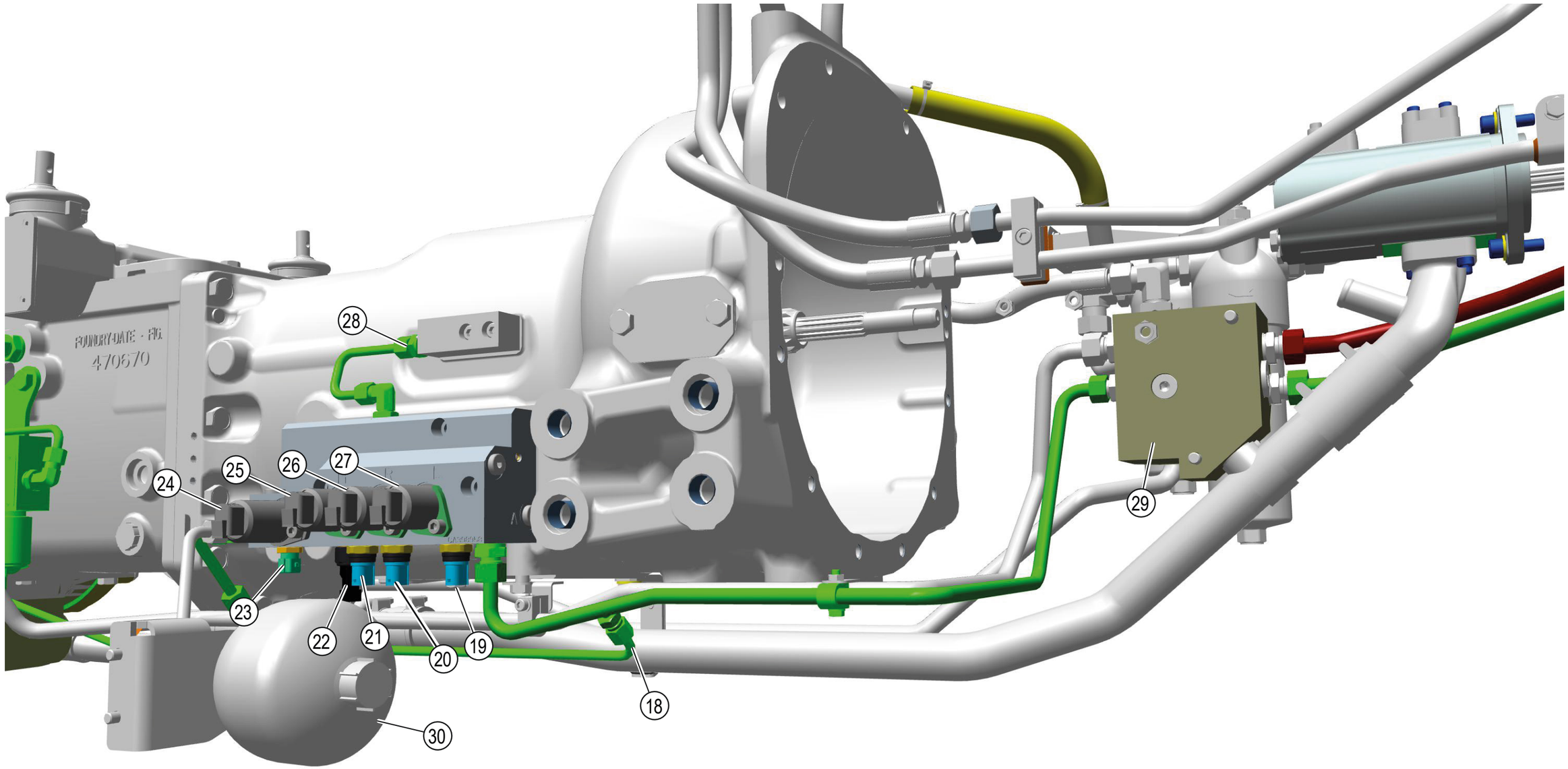

DTM_GS_STGV_0066

| | | |
|---|---|---|
| 1) Steering cylinder. | 4) Transmission pressure filter with clogging sensor. | 7) Steering unit rotary control valve |
| 2) Transmission oil cooler. | 5) Rear SCv,s/rear hitch pressure filter. | |
| 3) Hydraulic pump. | 6) Suction filter. | |




DTM_GS_STGV_0008

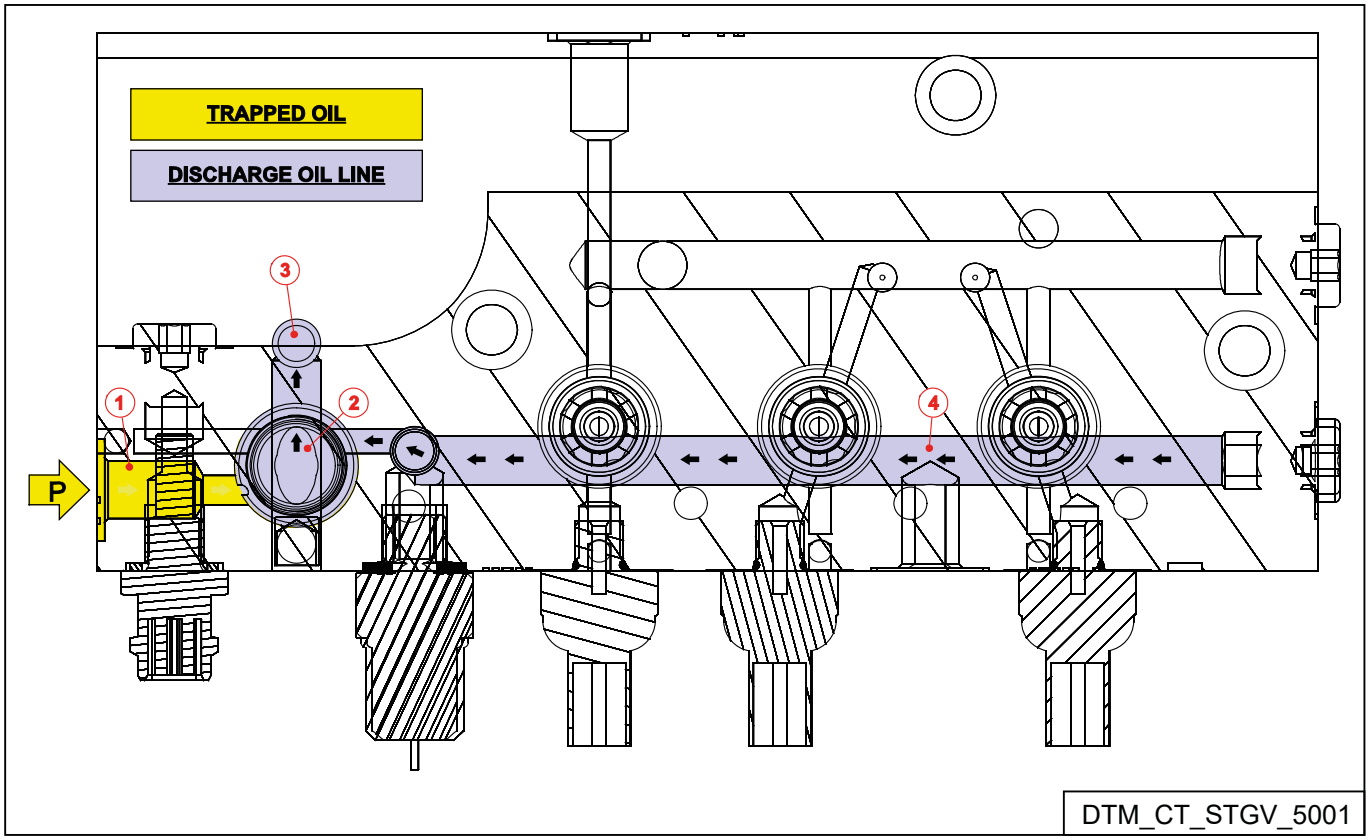
| | | |
|---|---|---|
| 8) Rear power take-off solenoid valve (Safety). | 12) Rear power take-off oil pressure switch | 16) Differential lock oil pressure switch. |
| 9) Four-wheel drive solenoid valve. | 13) Rear power take-off accumulator. | 17) Four-wheel drive oil pressure switch. |
| 10) Differential lock solenoid valve. | 14) Rear Power take-off solenoid valve (Main). | |
| 11) Rear power take-off brake line. | 15) Differential lock hydraulic control piston. | |



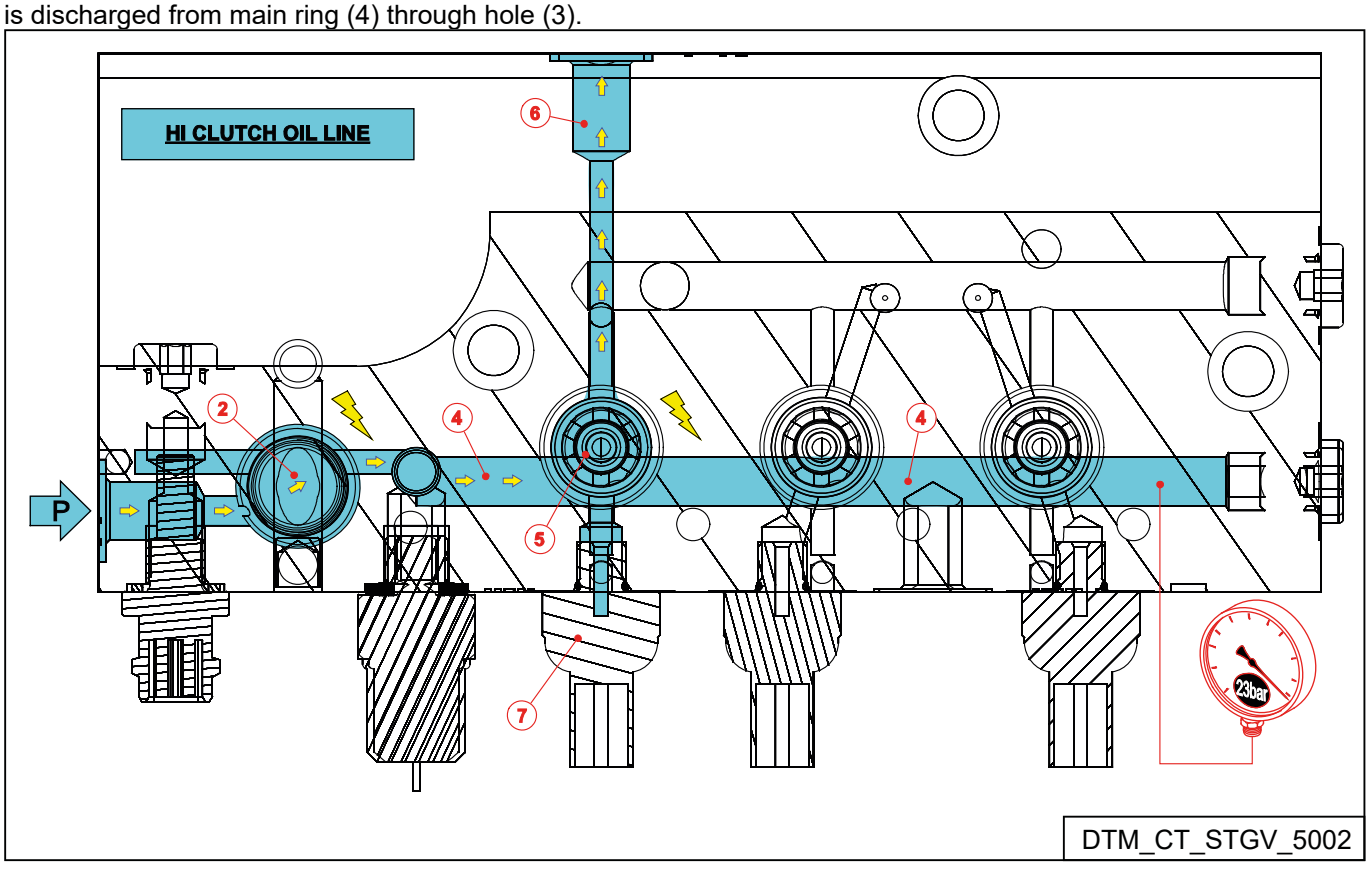

DTM_GS_STGV_0009

| | | |
|---|---|---|
| 18) Lubrication line (8bar). | 23) Transmission hydraulic oil temperature sensor. | 28) Fast forward clutch supply line. |
| 19) Slow forward gear clutch pressure sensor. | 24) Transmission safety solenoid valve. | 29) Multifunction valve block, depending on the hydraulic pump configuration:<br>- On 2 Pump configuration it includes: oil cooler by-pass valve(4bar); Lubrication valve (8bar); 23bar valve for 4WD, Dif. Lock, PTO engagement.<br>- On 3 Pump configuration it includes: oil cooler by-pass valve(4bar); Lubrication valve (8bar); 23bar valve for 4WD, Dif. Lock, PTO engagement; Rear hitch safety valve (190bar); Hydraulic filter for the rear hitch (125micron). |
| 20) Reverse gear clutch pressure sensor. | 25) Fast forward gear clutch solenoid valve. | |
| 21) Fast forward gear clutch pressure sensor. | 26) Reverse gear clutch solenoid valve. | |
| 22) Main line, low pressure circuit switch. | 27) Slow forward gear clutch solenoid valve. | 30) Transmission hydraulic accumulator (0,75l). |

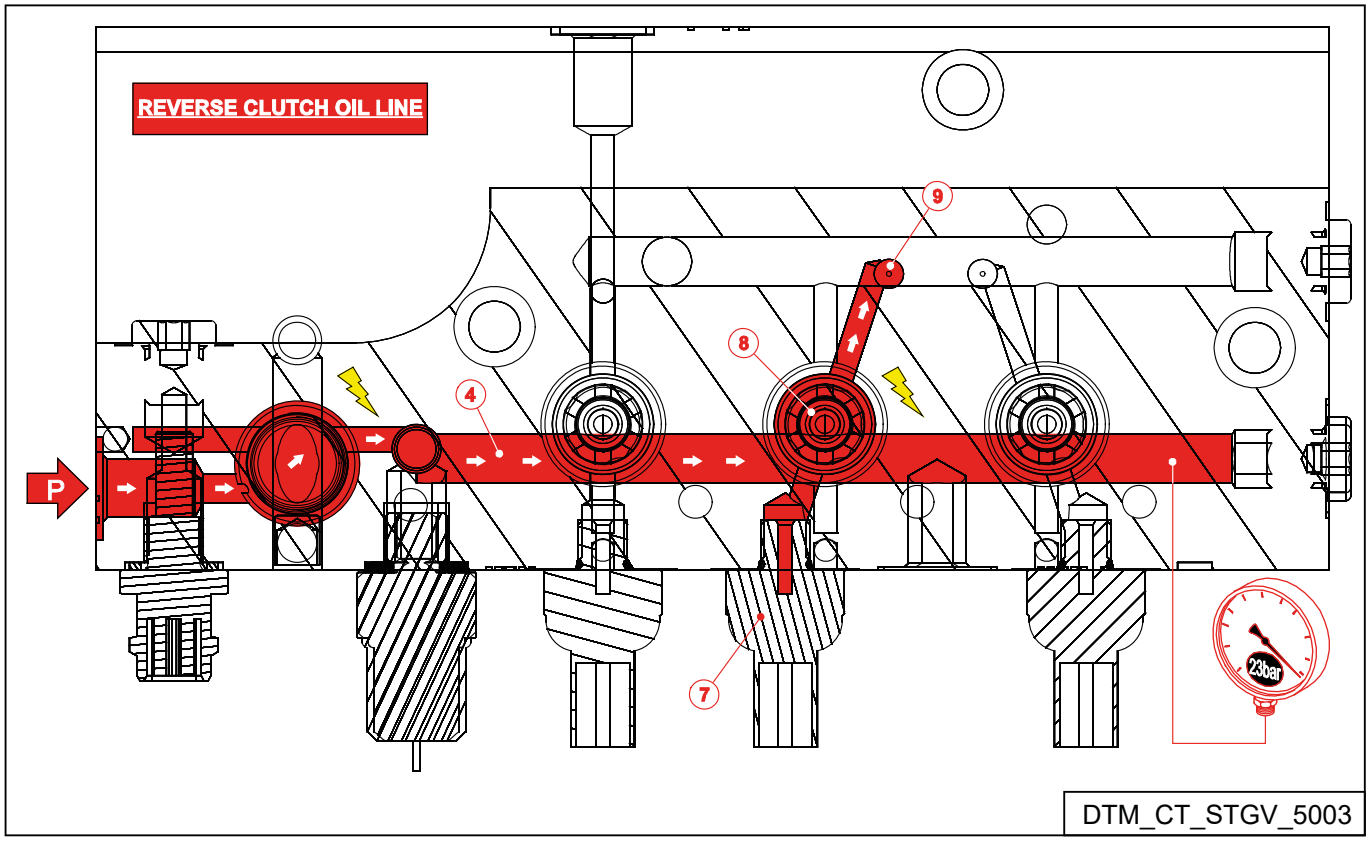
# 5.2. TRANSMISSION 24+12, HYDRAULIC VALVE BLOCK



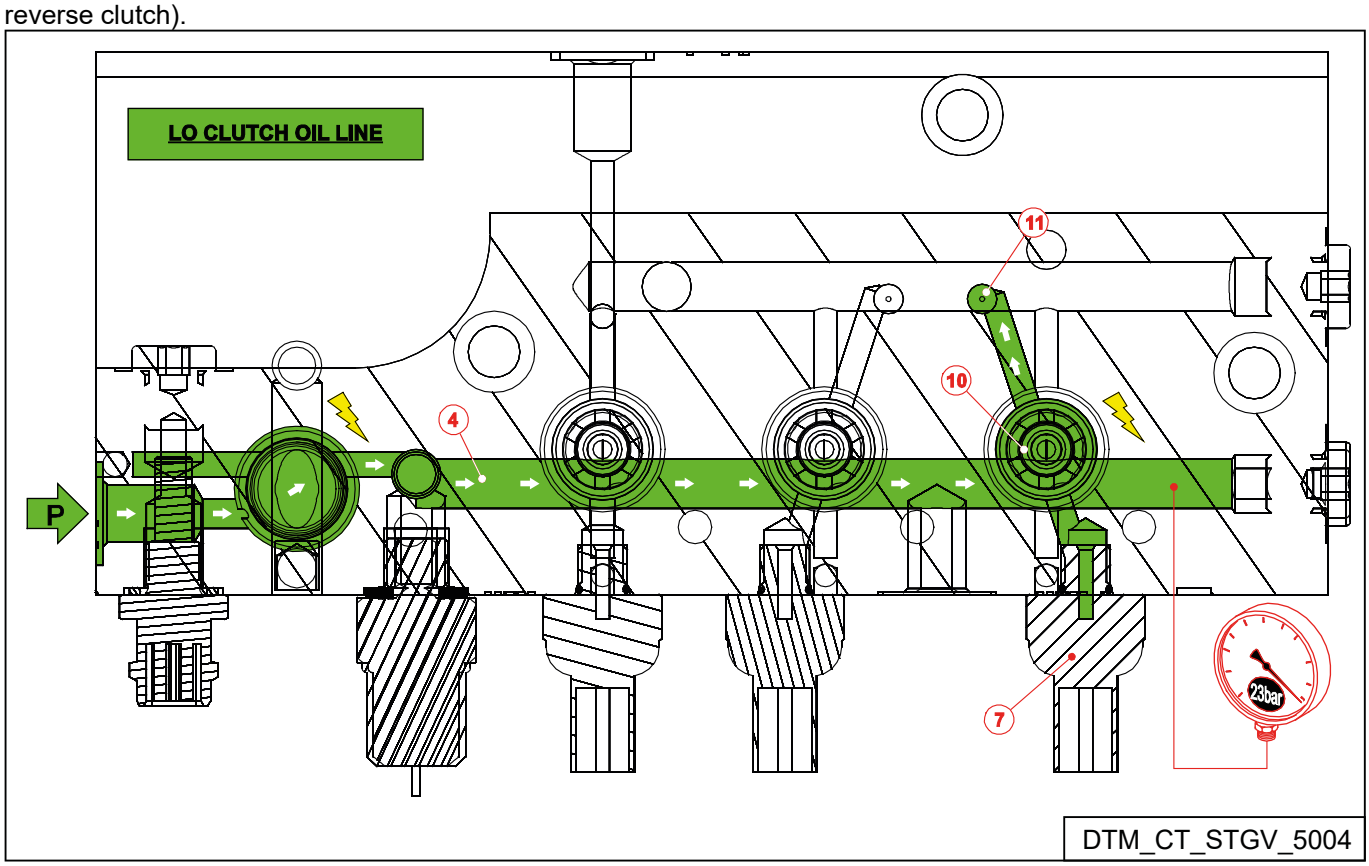

Oil is provided to ehmiii valve by line (1). Safety valve solenoid (2) when not energizer is “closed” and oil is trapped. In normal condition, safety valve (2) is energized and oil is routed to main ring (4). Activating the safety valve (2) oil is discharged from main ring (4) through hole (3).



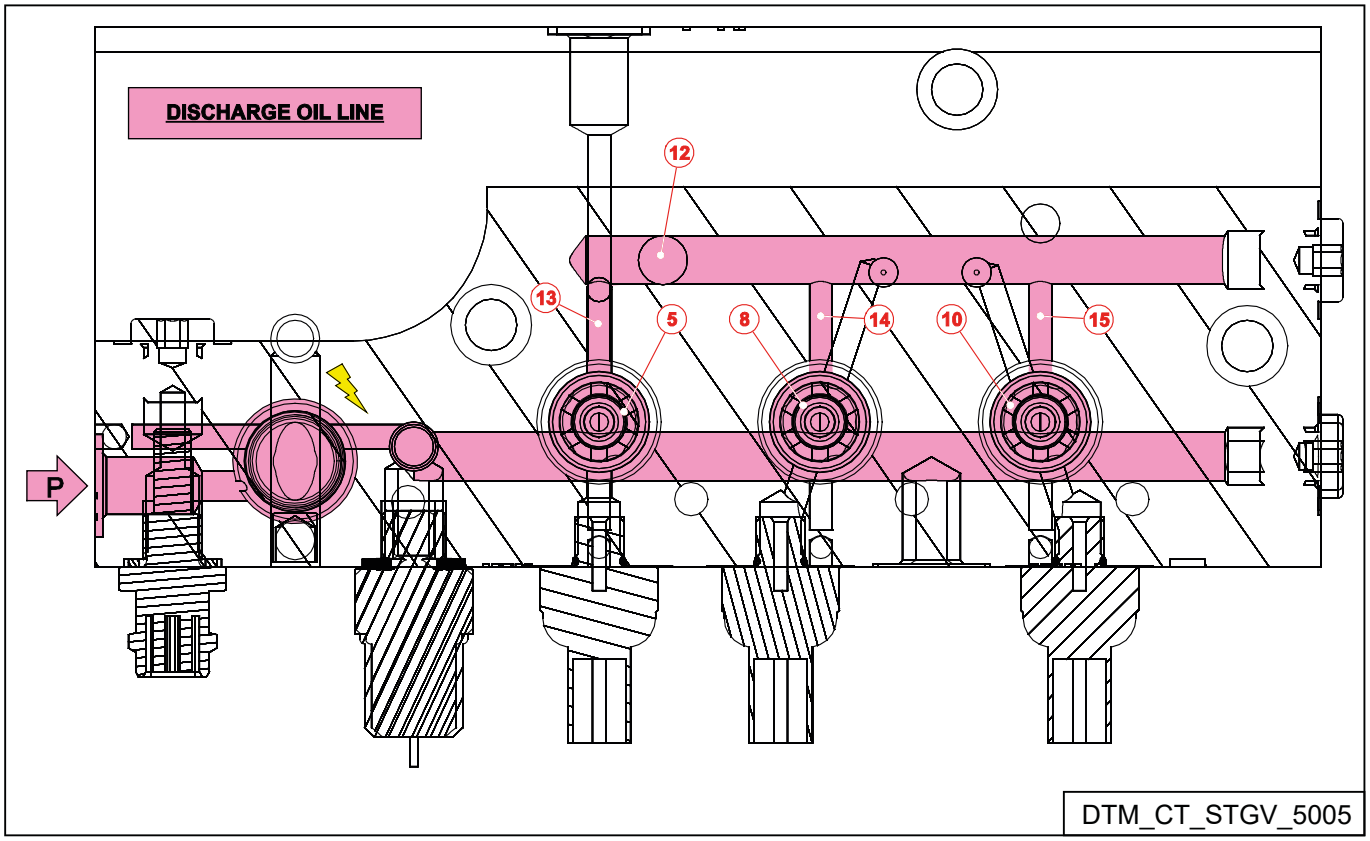

Oil inside the main ring (4) - (23 bar) is routed to the high clutch through line (6) when the high clutch solenoid (5) is energized. Pressure switch (7) read the pressure value behind the solenoid (same value that is provided to high clutch).




Oil inside the main ring (4) - (23 bar) is routed to the reverse clutch through line (9) when the reverse clutch solenoid (8) is energized. Pressure switch (7) read the pressure value behind the solenoid (same value that is provided to reverse clutch).




Oil inside the main ring (4) - (23 bar) is routed to the lo clutch through line (11) when the hi clutch solenoid (10) is energized. Pressure switch (7) read the pressure value behind the solenoid (same value that is provided to hi clutch).



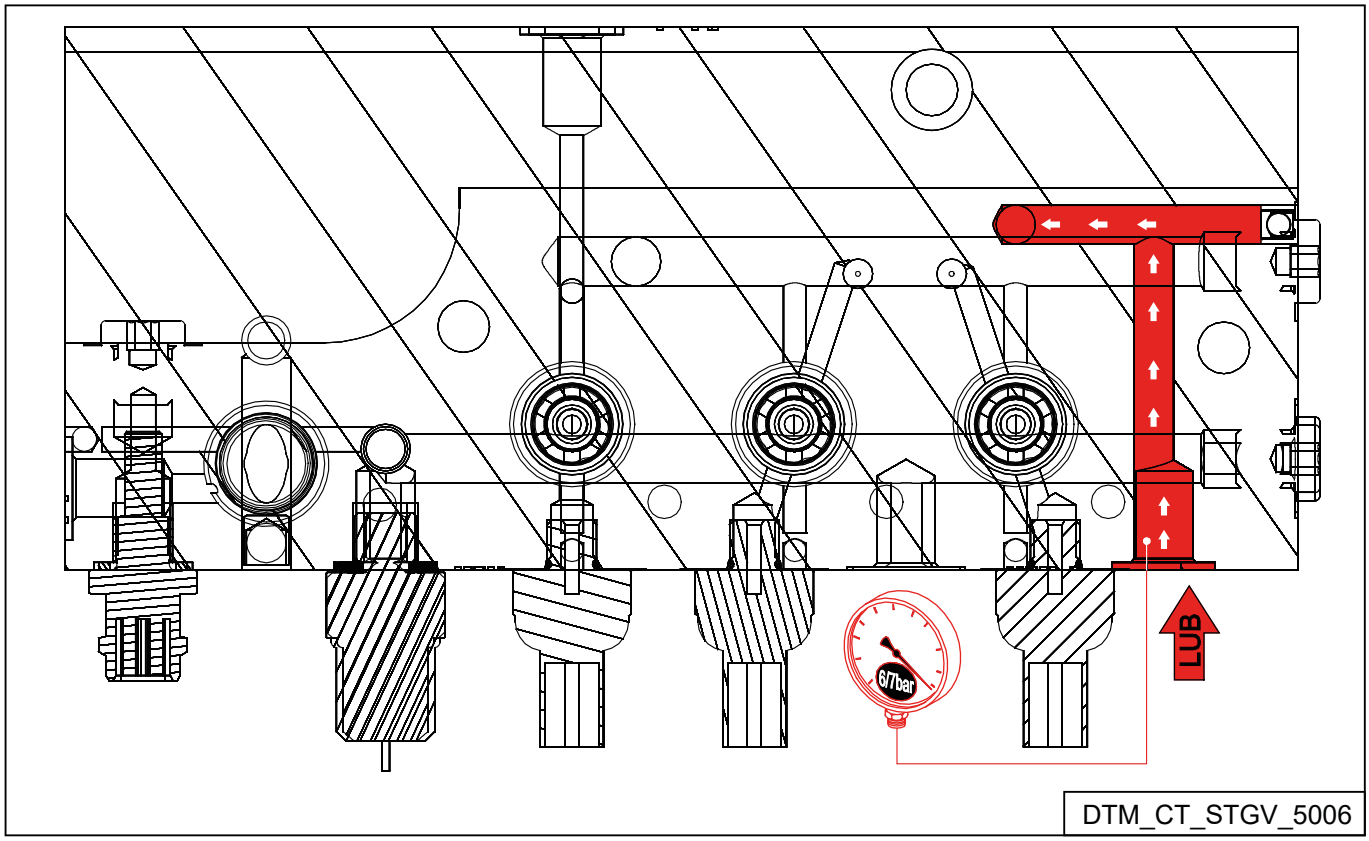

Conditions:

- Engine running
- FnR lever in neutral position

With tractor in above conditions, oil remains inside the main ring (4). Condition of solenoid valves is:

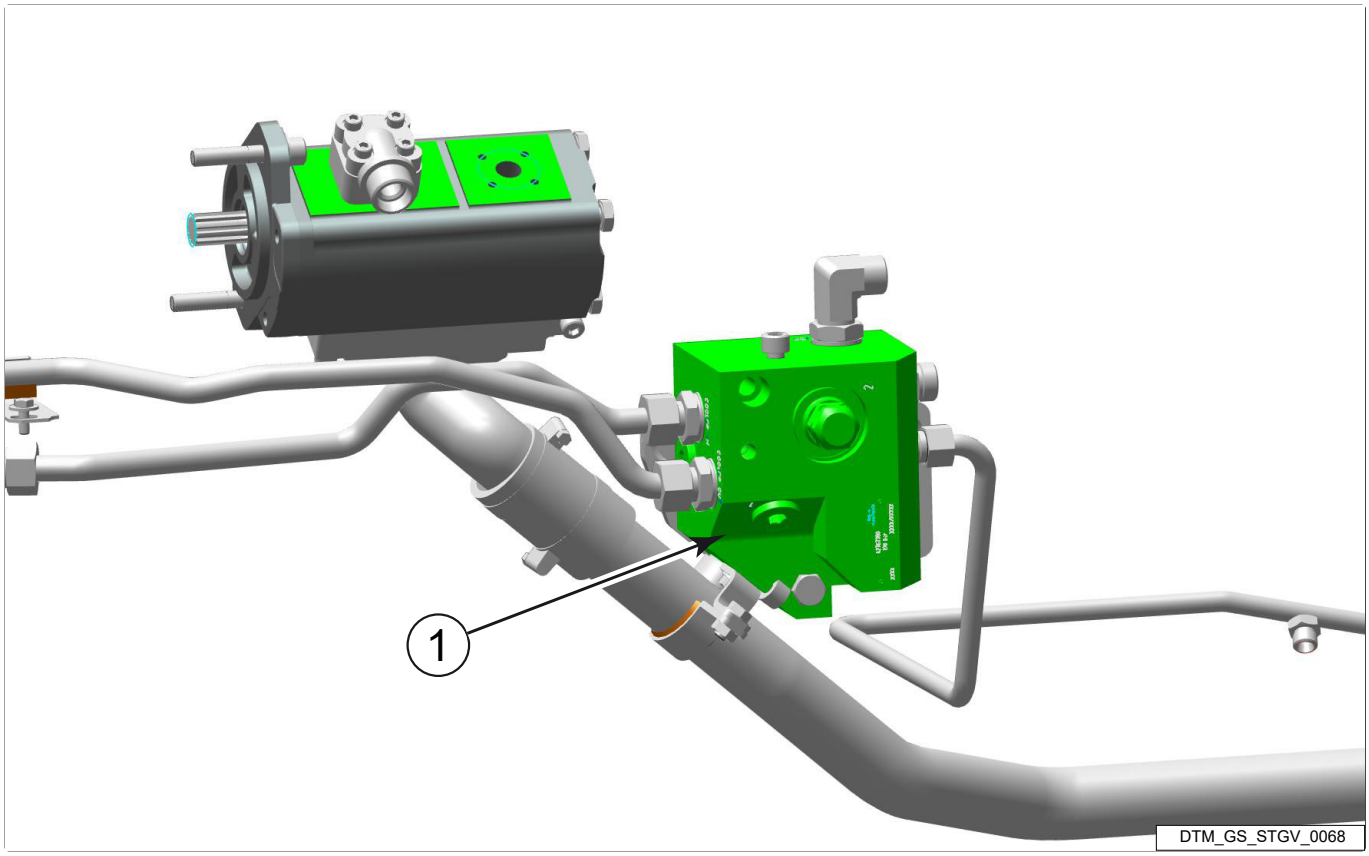
- Safety solenoid energized
- HI solenoid (5) not energized
- LO solenoid (10) not energized
- Reverse solenoid (8) not energized

Lines (13), (14) and (15) allow the discharge of oil inside the valves (5), (10) and (8) when are switched off (the small amount of oil that is inside valves).




With FnR lever in neutral position, oil pressure inside the lubrication valve is 8 bar.

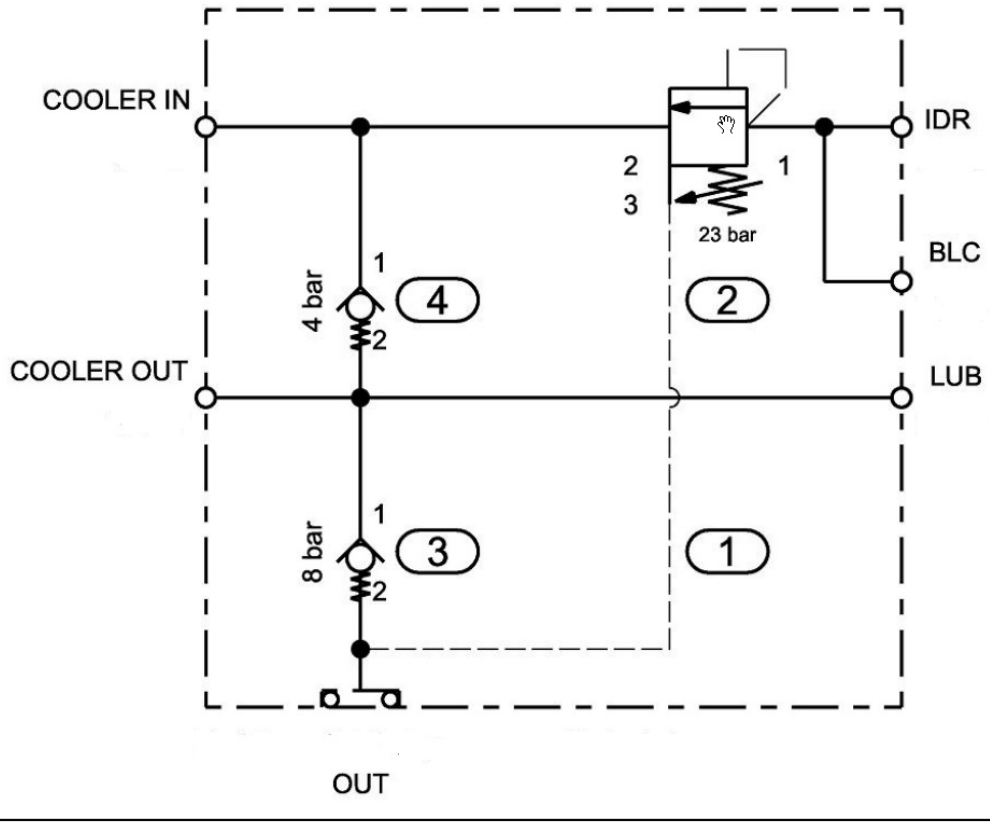
## 5.3. MULTIFUNCTION VALVE BLOCK FOR 2 PUMPS HYDRAULIC CONFIGURATION.



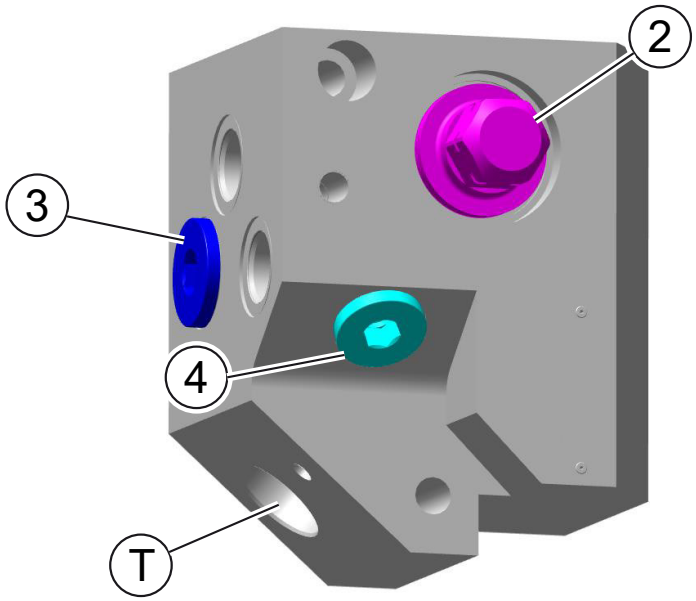

The Multifunction valve block (1), used in case of tractor equipped with 2 hydraulic pump configuration, is located on the left side of the engine, closed to the hydraulic pumps.
In this case it includes the following functions:

- Oil cooler by-pass valve(4bar).

- Lubrication valve (8bar).
- Pressure valve for 4WD, Differential Lock and PTO engagement (23bar).

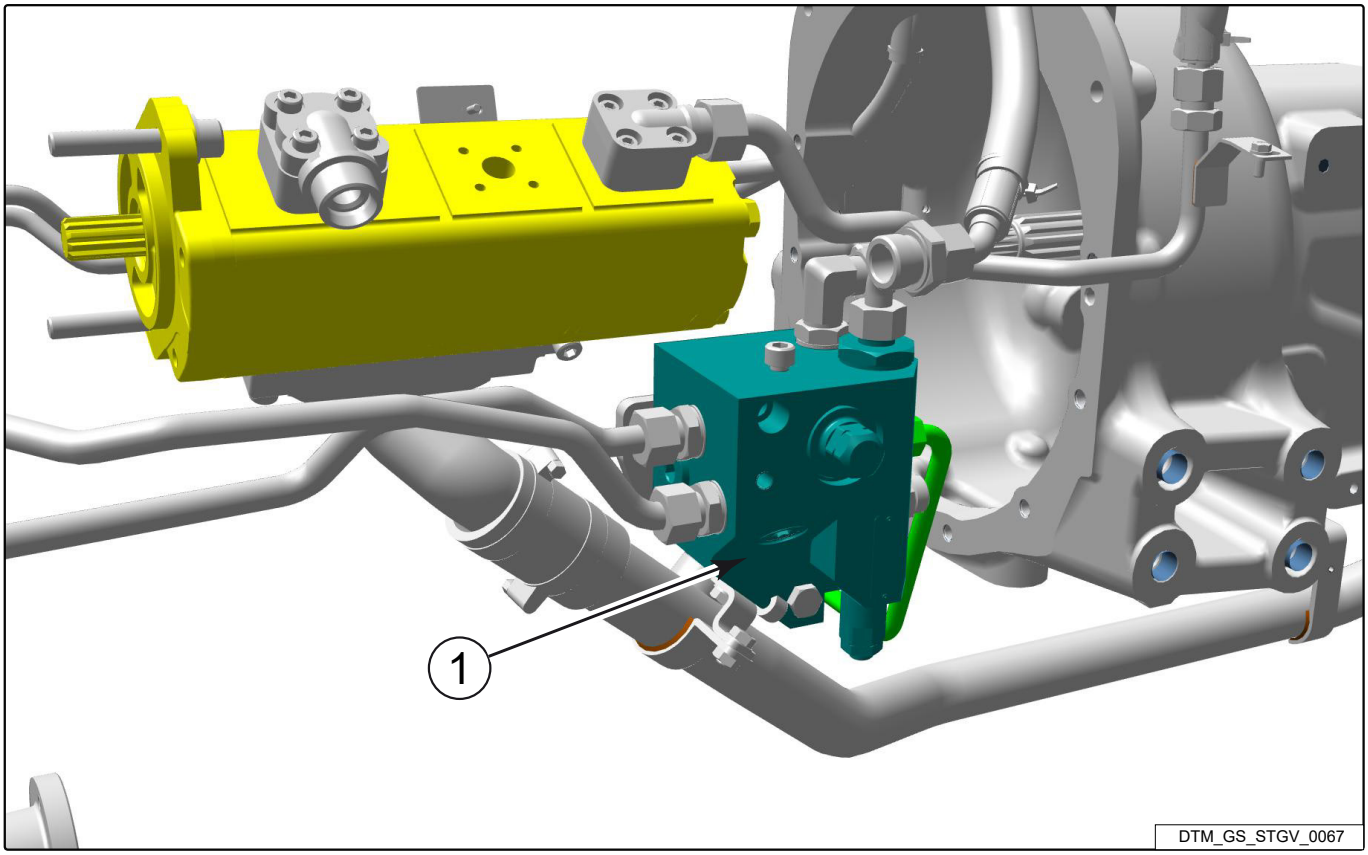



| | |
|---|---|
| 1) Return line to tank from valve N°2 | 3) Lubrication line valve (8bar) |
| 2) Pressure valve for 4WD, Diff. Lock, PTO (23bar) | 4) Oil cooler by-pass valve (4bar) |




| | |
|---|---|
| T) Return to tank, connection to suction line of the hydraulic pumps | 3) Lubrication line valve (8bar) |
| 2) Pressure valve for 4WD, Diff. Lock, PTO (23bar) | 4) Oil cooler by-pass valve (4bar) |

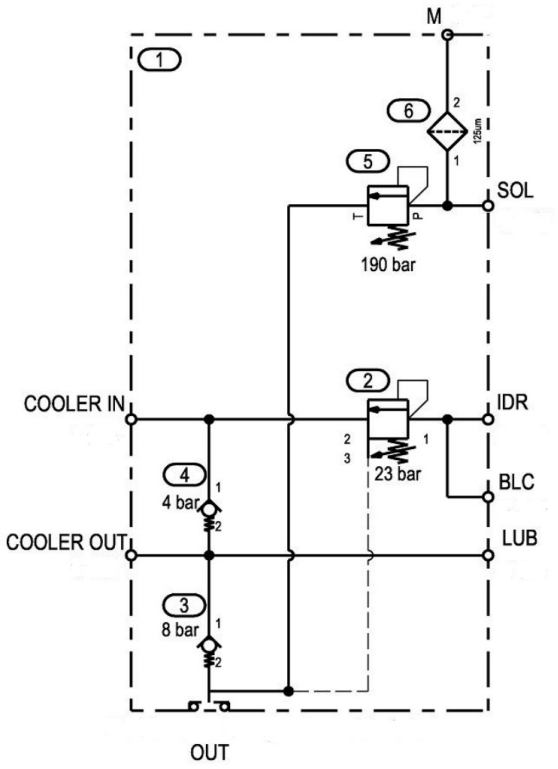
## 5.4. MULTIFUNCTION VALVE BLOCK FOR 3 PUMPS HYDRAULIC




The Multifunction valve block (1), used in case of tractor equipped with 3 hydraulic pump configuration, is located on the left side of the engine, closed to the hydraulic pumps.
In this case it includes the following functions:

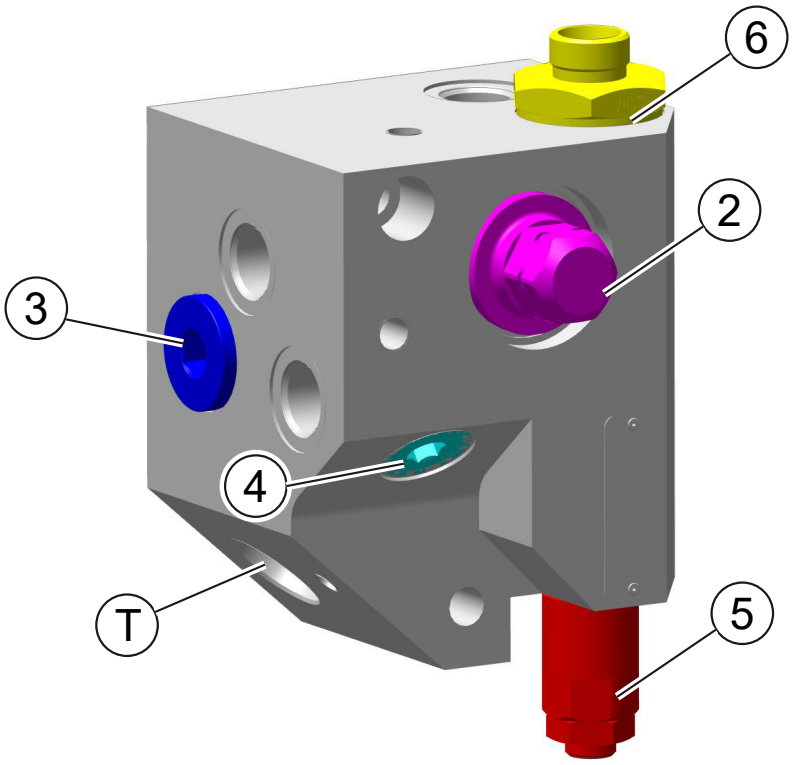
- Oil cooler by-pass valve(4bar).
- Lubrication valve (8bar).
- Pressure valve for 4WD, Differential Lock and PTO engagement (23bar).
- Rear hitch safety valve (190bar).
- Hydraulic filter for the rear hitch (125micron).

•




DTM_GS_STGV_0015

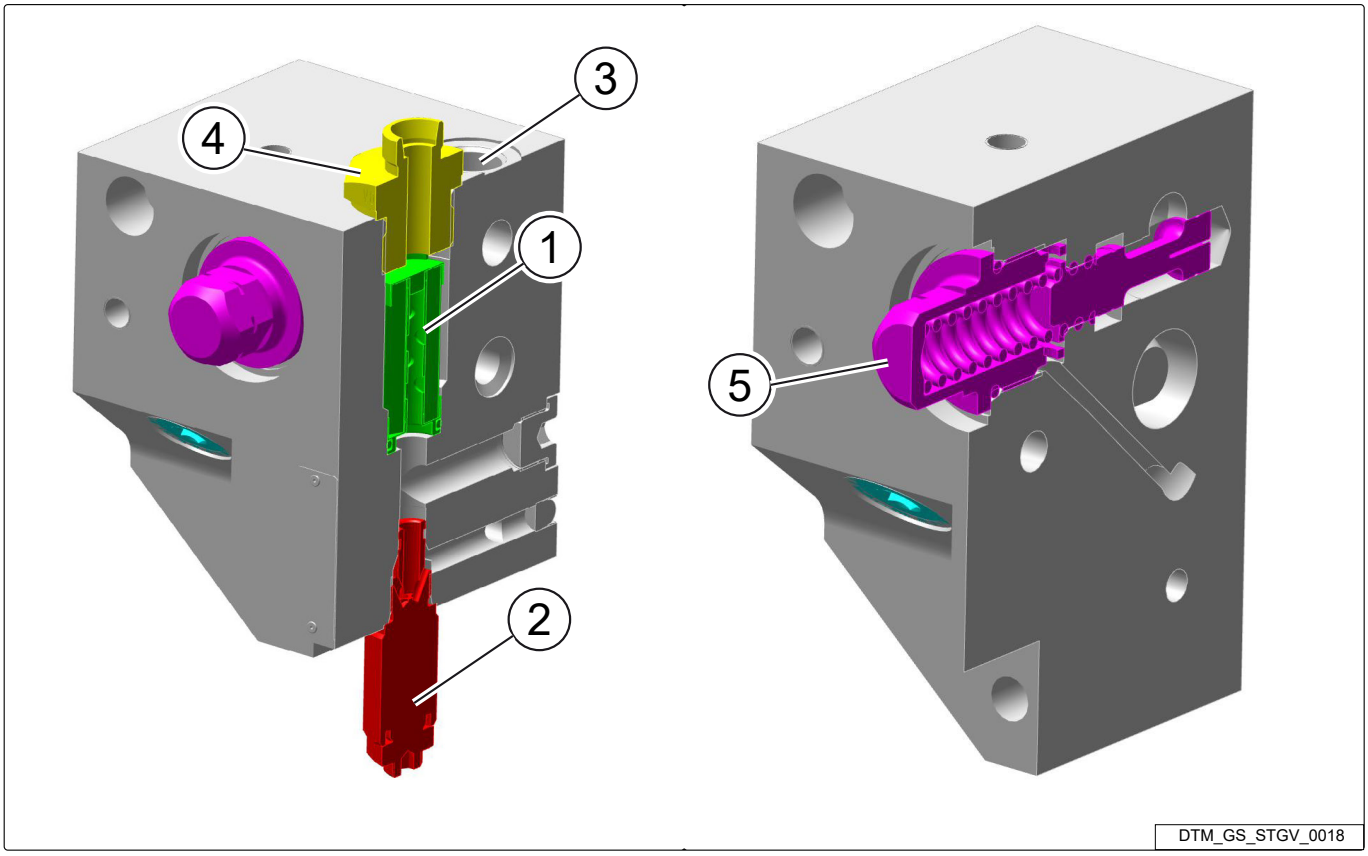
| | |
|---|---|
| 1) Multifunction valve block assembly | 4) Oil cooler by-pass valve (4bar) |
| 2) Pressure valve for 4WD, Diff. Lock, PTO (23bar) | 5) Rear hitch safety relief valve (190bar) |
| 3) Lubrication line valve (8bar) | 6) Rear hitch oil pressure filter (125micron) |



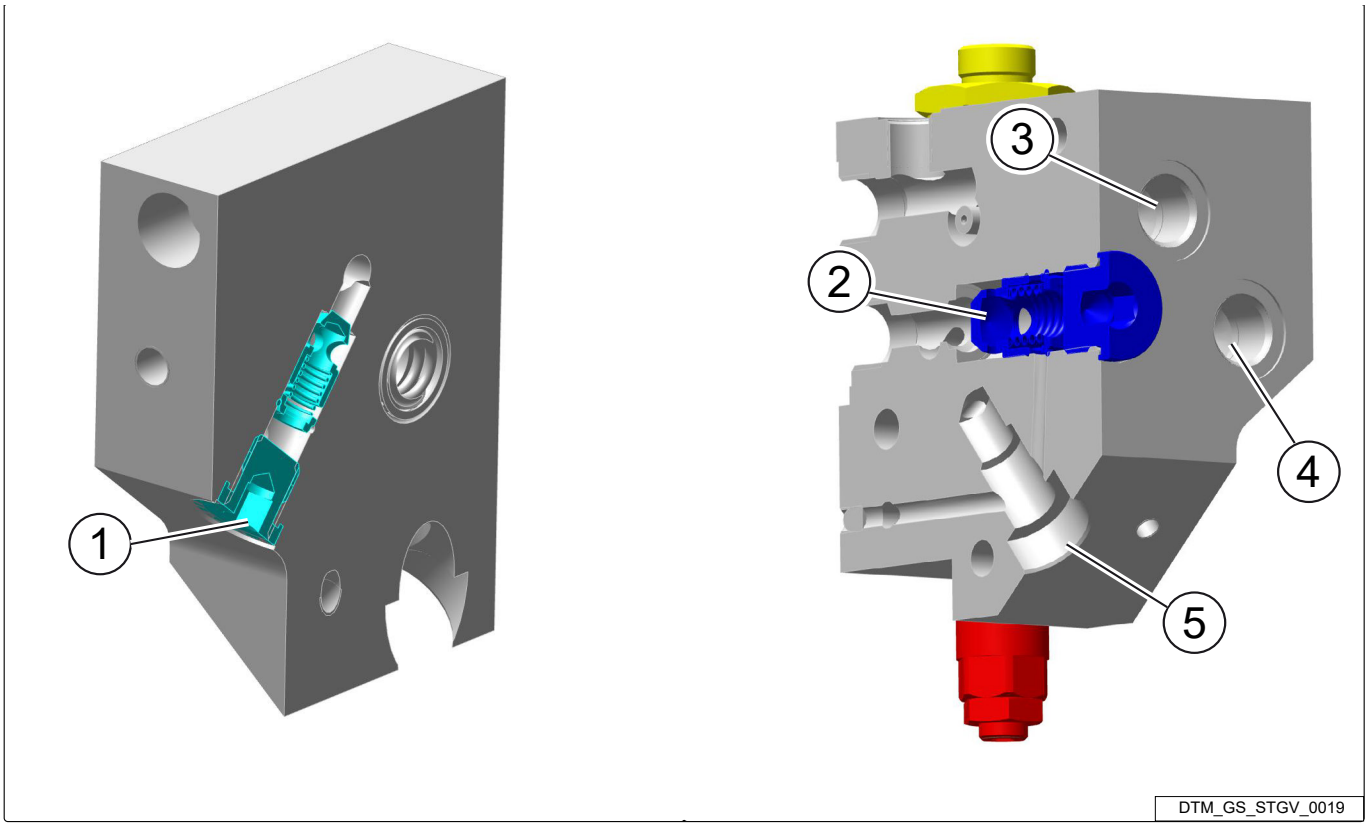

DTM_GS_STGV_0017

| | |
|---|---|
| T) Return to tank, connection to suction line of the hydraulic pumps | 4) Oil cooler by-pass valve (4bar) |
| 2) Pressure valve for 4WD, Diff. Lock, PTO (23bar) | 5) Rear hitch safety relief valve (190bar) |
| 3) Lubrication line valve (8bar) | 6) Rear hitch oil pressure filter (125micron) |

# 5.5. MULTIFUNCTION VALVE BLOCK INTERNAL PART OVERVIEW

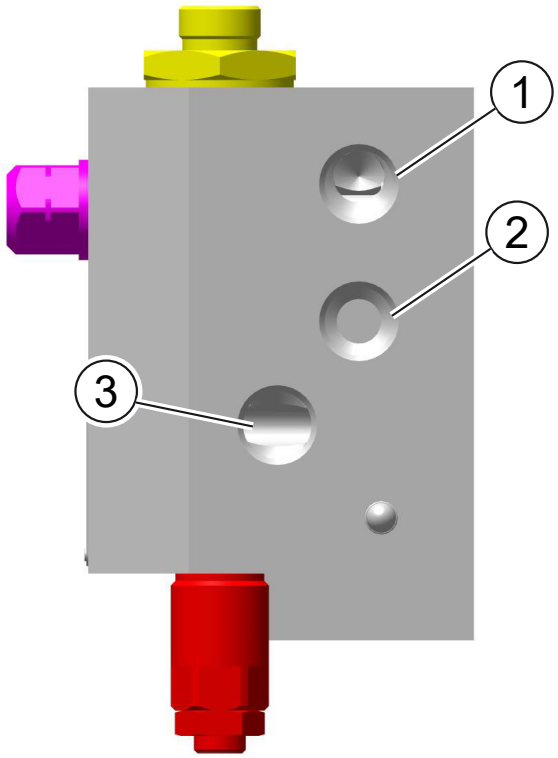



| | |
|---|---|
| 1) Rear hitch oil pressure filter (125micron) | 4) Connection to the rear hitch |
| 2) Rear hitch safety relief valve (190bar) | 5) Pressure valve for 4WD, Diff. Lock, PTO (23bar) |
| 3) Connection to Steering valve (IN) | |




| | |
|---|---|
| 1) Oil cooler by-pass valve (4bar) | 4) Connection to oil cooler line (OUT) |
| 2) Lubrication line valve (8bar) | 5) Return to tank, connection to suction line of the hydraulic pumps |
| 3) Connection to oil cooler line (IN) | |

The same connection points are available on the multifunction valve, is not present the relevant connection to the rear hitch and the oil filter.

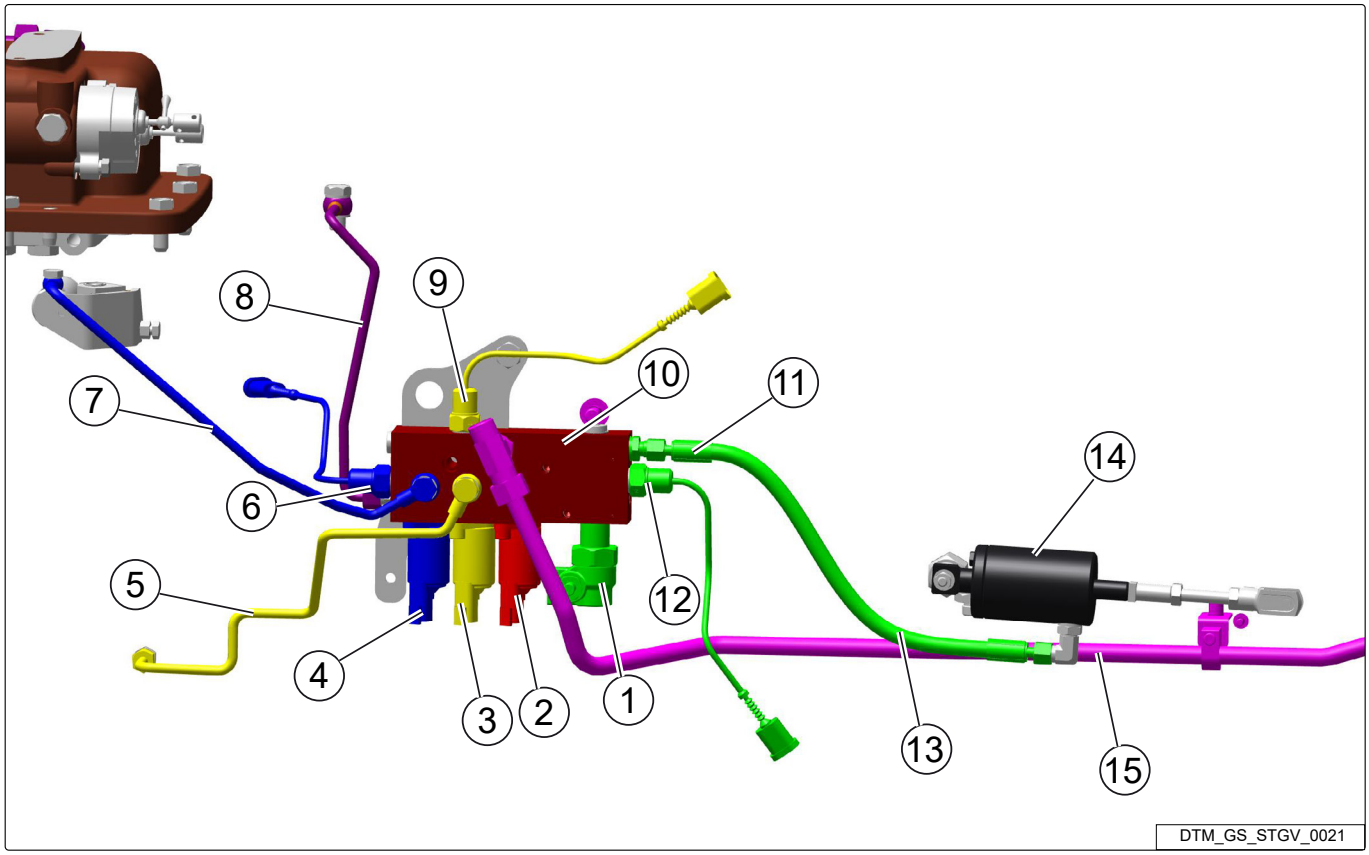



DTM_GS_STGV_0020

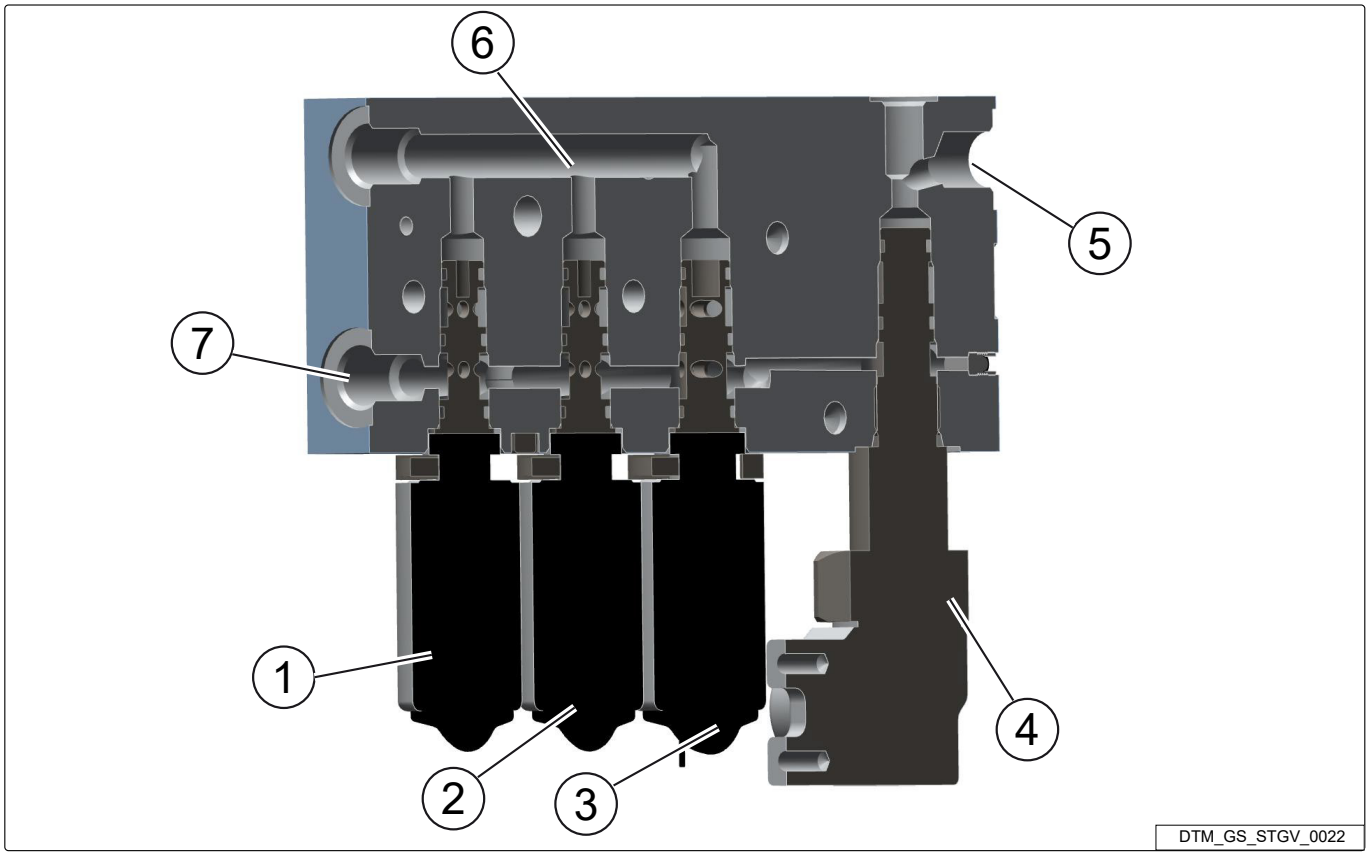
| |
|---|
| 1) Connection to transmission valve block |
| 2) Connection to lubrication line |
| 3) Connection to rear hitch (supply line) |

# 5.6. 4WD, DIFFERENTIAL LOCK, REAR PTO OVERVIEW

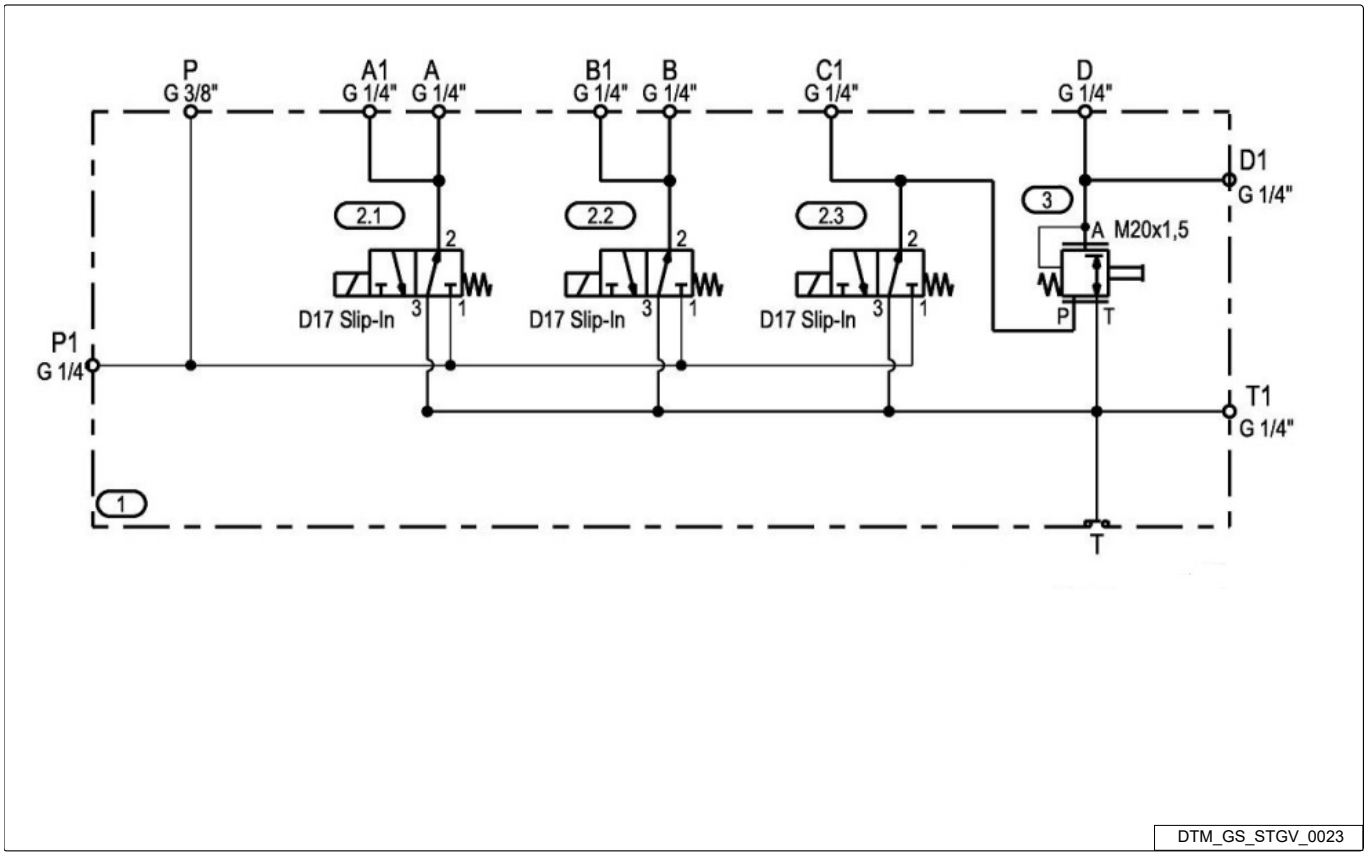
## 5.6.1. Mechanical rear PTO version.




| | |
|---|---|
| 1) Rear PTO engagement valve (driven by Bowden cable) | 9) 4WD pressure switch |
| 2) Rear PTO safety valve coil | 10) Valve block assembly |
| 3) 4WD valve coil | 11) Rear PTO hydraulic supply line |
| 4) Differential lock valve coil | 12) REAR PTO pressure switch |
| 5) 4WD Hydraulic supply line | 13) Rear PTO hydraulic cylinder supply line |
| 6) Diff. lock pressure switch | 14) REAR PTO Hydraulic cylinder |
| 7) Diff. lock Hydraulic supply line | 15) Hydraulic supply line to the valve assembly |
| 8) Hydraulic return line to tank | |

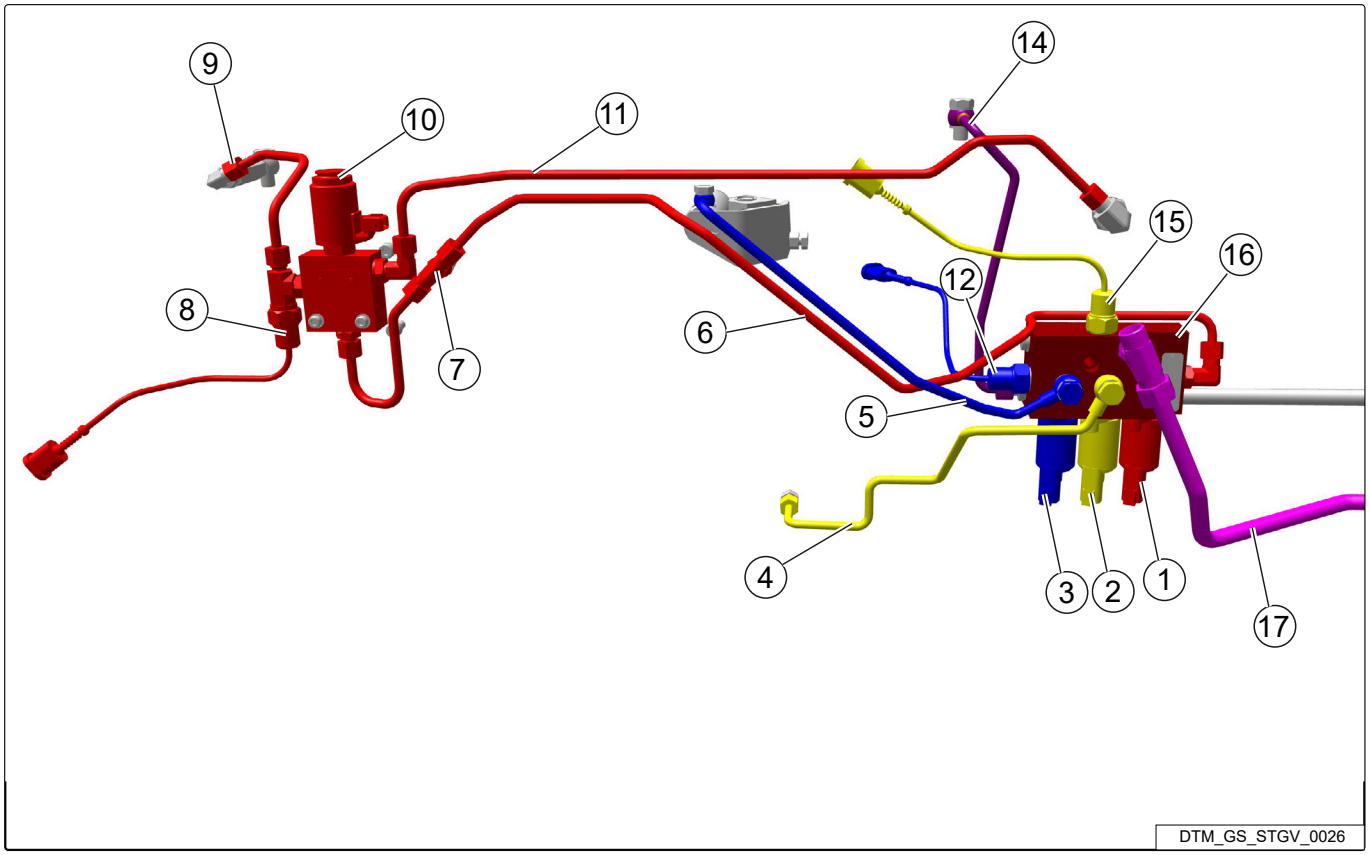



| | |
|---|---|
| 1) Differential lock valve coil (2.1) | 5) Rear PTO hydraulic cylinder supply line |
| 2) 4WD valve coil (2.2) | 6) Valve block supply line |
| 3) Rear PTO safety valve coil (2.3) | 7) Valve block return line to tank |
| 4) Rear PTO engagement valve, driven by Bowden cable (3) | |

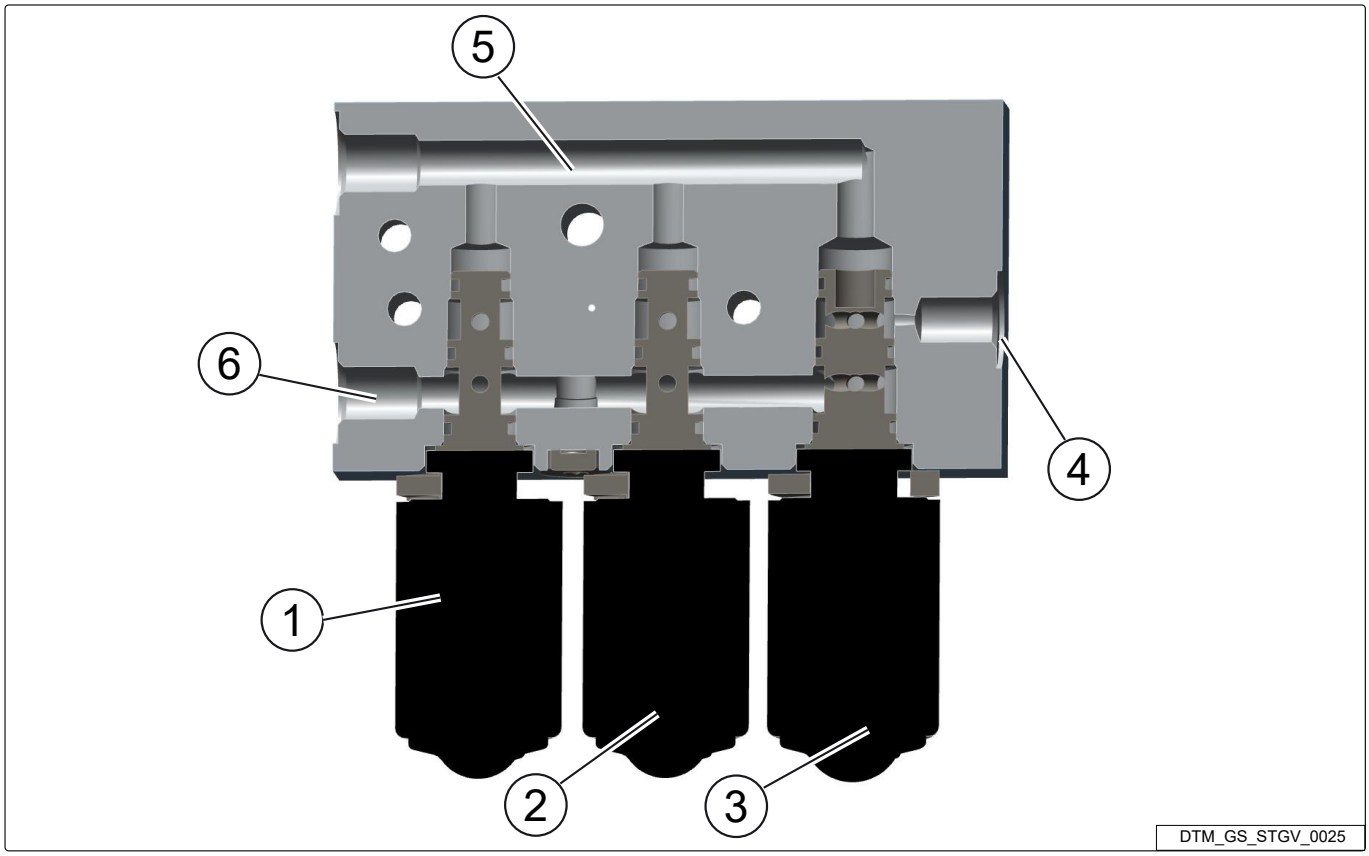



| | |
|---|---|
| 2.1) Differential lock valve coil | A) Diff. lock pressure line connection |
| 2.2) 4WD valve coil | A1) Diff. lock pressure switch connection |
| 2.3) Rear PTO safety valve coil | B) 4WD pressure line connection |
| 3) Rear PTO engagement valve (driven by Bowden cable) | B1) 4WD pressure switch connection |
| T) Not used | C1) Rear PTO pressure switch connection |
| T1) Valve block return line to tank | D) Rear PTO hydraulic cylinder supply line |
| P) Valve block supply line | D1) Not used |
| P1) Not used | |

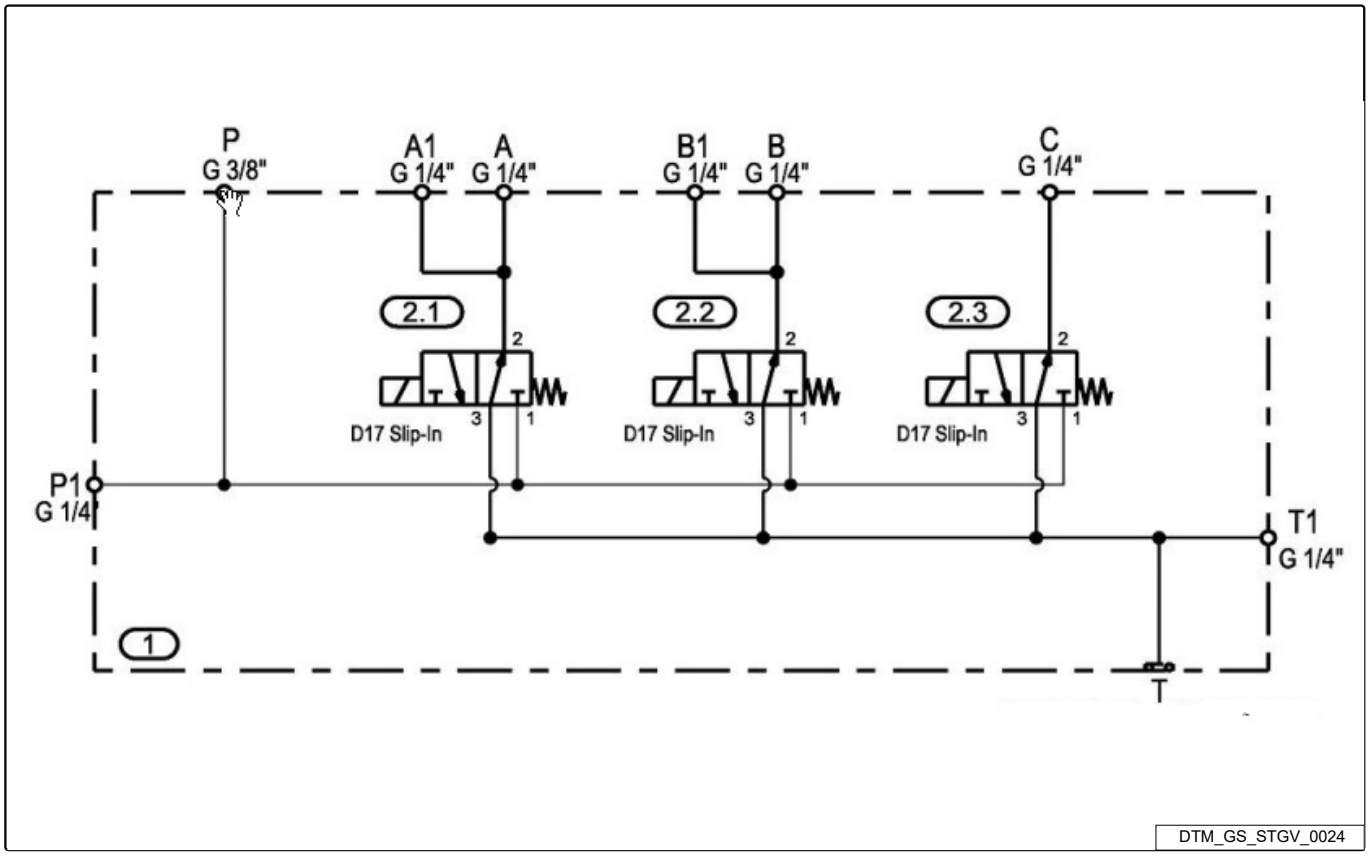
## 5.6.2. Hydraulic rear PTO version.




| | |
|---|---|
| 1) Rear PTO safety valve coil | 9) Rear PTO Clutch supply line |
| 2) Differential lock valve coil | 10) Rear PTO main valve |
| 3) 4WD valve coil | 11) Rear PTO hydraulic return line to tank |
| 4) 4WD hydraulic supply line | 12) Diff. lock pressure switch |
| 5) Diff. lock hydraulic supply line | 14) Hydraulic return line to tank from valve assembly |
| 6) Rear PTO hydraulic supply line | 15) 4WD pressure switch |
| 7) Connection to PTO brake line | 16) Valve block assembly |
| 8) Rear PTO pressure switch | 17) Hydraulic supply line to the valve assembly |



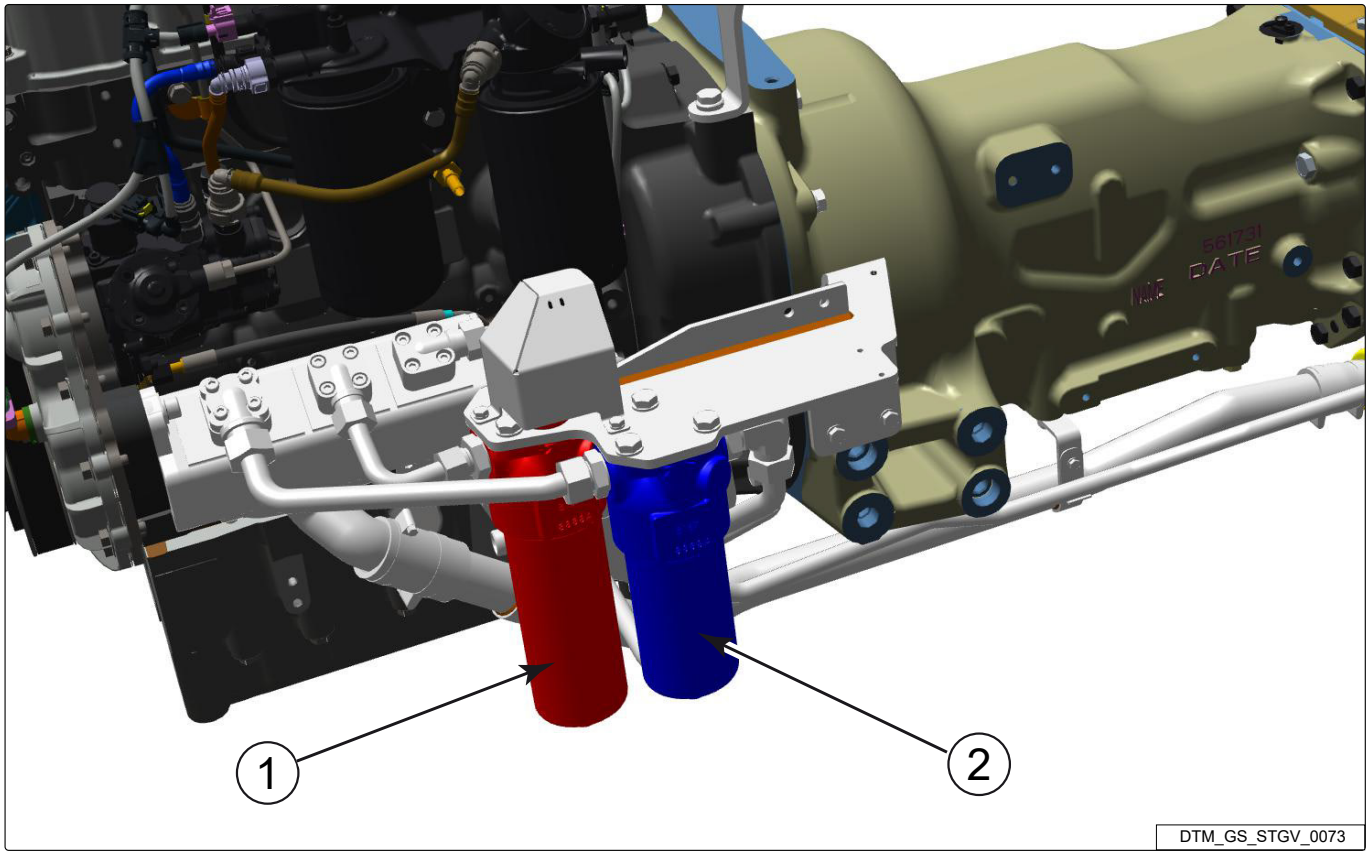

| | |
|---|---|
| 1) Differential lock valve coil (2.1) | 4) Rear PTO hydraulic supply line |
| 2) 4WD valve coil (2.2) | 5) Valve block supply line |
| 3) Rear PTO safety valve coil (2.3) | 6) Valve block return line to tank |




| | |
|---|---|
| 2.1) Differential lock valve coil (2.1) | P1) Not used |
| 2.2) 4WD valve coil (2.2) | A) Diff. lock pressure line connection |
| 2.3) Rear PTO safety valve coil (2.3) | A1) Diff. lock pressure switch connection |
| T) Not used | B) 4WD pressure line connection |
| T1) Valve block return line to tank | B1) 4WD pressure switch connection |
| P) Valve block supply line | C) Rear PTO supply line |

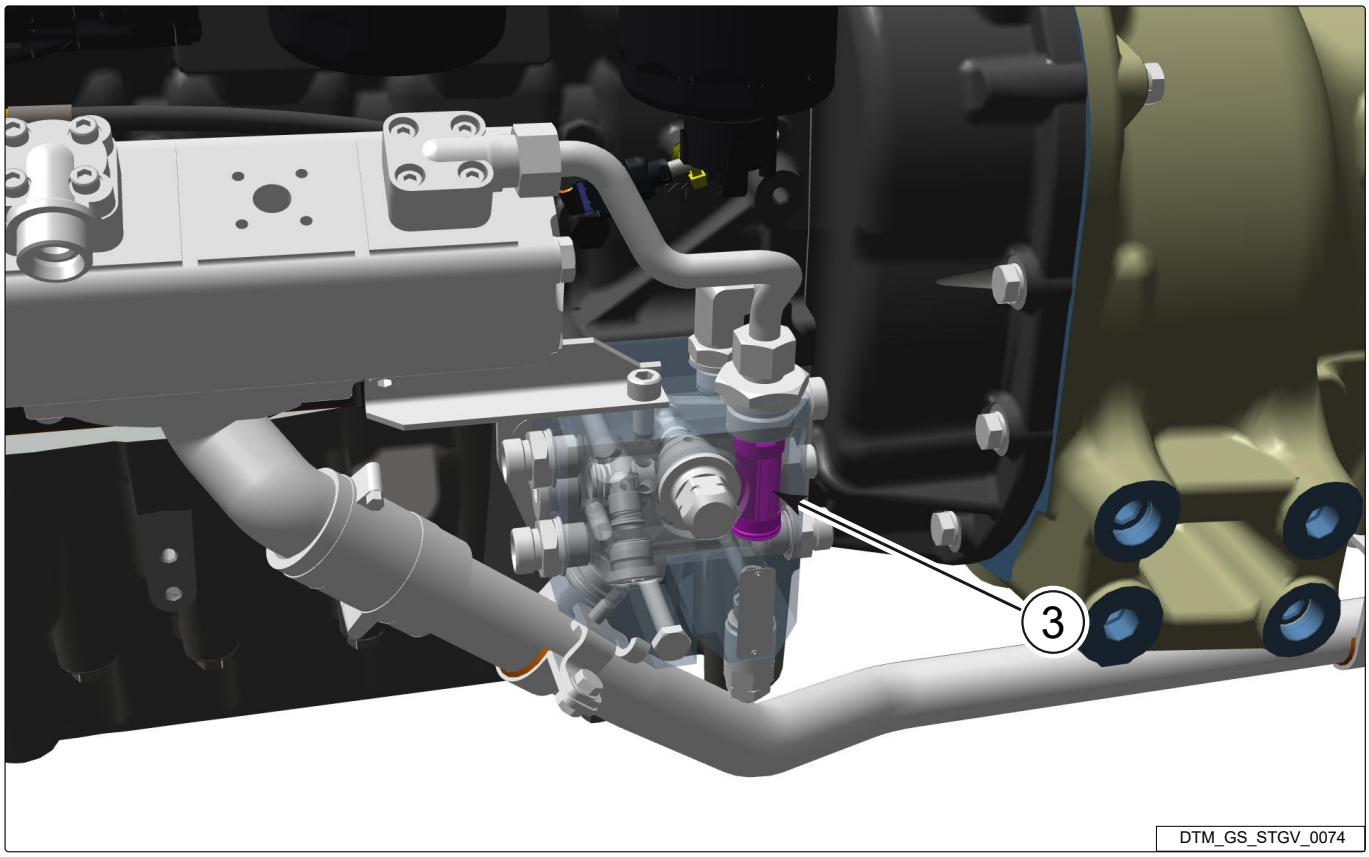
# 5.7. HYDRAULIC FILTERS

## 5.7.1. Hydraulic filters positions



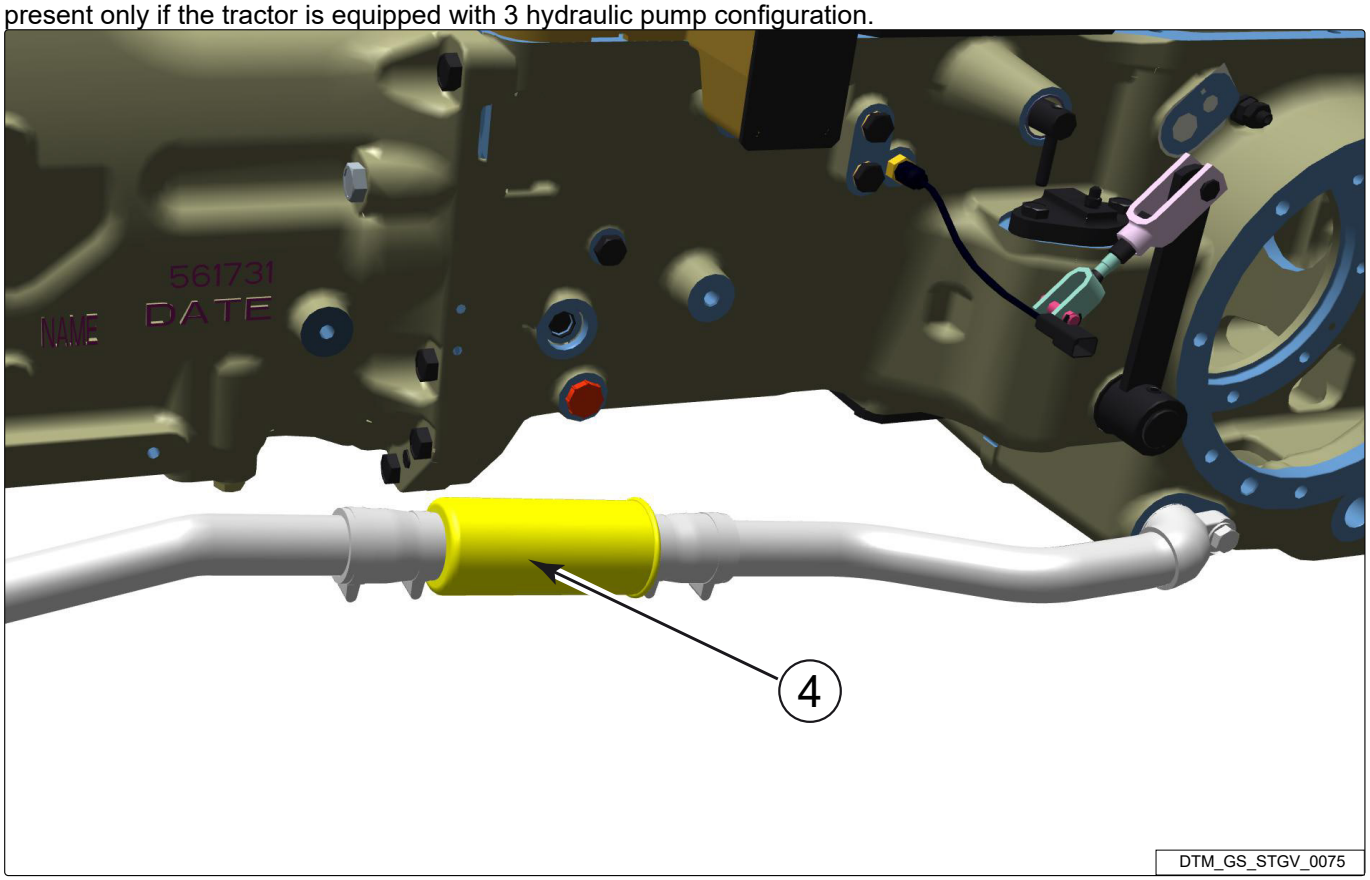

The hydraulic pressure filter (1) is link to steering function and transmission functions, if the tractor is equipped with hydraulic transmission 24+12, on the filter is install a clogging pressure switch (3,5 bar).
The hydraulic pressure filter (2) depending on the hydraulic pump configurations can be link to:

- 2 pump configuration is link to rear SCV's and rear hitch.
- 3 pump configuration is link to the rear



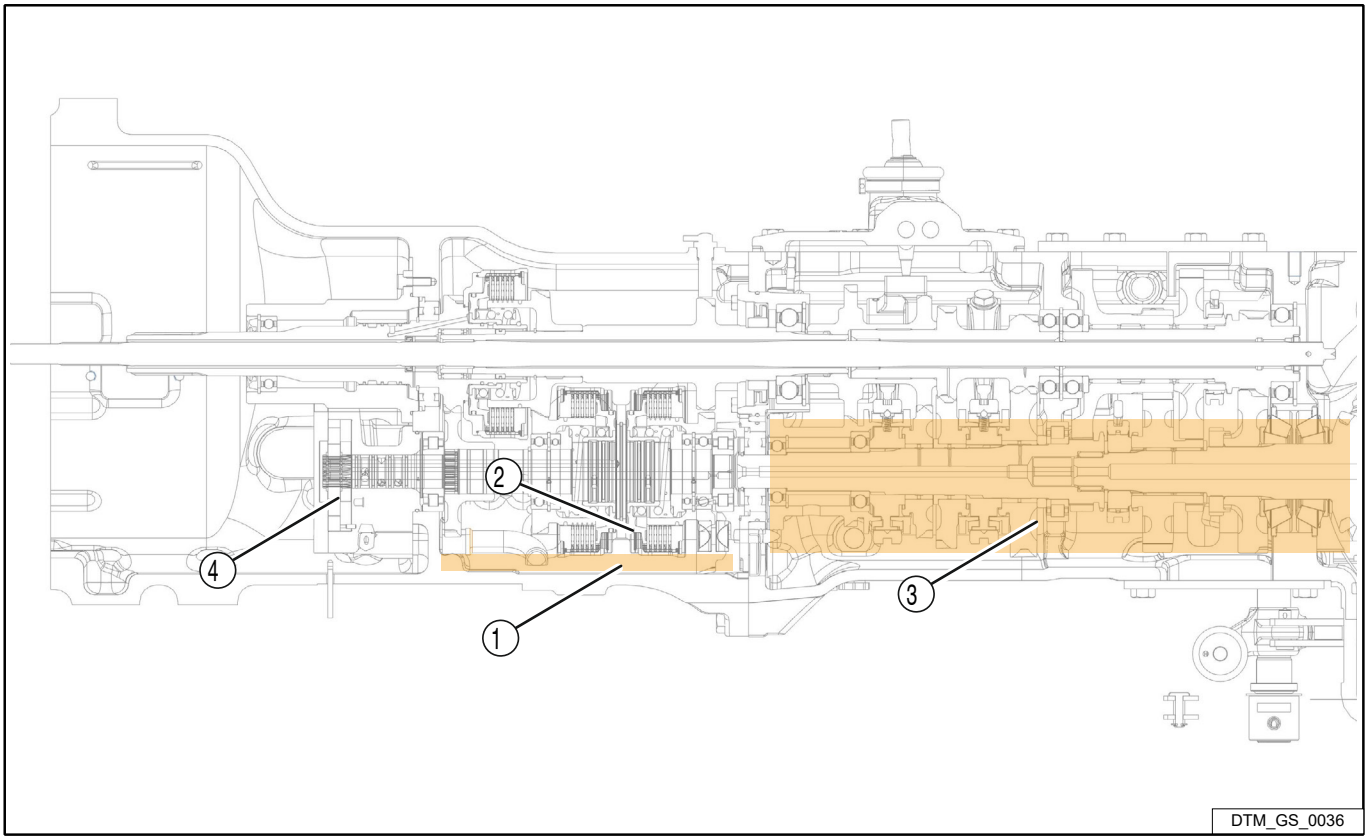

The hydraulic pressure filter (3) is link to the rear hitch and is located inside the Multifunction valve block. The filter is

present only if the tractor is equipped with 3 hydraulic pump configuration.



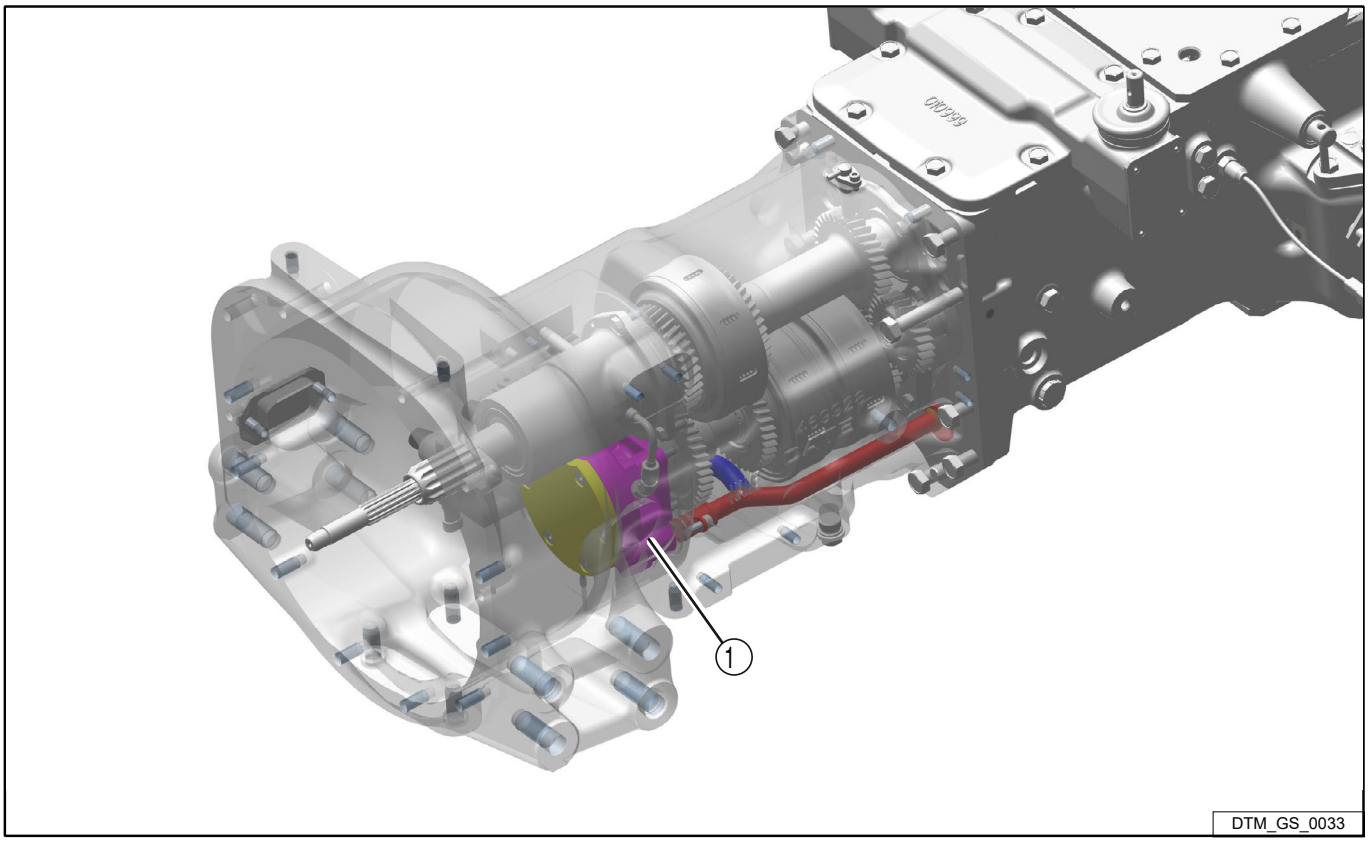

The suction screen (4) is fitted in the suction line between the hydraulic pump and the transmission.

# 5.8. GEROTOR TRANSFER PUMP ON 24+12 TRANSMISSION.

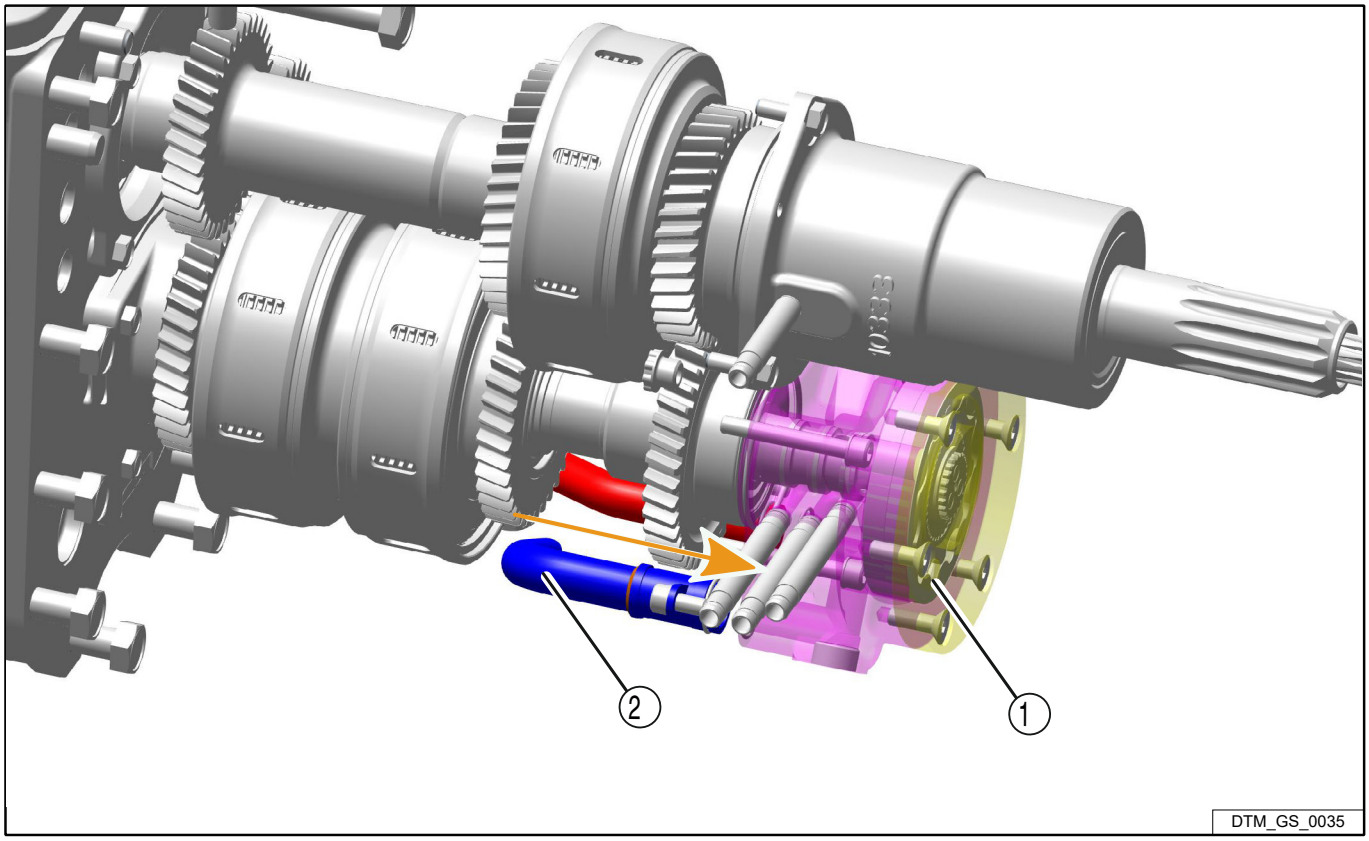



| | |
|---|---|
| 1) Front housing oil level. | 3) Rear housing oil level. |
| 2) Internal transfer oil line | 4) Gerotor transfer pump. |

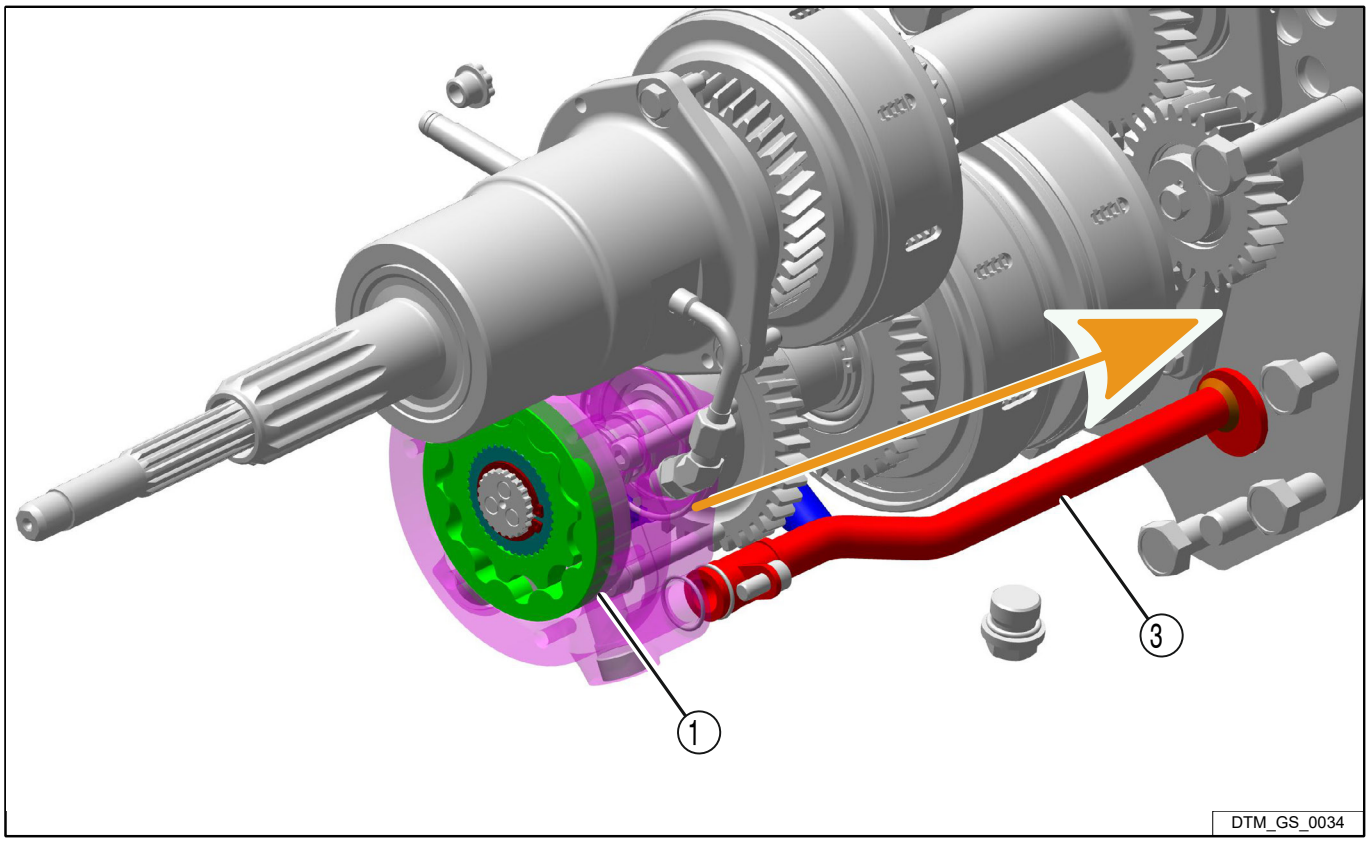
To prevent the clutches being self-driven, the oil level in the front housing (1) must be less than in the rear housing (3). By the Gerotor pump (4), the oil from the front housing is conveyed in the rear housing by a dedicated oil transfer line.



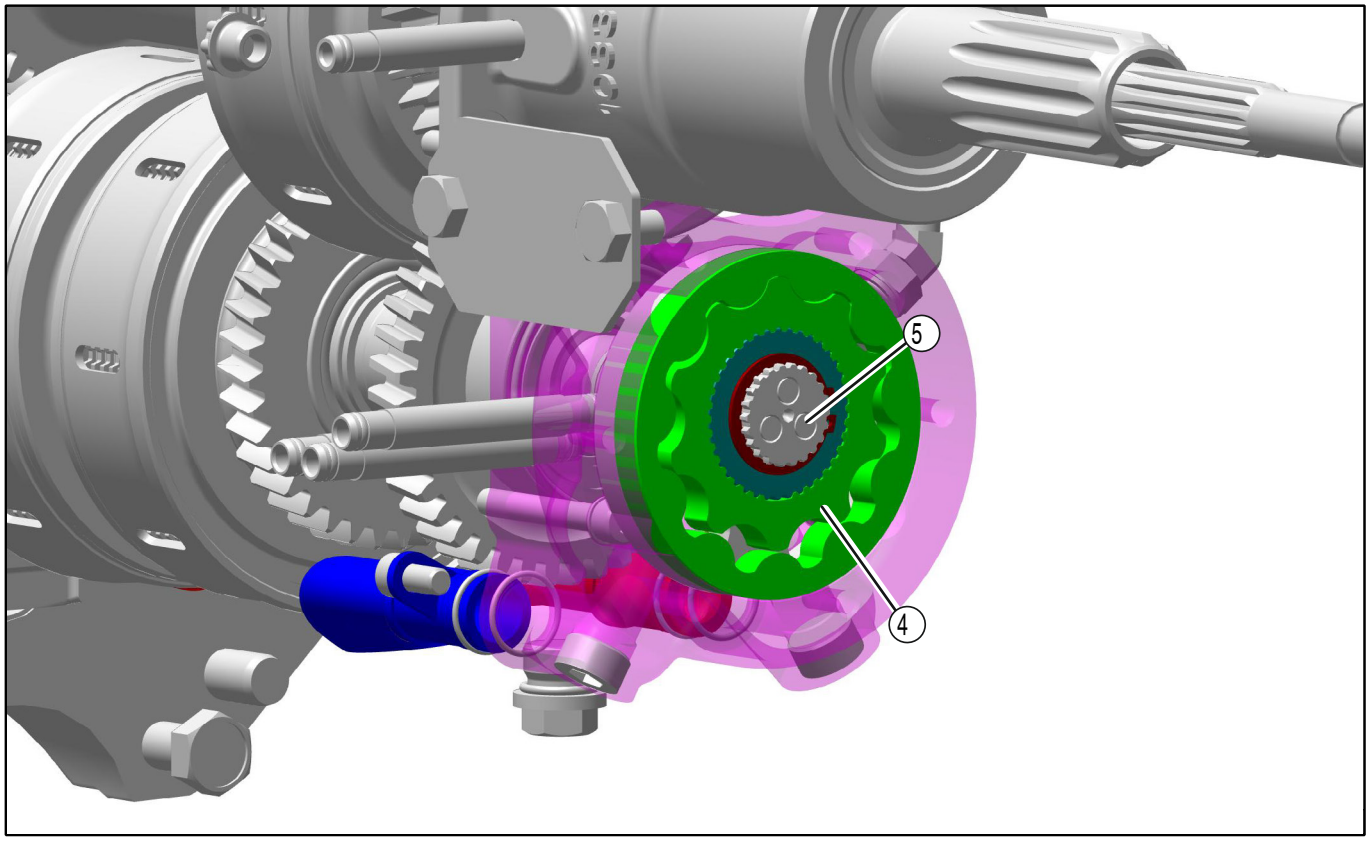

The Gerotor pump (1) is located in the front of the clutch housing.




The Gerotor pump (1) by the suction pipe (2) is sucking the oil from the clutch housing.




The oil is transfer by the connection pipe (3) to the rear side of the transmission.




The Gerotor pump gear (4) is driven directly from the clutch shaft (5).

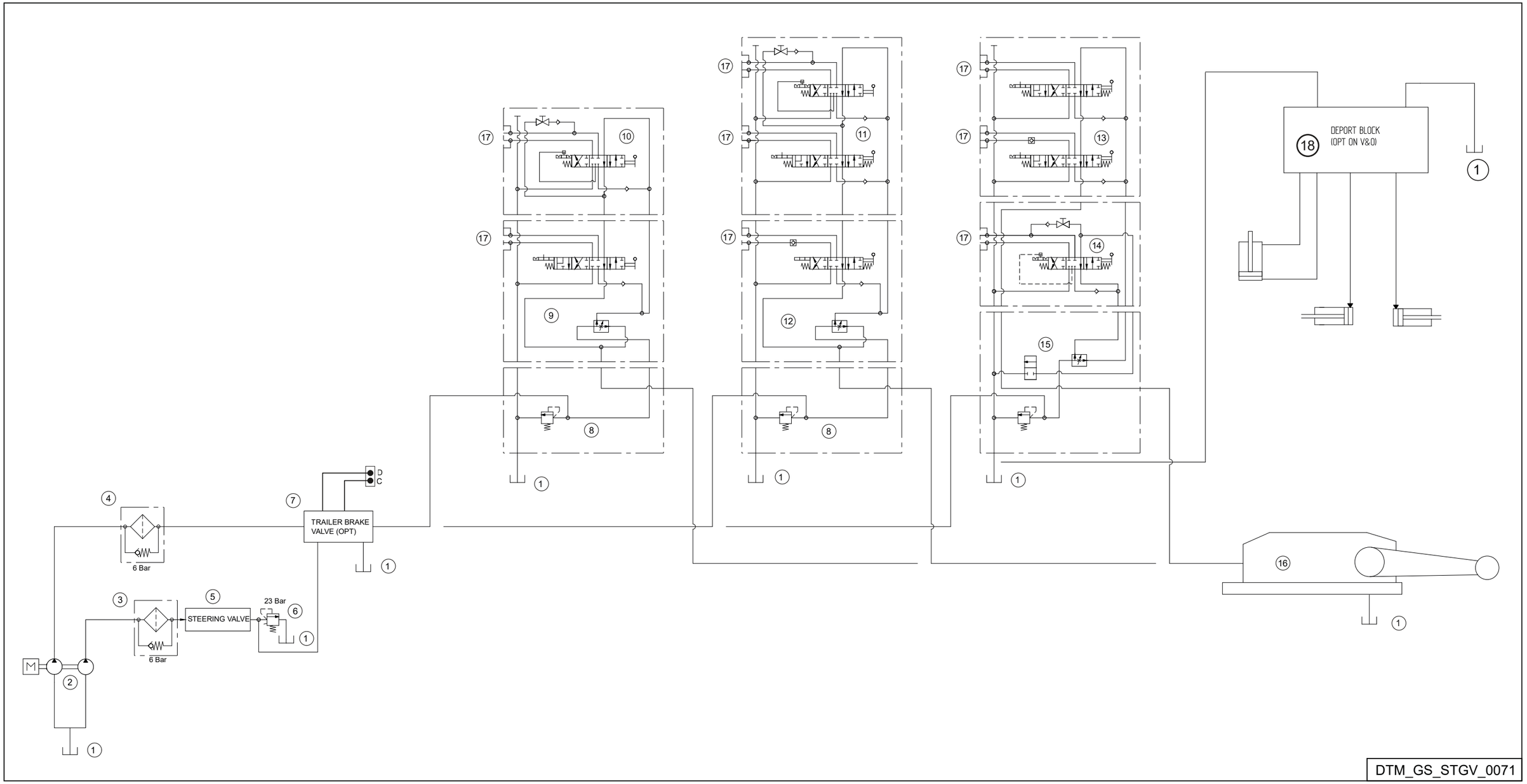
# 6 Selective Control Valves

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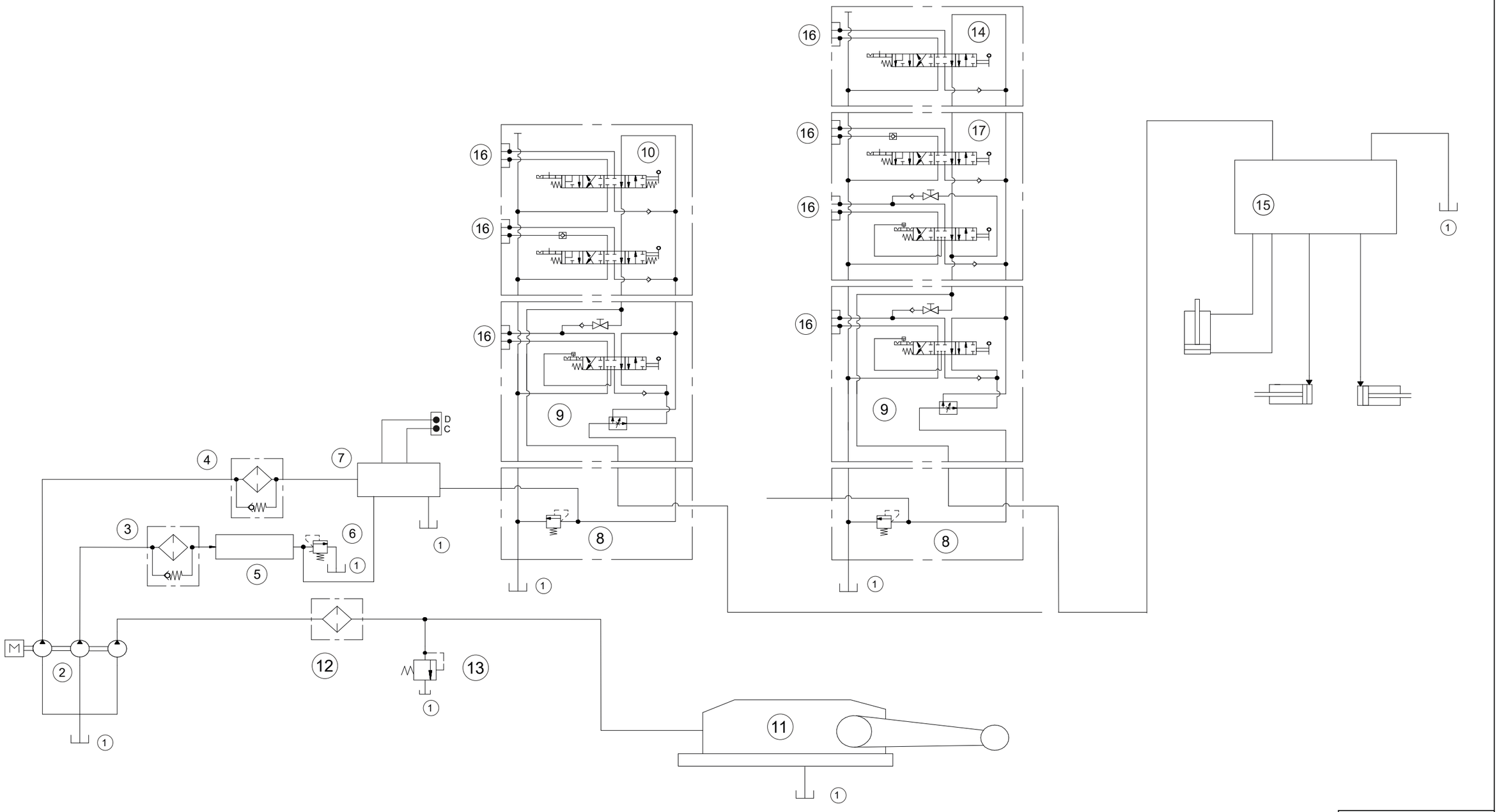
# 6.1. REAR SCVS HYDRAULIC SCHEMATICS

## 6.1.1. Configuration with 2 pumps and mechanical distributors



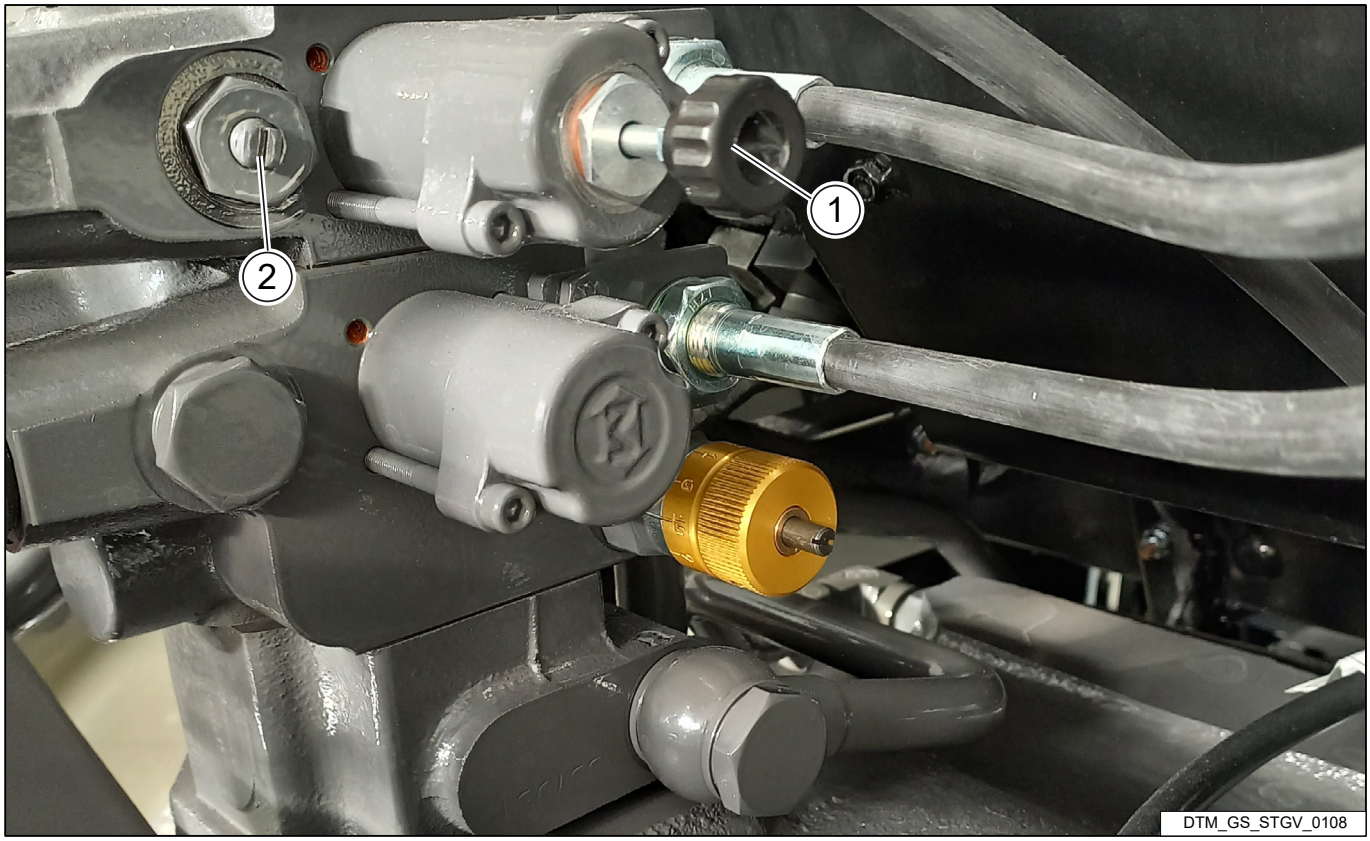

| | | | |
|---|---|---|---|
| 1) Filter element / Suction line / return to tank. | 6) Transmission pressure valve (23 bar). | 11) Block with 2 SCVs. The top SCV Single/Double effect + Detent function (excludable), with automatic release with no pressure, lower SCV 4 position double effect with Float. | 16) Rear hitch. |
| 2) Hydraulic pumps. | 7) Trailer brake valve MR (optional). | 12) Flow divider valve block (priority to the rear hitch), with one SCV 4 position double effect with Float with zero leak (on one port). | 17) Quick Coupler. |
| 3) Pressure oil filter Steering valve + Transmission. | 8) Relief valve (190 bar for SCV's and rear hitch). | 13) Block with 2 SCVs. The top SCV with 4 position double effect with Float, lower SCV 4 position double effect with Float with zero leak (on one port). | 18) Deport valve block (optional on CAB models).<br>D) Trailer brake coupler MR.<br>C)Trailer brake coupler MR. |
| 4) Pressure oil filter SCV + Rear hitch. | 9) Flow divider valve block (priority to the rear hitch), with one SCV 4 position double effect with Float. | 14) Single/Double effect SCV + Detent function (excludable), with automatic release with no pressure. | |
| 5) Steering valve. | 10) Single/Double effect SCV + Detent function (excludable), with automatic release with no pressure. | 15) Flow regulator valve block (priority to the rear hitch and SCVs on the top block). | |

## 6.1.2. Configuration with3 pumps and mechanical distributors




| | | | |
|---|---|---|---|
| 1) Filter element / Suction line / return to tank. | 6) Transmission pressure valve (23 bar). | 11) Rear hitch. | 16) Quick Coupler. |
| 2) Hydraulic pumps. | 7) Trailer brake valve MR (optional). | 12) Pressure oil filter for the rear hitch. | 17) Block with 2 SCVs. The top SCV with 4 position double effect with Float with zero leak (on one port), lower SCV 4 position double effect , with automatic release with no pressure<br>D.Trailer brake coupler MR.<br>C.Trailer brake coupler MR. |
| 3) Pressure oil filter Steering valve + Transmission. | 8) SCV's relief valve (190 bar). | 13) Rear hitch relief valve (190 bar). | |
| 4) Pressure oil filter SCV. | 9) Flow regulator valve block with priority to the SCV of the block, with a Single/Double effect SCV + Detent function (excludable), with automatic release with no pressure. | 14) Block with 1 SCV, 4 position Double effect with Float. | |
| 5) Steering valve. | 10) Block with 2 SCVs. The top SCV with 4 position double effect with Float, lower SCV 4 position double effect with Float with zero leak (on one port). | 15) Deport valve block (optional). | |

## 6.1.3. Mechanical SCV, detent setting and single/double effect conversion



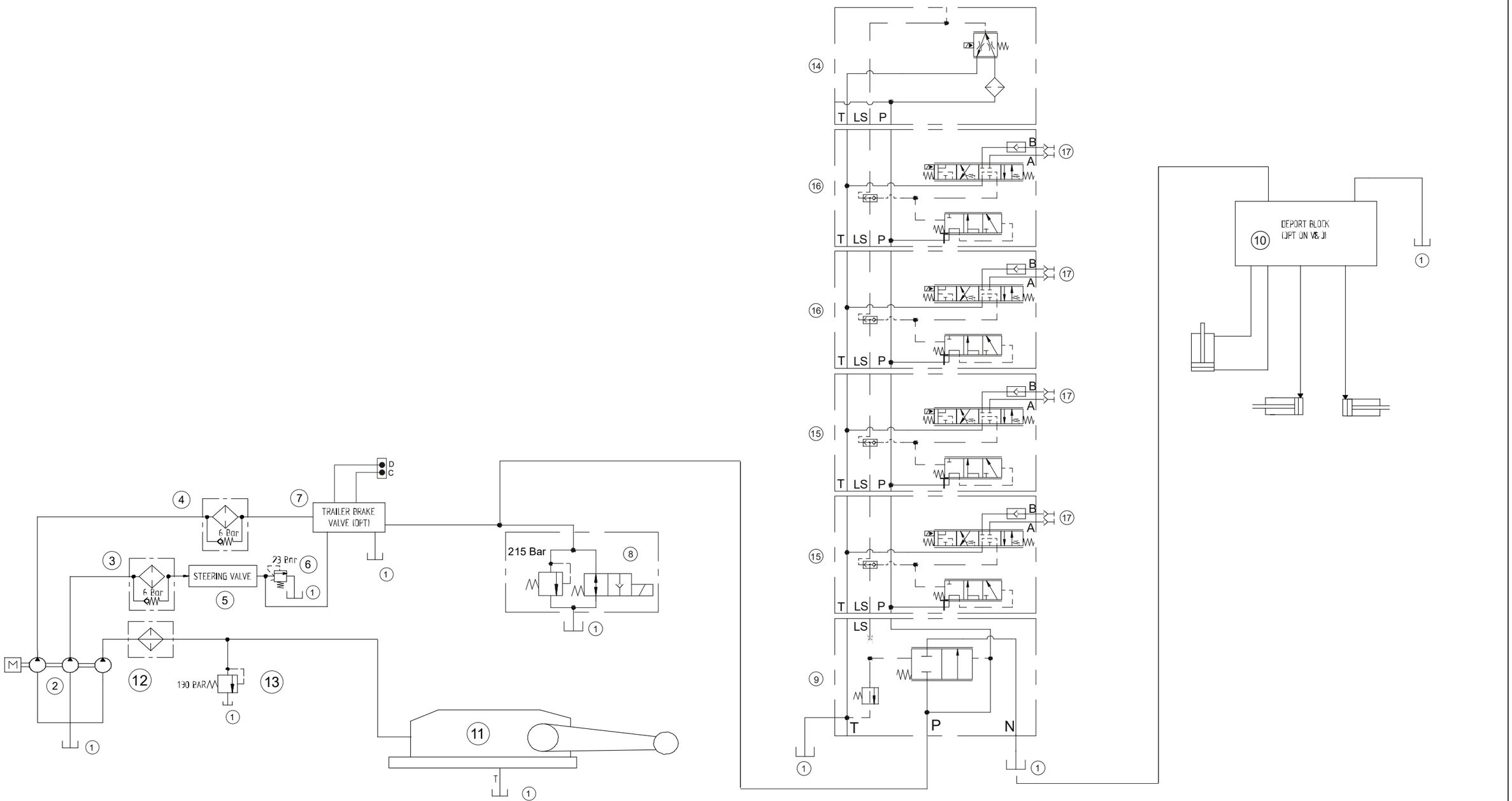

On the SCV equipped with the knob (1), the detent function can be selected, see following knob set:

- Screwed in, the detent function is excluded, the control lever returns to neutral when released.
- Unscrewed, the detent function is activated, the control lever remains in operating position until manually returned to neutral.

**NOTE: After the engine has been switched-off, the detent is automatically deactivated.**

The SCV are equipped with a drive screw (2) for conversion between double and single acting.
Unscrew the screw until the mechanical stop is felt. To use a spool valve in single acting mode, connect the implements hose to the left-hand outlet.

## 6.1.4. Configuration with3 pumps and electrohydraulic distributors (EHSCV)




DTM_GS_STGV_0107

| | | | |
|---|---|---|---|
| 1) Filter element / Suction line / return to tank. | 6) Transmission pressure valve (23 bar). | 11) Rear hitch. | 16) EH SCV distributor, double effect + float + detent. |
| 2) Hydraulic pumps. | 7) Trailer brake valve MR (optional). | 12) Pressure oil filter for the rear hitch. | 17) Quick coupler.<br>D) Trailer brake coupler MR.<br>C) Trailer brake coupler MR. |
| 3) Pressure oil filter Steering valve + Transmission. | 8) Pressure SCV's relief valve (215 bar). | 13) Rear hitch relief valve (190 bar). | |
| 4) Pressure oil filter SCV. | 9) Connection plate (load sense valve) | 14) End plate valve (pilot pressure adjustment). | |
| 5) Steering valve. | 10) Deport valve block (optional). | 15) EH SCV distributor, double effect + float. | |

## 6.1.5. Deport Function (hydraulic valve)

The hydraulic deport block is an hydraulic optional that include the following functions:

- Electrohydraulic central & lateral adjustment.
- Hydraulic levelling control.

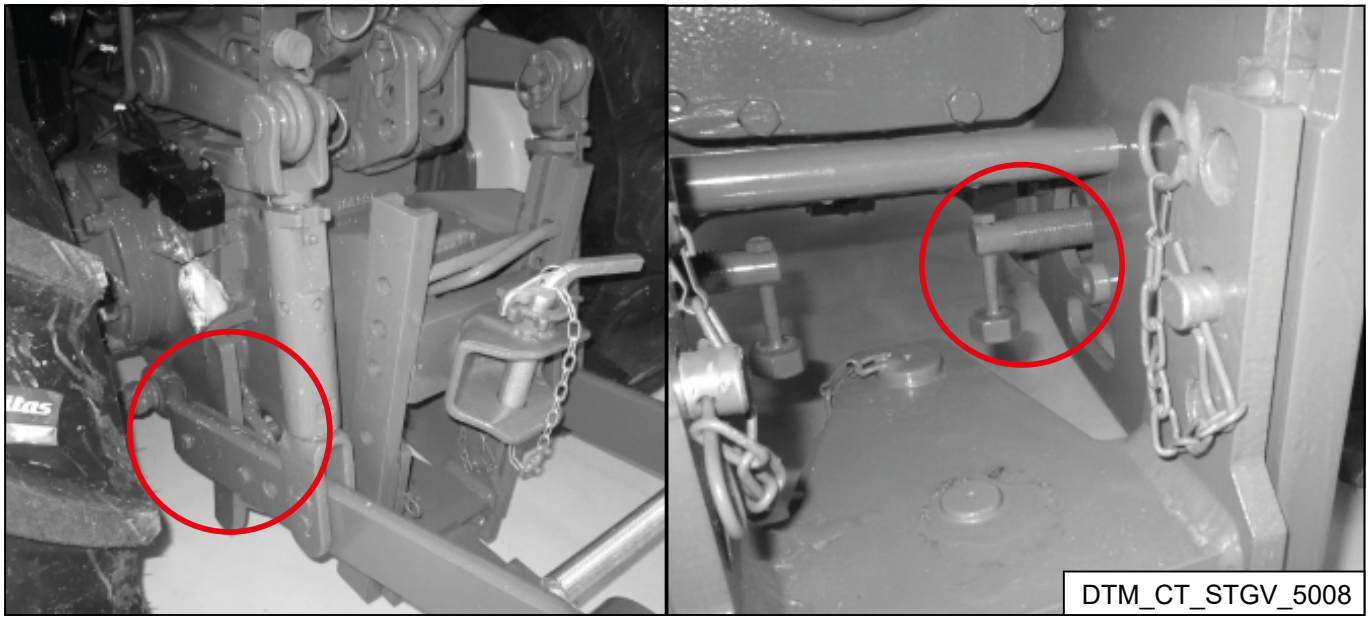
The main components are:

- Hydraulic valve block.
- Vertical hydraulic rod.
- Hydraulic stabilizers.
- Hydraulic lines.
- Switches and electrical connections.

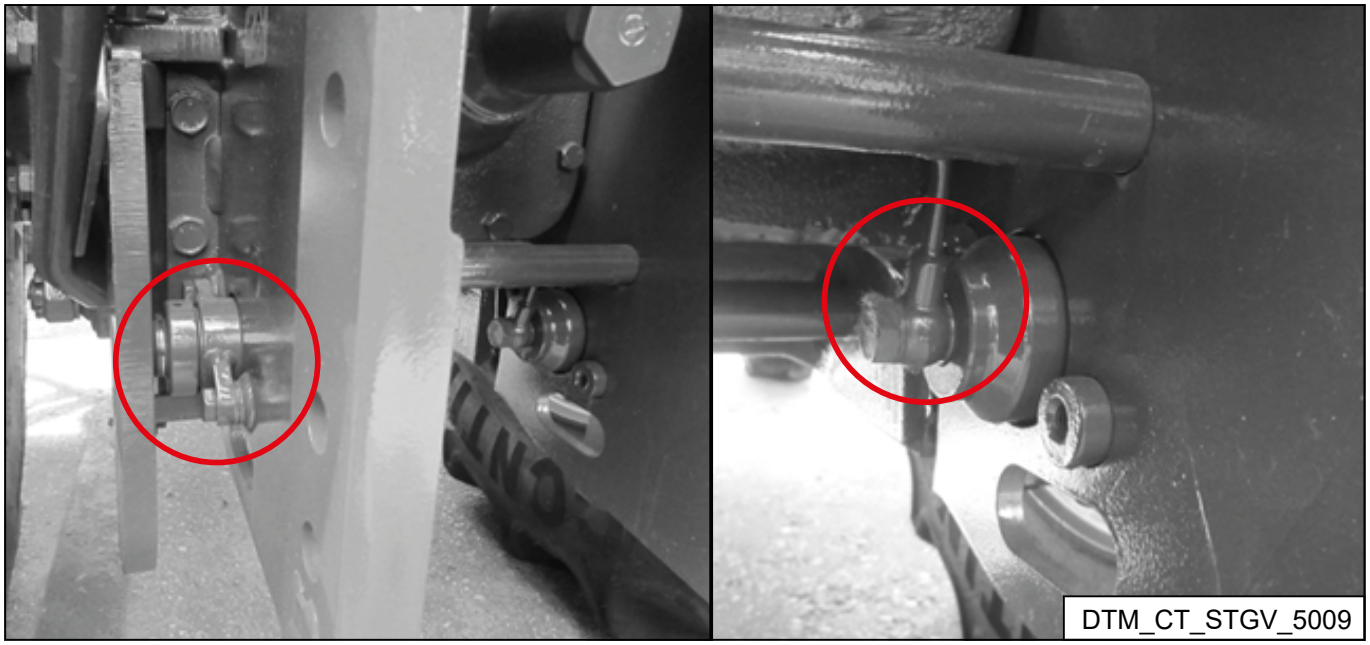
### 6.1.5.1 Lateral adjustment:

The lateral adjustment can be set instead of the mechanical ones (A) by two hydraulic cylinder.
The hydraulic cylinder are supplied by the valve block and the relevant setting (central or lateral adjustment) is performed by the switches on the right hand side console.

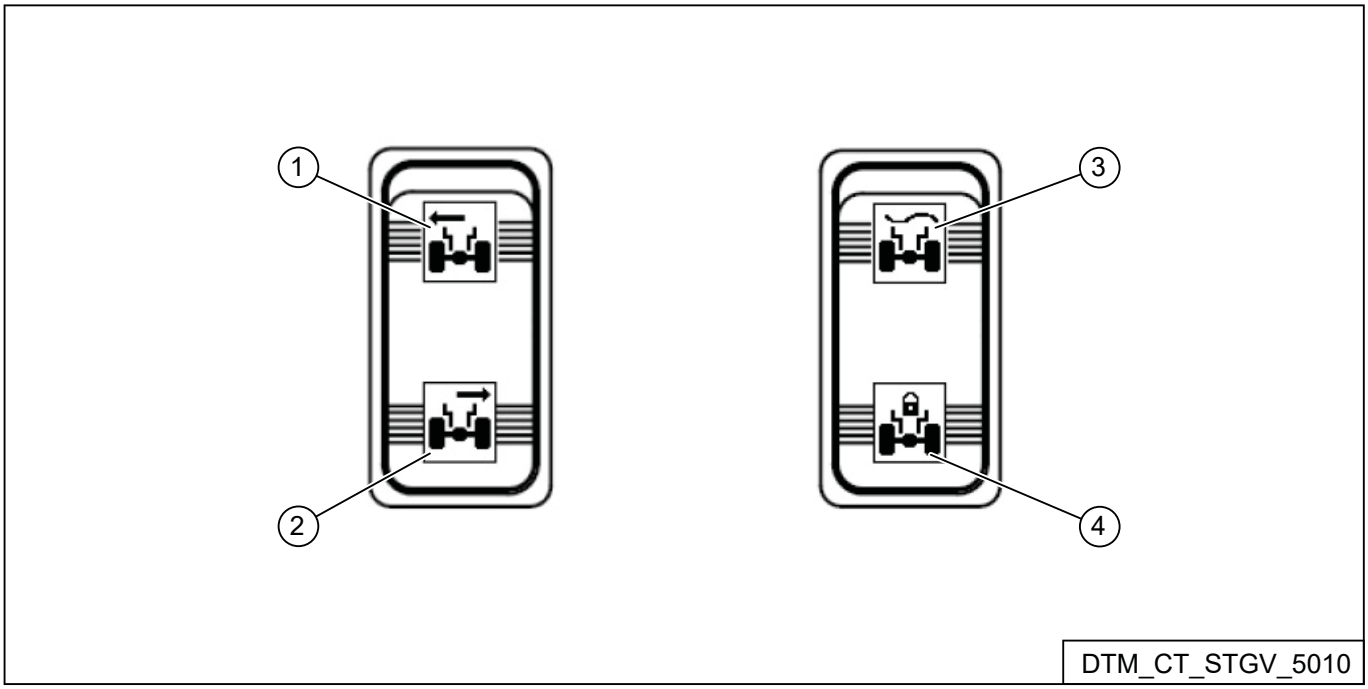
**Mechanical adjustment**




**Hydraulic adjustment**



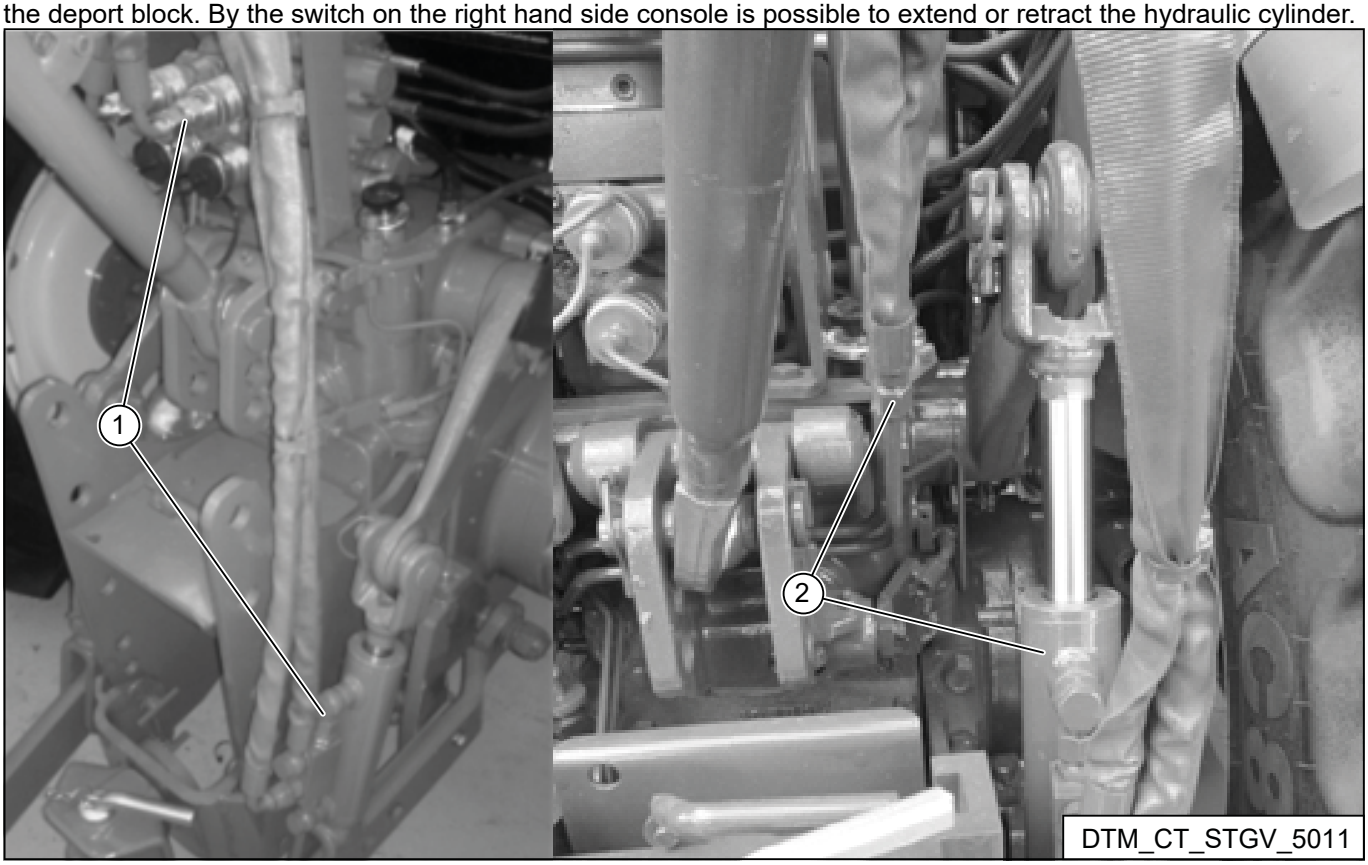
### 6.1.5.2 Activation Swichtes (on right hand side console):




| | |
|---|---|
| 1) Left Hand side adjustment | 3) Floating adjustment |
| 2) Right Hand side adjustment | 4) Blocking adjustment |

### 6.1.5.3 Levelling control

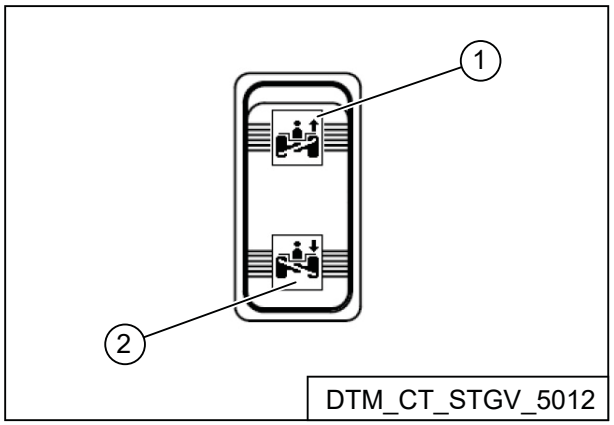
The leveling control is linked to the vertical hydraulic rod. This function can be order as a separate optional and the hydraulic supply is performed by the SCV'S. If the Deport Block is fitted, the hydraulic supply lines are connected to the deport block. By the switch on the right hand side console is possible to extend or retract the hydraulic cylinder.




| | |
|---|---|
| 1) Hydraulic vertical rod connected to the SCV. | 2) Hydraulic vertical rod connected to the Deport valve block. |

### 6.1.5.3.1 Activation Swicht (on right hand side console)

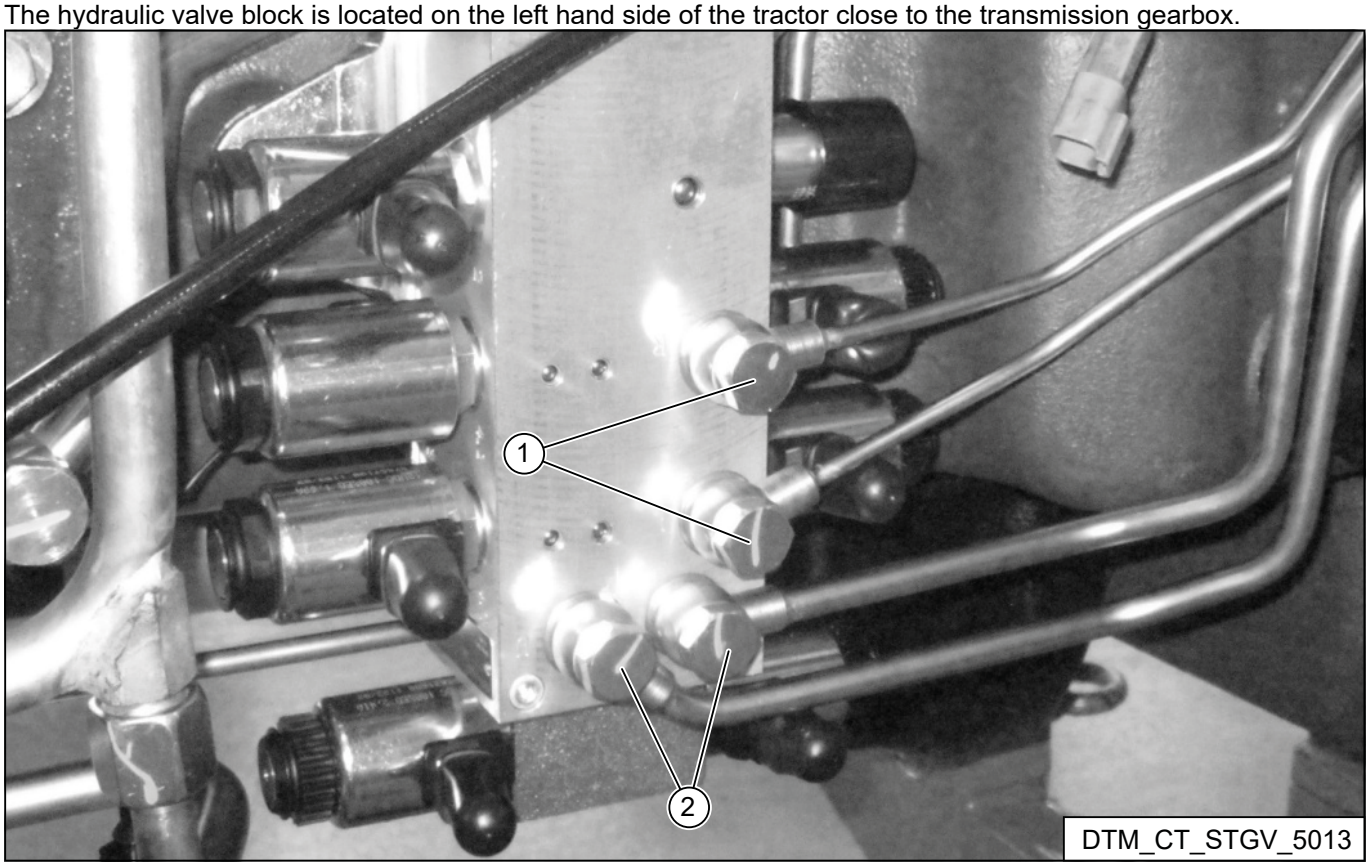
**Levelling adjustment**



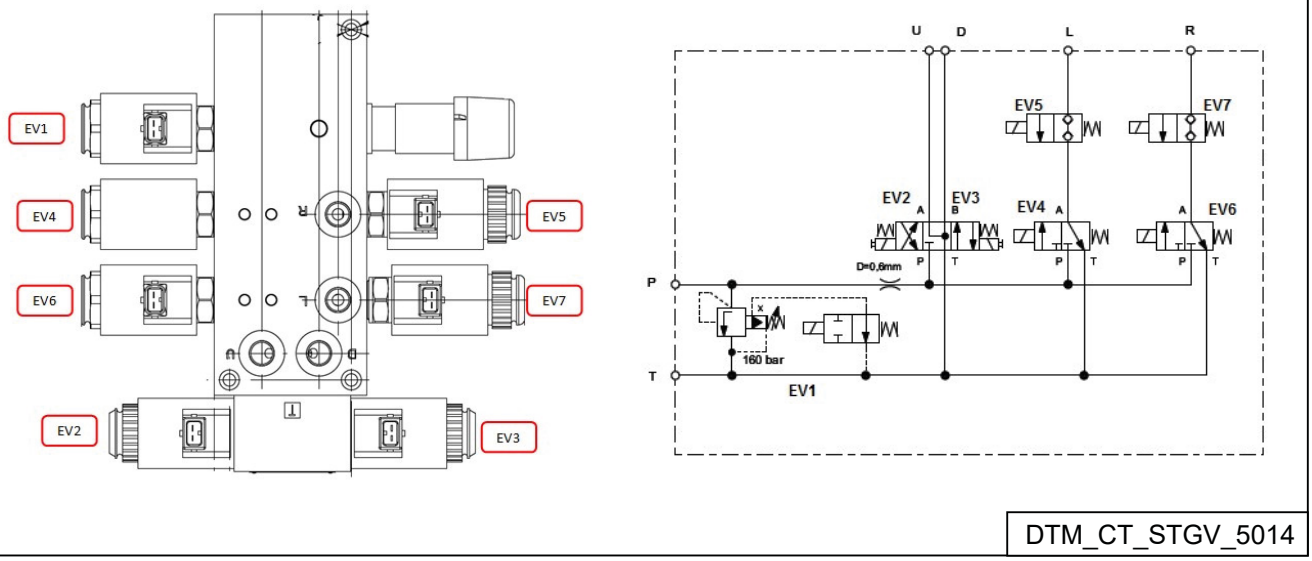

| |
|---|
| 1) Retract the hydraulic |
| 2) Extend the hydraulic |

## 6.1.6. Deport Hydraulic valve block

The hydraulic valve block is located on the left hand side of the tractor close to the transmission gearbox.




1) lateral adjustment hydraulic connection cylinder
2) Levelling adjustment hydraulic connection cylinder

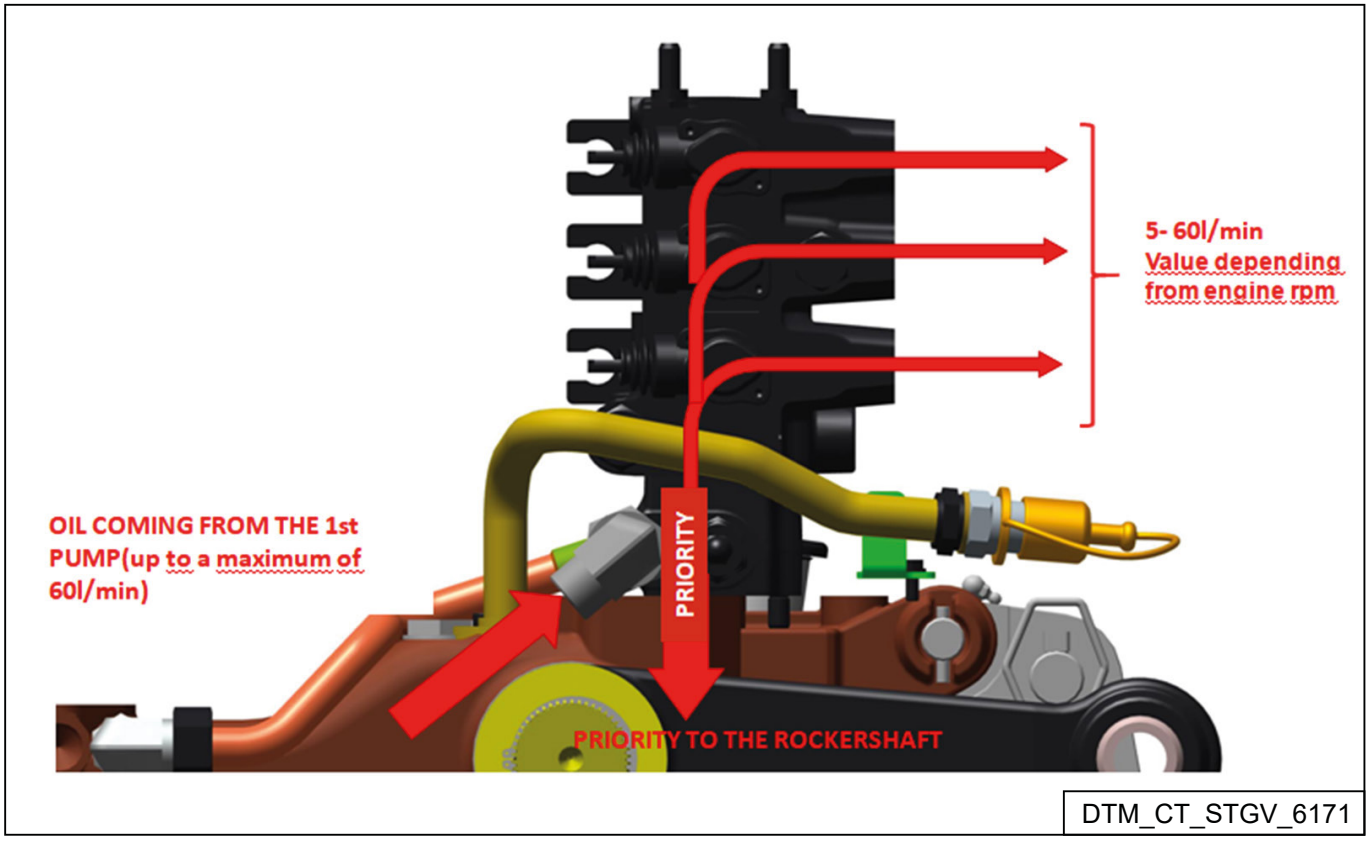



DTM_CT_STGV_5014

| Deport Function | EV Status | | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|
| **Function** | EV1 | EV2 | EV3 | EV4 | EV5 | EV6 | EV7 | |
| **Valve Number** | Y992 | Y991 | Y990 | Y989 | Y988 | Y987 | Y986 | |
| **Engine OFF** | O | O | O | O | O | O | O | NO Action (vertical and lateral adjustement blocked) |
| **Engine ON** | O | O | O | O | O | O | O | NO Action (vertical and lateral adjustement blocked) |
| **Hydraulic vertical rod adjustement UP** | I | O | I | O | O | O | O | Activation of the relevant function until switch is pressed; when the switch is released, the system comes back to the "Engine ON" status |
| **Hydraulic vertical rod adjustement DOWN** | I | I | O | O | O | O | O | Activation of the relevant function until switch is pressed; when the switch is released, the system comes back to the "Engine ON" status |
| **Hydraulic lateral adjustement LEFT** | I | O | O | I | I | O | I | Activation of the relevant function until switch is pressed; when the switch is released, the system comes back to the "Engine ON" status |
| **Hydraulic lateral adjustement RIGHT** | I | O | O | O | I | I | I | Activation of the relevant function until switch is pressed; when the switch is released, the system comes back to the "Engine ON" status |
| **Adjustement BLOCKED** | I | O | O | I | I | I | I | Activation of the relevant function until switch is pressed; when the switch is released, the system comes back to the "Engine ON" status |
| **Adjustement FLOATING** | O | O | O | O | I | O | I | The Floating condition will be permanent until new switch imput is given |

## 6.1.7. Mech, rear scv functionality: flow divider/flow regulator

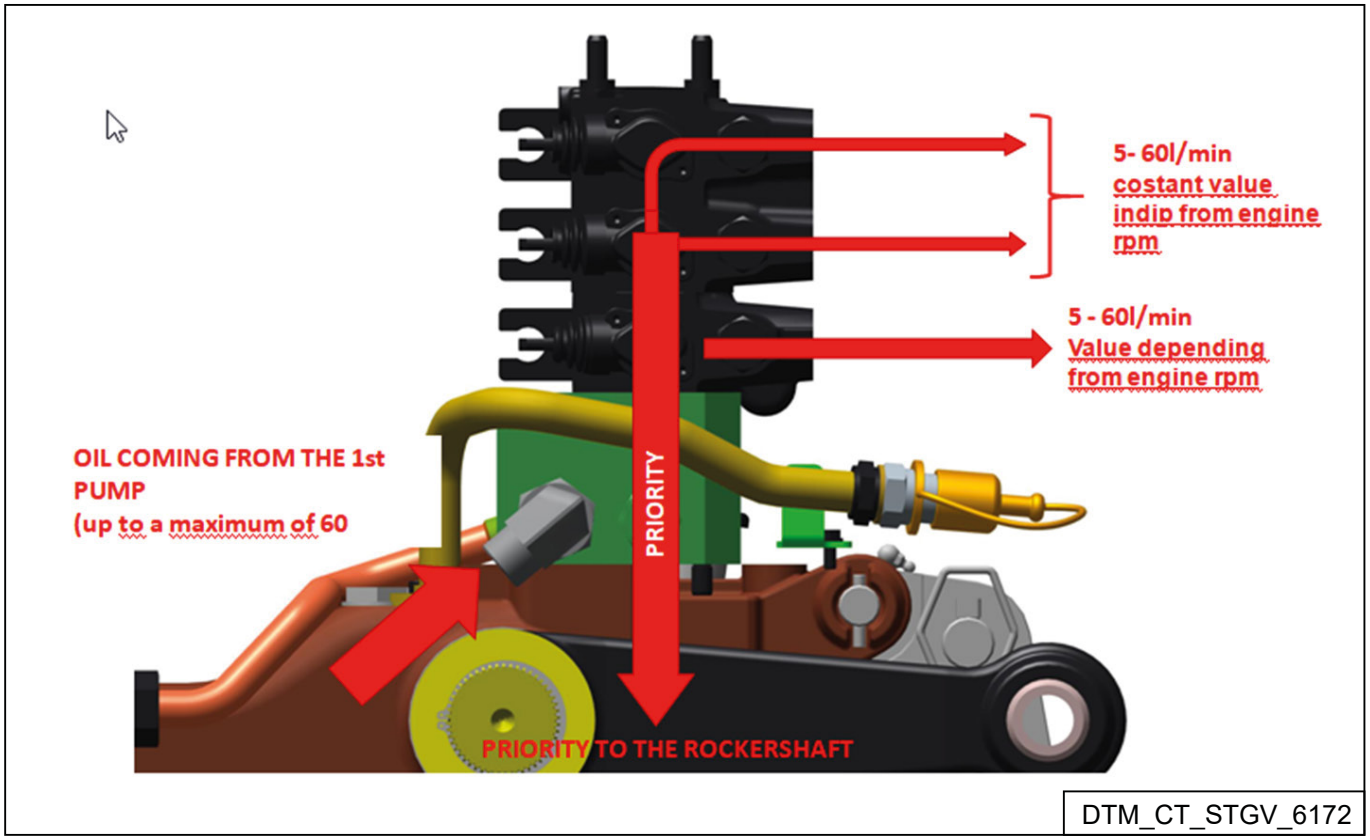
### 6.1.7.1 Flow divider (2 pump configuration)




DTM_CT_STGV_6171

The flow divider is available on 2 pump configuration with 2 and 3 SCVs.
The oil flow delivered by the SCV is depending from the engine rpm (according to the flow divider setting).
The oil flow conveyed to the SCVs but not used is redirect to the rear hitch.

### 6.1.7.2 Flow regulator (2 pump configuration)

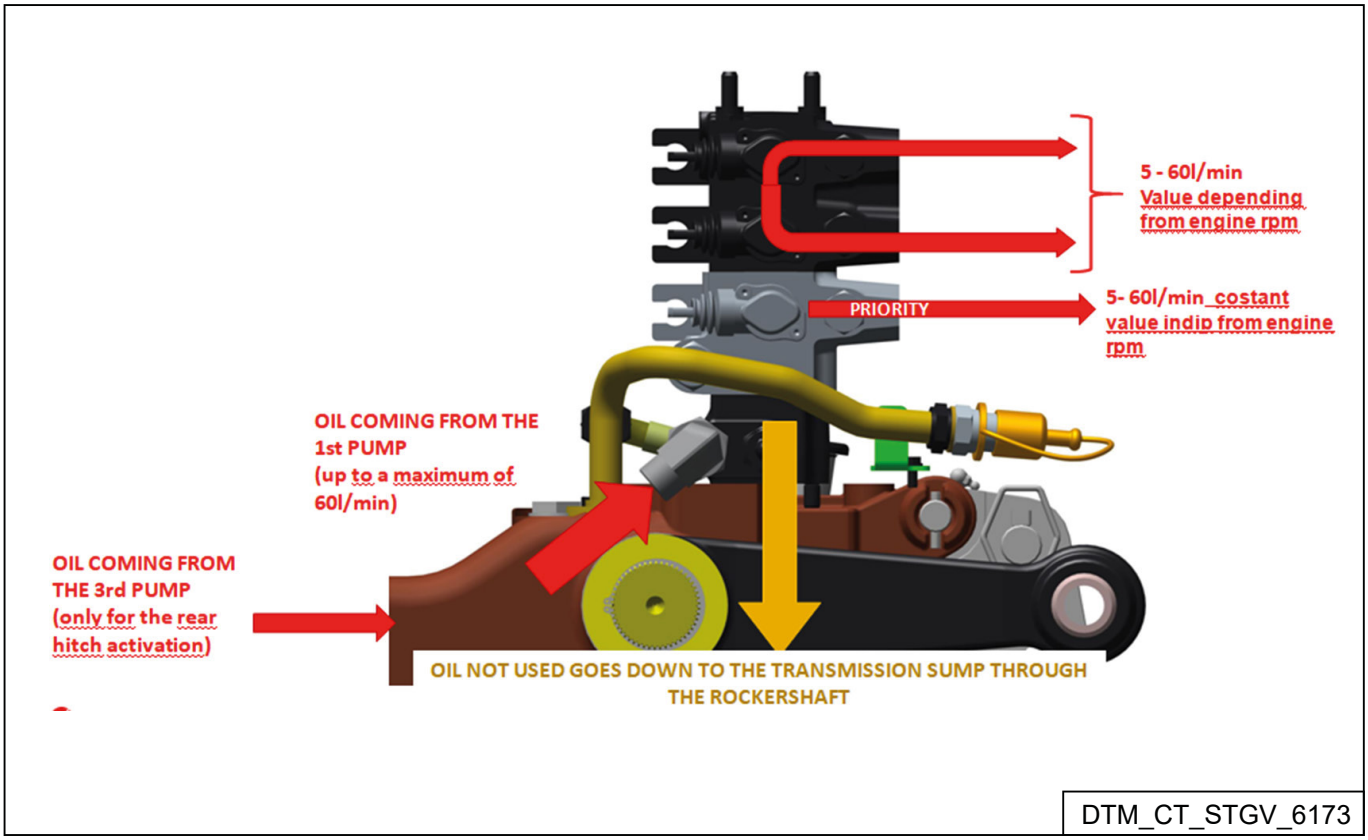



DTM_CT_STGV_6172

The flow regulator is available on 2 pump configuration with 3 SCVs.

The oil flow delivered by the 2 SCVs on top is costant and indipendent from the engine rpm, is set according to the flow regulator ratio.
The oil flow delivered by the lower SCV is depending from the engine rpm (according to the flow regulator setting).
The oil flow conveyed to the SCVs but not used is redirect to the rear hitch.

### 6.1.7.3 Flow regulator (3 pump configuration)




The flow regulator is available on 3 pump configuration with 3 and 4 SCVs.
The oil flow delivered by the 2 SCVs on top is depending from the engine rpm (according to the flow regulator setting).
The oil flow delivered by the lower SCV is costant and indipendent from the engine rpm, is set according to the flow regulator ratio.
The oil flow conveyed to the SCVs but not used is redirect to the rear hitch.

# 7 Suspended Front Axle (IFAS)

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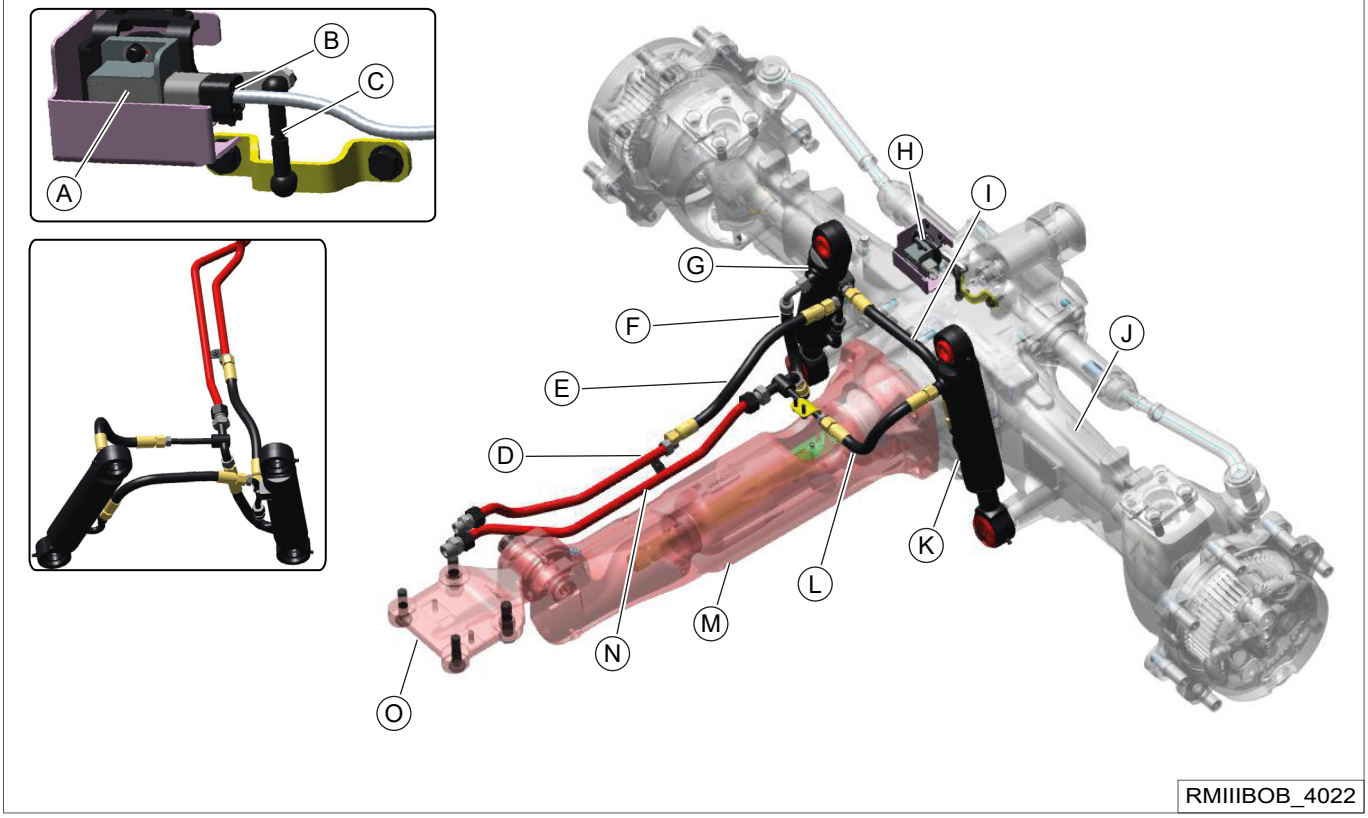

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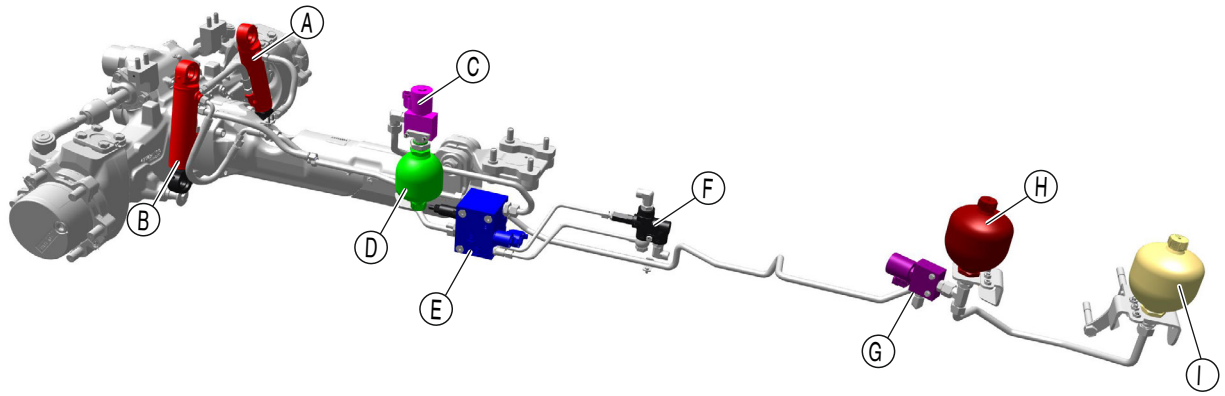
# 7.1. SUSPENDED FRONT AXLE (IFAS)

## 7.1.1. Layout of Components of the Front Axle Suspension System




| No. | Description | No. | Description |
|---|---|---|---|
| A | Suspension system position sensor - B978 | I | Hose of the small displacement cylinders (suspension rams lower chambers) |
| B | Position sensor electrical connection | J | Suspended front axle |
| C | Connecting tie rod with ball joints | K | RH suspension ram |
| D | Pipe from the rod port (RS) to the small displacement cylinders (lower chambers of the suspension rams) | L | Hose of the large displacement cylinder (upper chambers of the suspension rams) |
| E | Hose from the rod port (RS) to the small displacement cylinders (lower chambers of the suspension rams) | M | Suspension system lower support |
| F | Hose of the LH large displacement cylinder (upper chamber of the left suspension ram) | N | Pipe from the piston port (PS) to the large displacement cylinders (upper chambers of the suspension rams) |
| G | LH suspension ram | O | Lower support rear bearing |
| H | Suspension position sensor assembly | | |

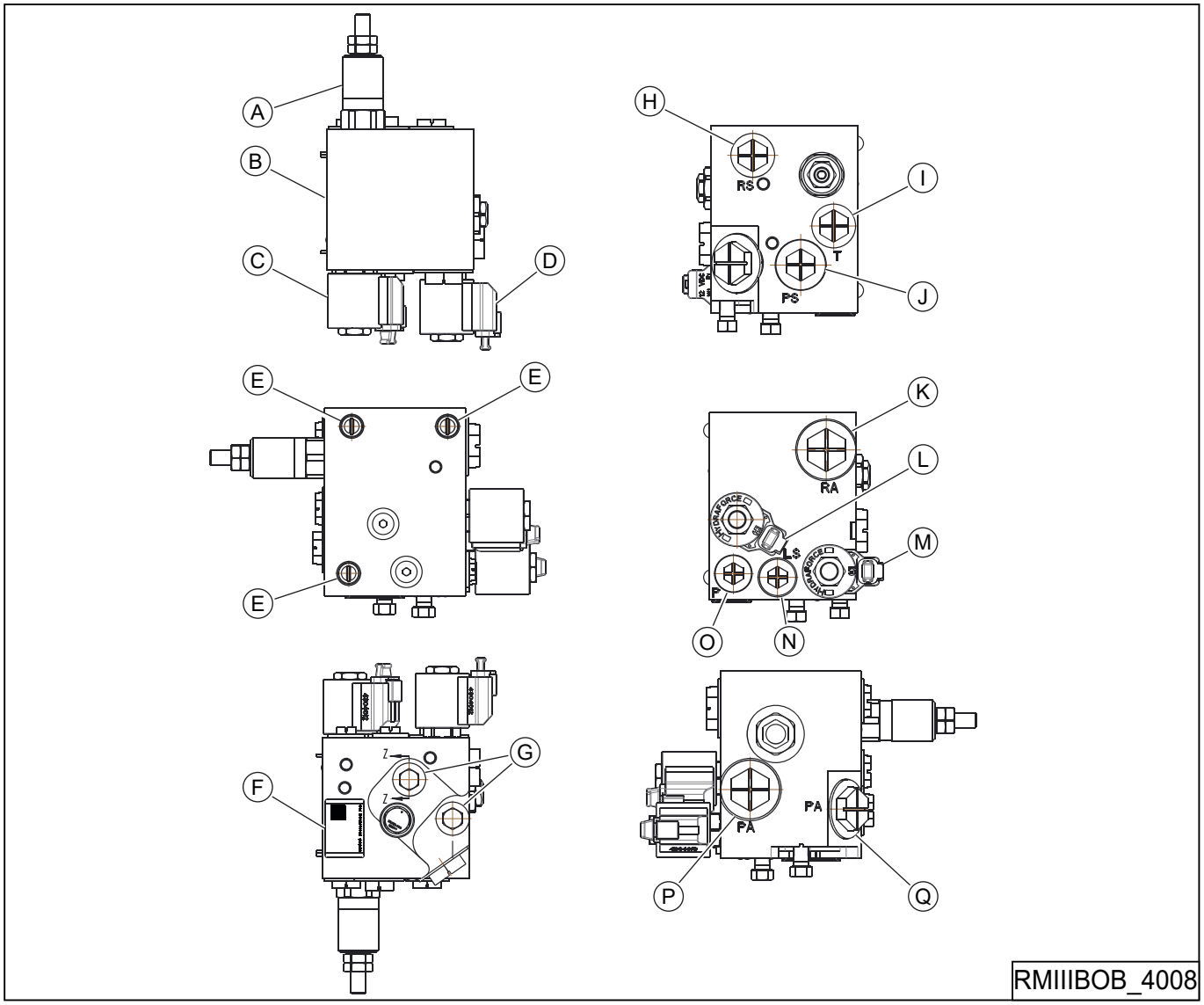
## 7.1.2. Layout of Components of the Suspension Hydraulic System



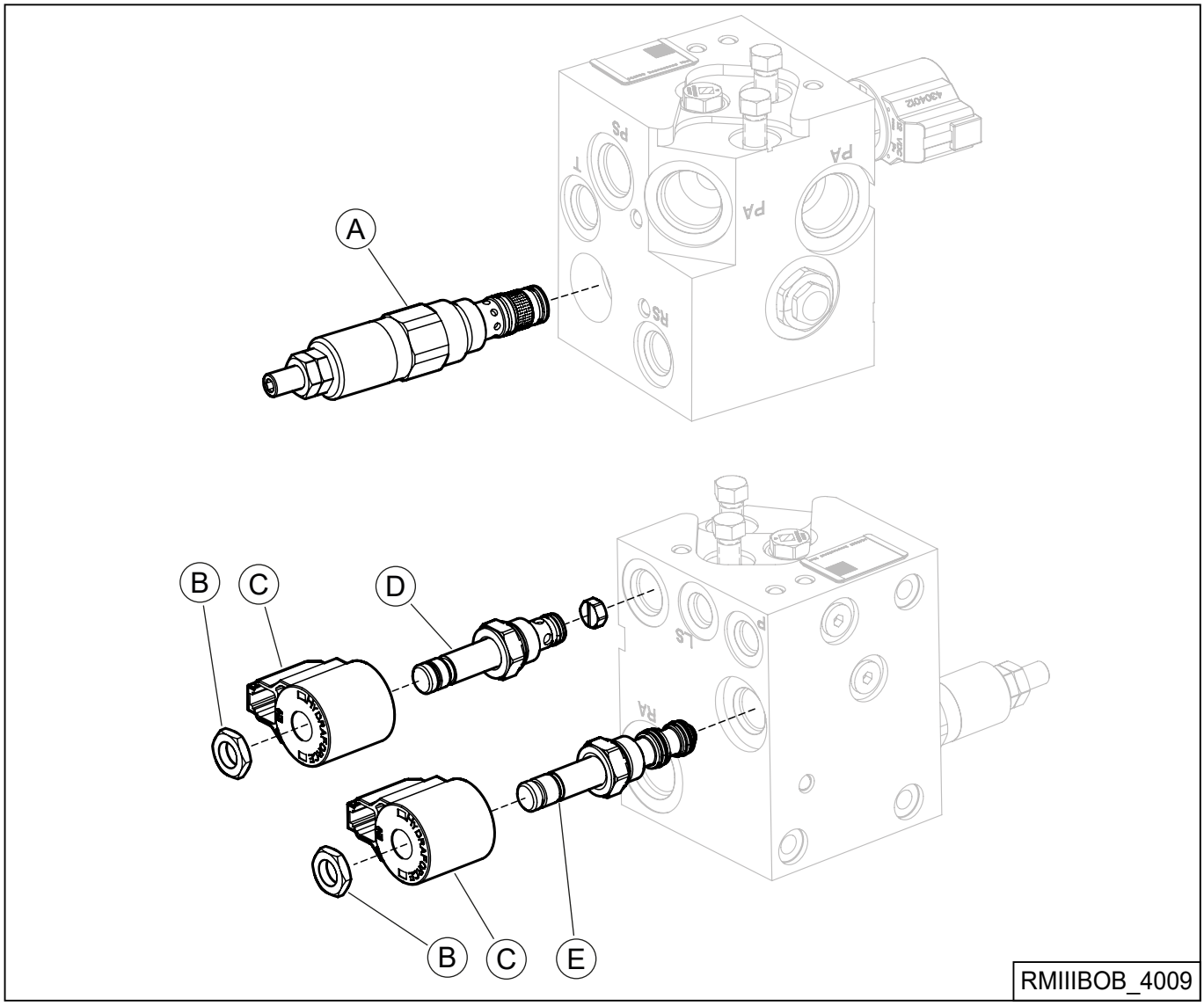

DTM_GS_STGV_0110

| No. | Description |
|---|---|
| A | LH suspension ram |
| B | RH suspension ram |
| C | Rod on-off lockout valve (Y982) |
| D | Rod side accumulator (0.5 L / 40 bar) |
| E | Suspension levelling valve (hydraulic control unit) |
| F | Selective priority valve |
| G | Piston on-off lockout valve (Y983) |
| H | Piston side accumulator (0.75 L / 30 bar) |
| I | Piston side accumulator (0.75 L / 50 bar) |

## 7.1.3. Suspension Levelling Valve (Hydraulic Control Unit) - Overview



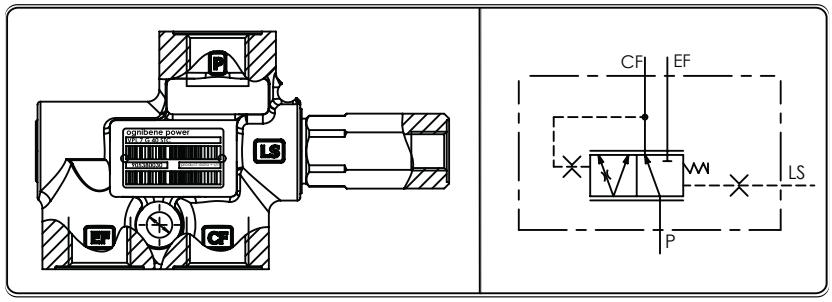

| No. | Description | No. | Description |
|---|---|---|---|
| A | Pressure regulating valve | J | Piston port |
| B | Suspension system levelling valve | K | Rod Accumulator port |
| C | Lifting solenoid valve | L | Raise coil electrical connector (Y993) |
| D | Lowering and pressure reducing solenoid valve | M | Lower coil electrical connector (Y994) |
| E | Mounting hole | N | Load sense port |
| F | Nameplate assembly | O | Pump port |
| G | Manual override hex screw (9.5 ±1.0 Nm) | P | Piston accumulator N. 1 port |
| H | Rod port | Q | Piston accumulator N. 2 port |
| I | Tank port | | |

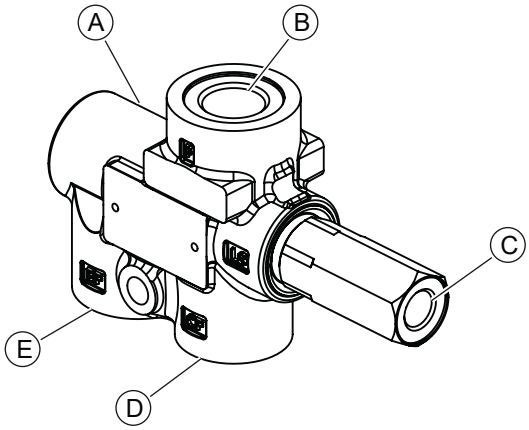



| No. | Description | No. | Description |
|---|---|---|---|
| A | Pressure regulating valve | D | Lower solenoid valve body |
| B | Nut | E | Raise solenoid valve body |
| C | Solenoid valve coil | | |

| Hydraulic specifications | | | |
|---|---|---|---|
| Valve and accumulator rated pressure | 210 bar | Coil voltage | 9-16VDC |
| Relief valve setting | 210 bar | Coil resistance 20 ºC | Coil #1 (Y993): 8.8Ω<br>Coil #2 (Y994): 8.0Ω |

## 7.1.4. Suspension Selective Priority Valve - Layout of Components




DTM_GS_STGV_0109

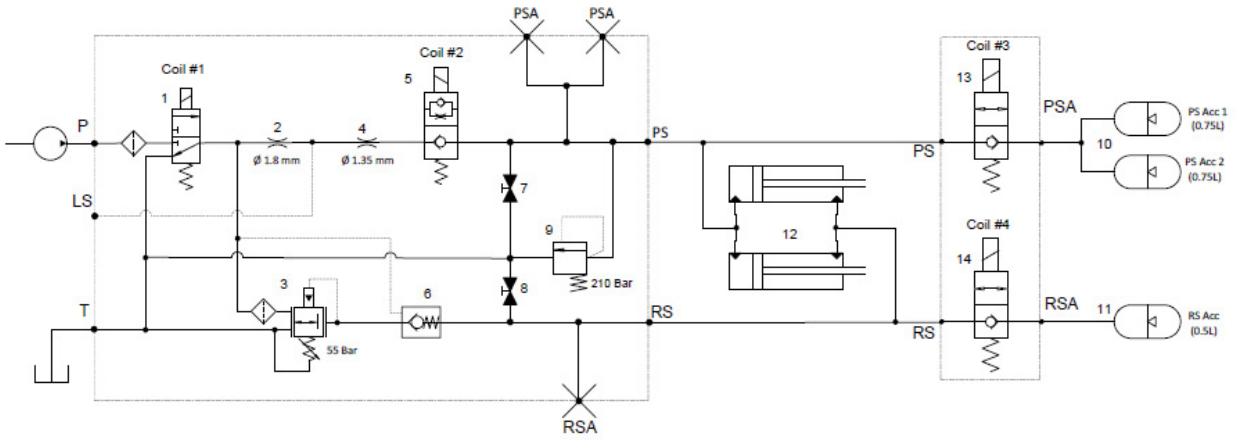
| No. | Description | Max pressure |
|---|---|---|
| A | Selective priority valve | |
| B | Pump port (P) | 250 bar |
| C | Load sense port (LS) | 210 bar |
| D | Hydraulic pump port (CF) | 210 bar |
| E | Selective valve port (EF) | 250 bar |

**General requirements and technical data:**

- Nominal flow: 40 l/min
- Control spring pressure: 7 bar
- General requirements:
  - Oil temperature -30/+100°C

# 7.2. SUSPENDED FRONT AXLE, HYDRAULICS CONTROL

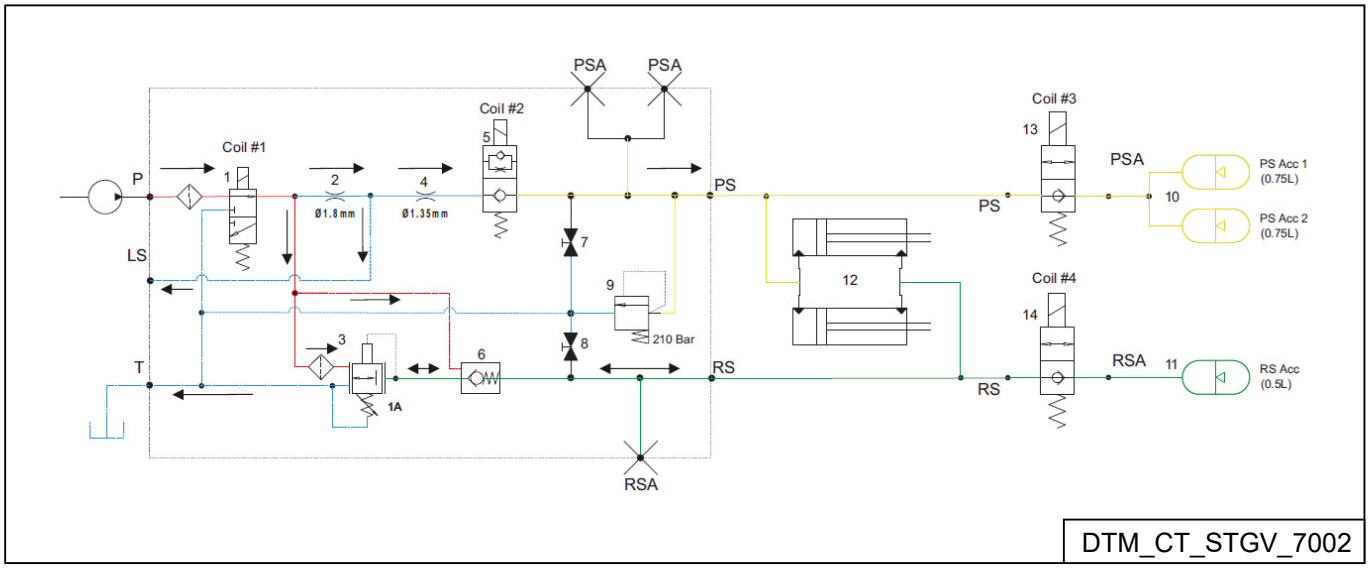
## 7.2.1. Hydraulic Circuit, description of the functions:




DTM_CT_STGV_7001

| Nº | Component description | Function |
|---|---|---|
| 1 | Raise suspension valve (Coil #1 - Y985) (three port, two position solenoid valve) | Raise valve - adds oil to the suspension system when energized |
| 2 | Raise orifice | Raise speed control |
| 3 | Rod side pressure regulating valve | Fixed Rod pressure setting valve (Factory set at 55 bar) |
| 4 | Restrictor to control pump pressure supply | Increase LS pressure and controls lowering speed |
| 5 | Lower suspension valve (Coil #2 - Y984) (two port, two position solenoid poppet valve) | Lower valve - removes oil from the suspension system when energized |
| 6 | Pilot operated check valve to isolate rod side | Holds oil in rod - allows oil flow out of rod when piloted |
| 7 | Piston side manual override | Allows removal of oil from rod. Used during servicing |
| 8 | Rod side manual override | Allows removal of oil from piston. Used during servicing |
| 9 | Relief valve for overpressure protection | Overpressure protection (210 bar) |
| 10 | Piston side accumulators | Allows compliance during compression stroke |
| 11 | Rod side accumulator | Allows compliance during rebound stroke |
| 12 | Suspension cylinders | Provide suspension strut |
| 13 | Piston lockout valve (Coil #3 - Y983) (Two port, two position solenoid valve) | Blocks oil flow from piston into accumulators |
| 14 | Rod lockout valve (Coil #4 - Y982) (Two port, two position solenoid valve) | Blocks oil flow from rod into accumulator |

### 7.2.1.1 Level control - Raise



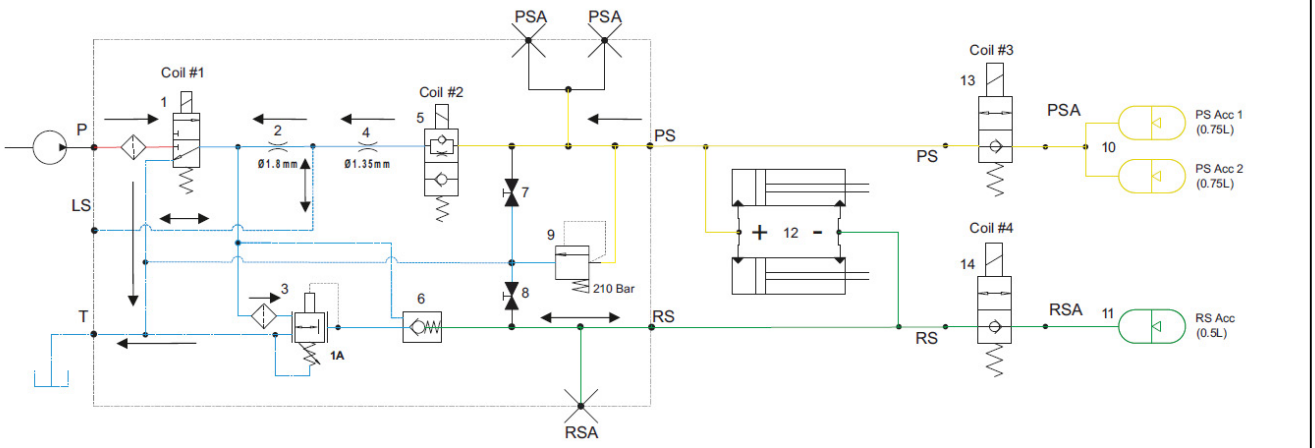

**Reasons for suspension system raising:**

- Calibration procedure of the suspension system;
- Load added to the front of the tractor;
- Suspension position needs adjustment;
- Oil lost due to leakage;
- Over pressure relief valve actuation.

**Suspension system raising:**

- The solenoid coil #1 is energized, this switches the raise suspension valve (1) to its open position that allows oil from the pump port to enter the circuit, supplying orifice (2), piloting PO check valve (6) and supplying pressure regulating valve (3).
- The pressure regulating valve regulates the pressure to 55 bar at its output port. Depending on the rod pressure (the green line), the rod port may need addition of oil to increase the pressure or removal of oil to reduce the pressure (on the start-up, oil will be added).
- The pump margin is established across the orifice (2) between pump and LS ports that regulates the amount of oil flow entering the piston WP.
- A small pressure drop is created as the oil flows across the restrictor (4) to increase the load sense (LS) pressure to ensure that the pump pressure is high enough to saturate the pressure of the regulating valve.
- The oil flow passes across the valve (5) that is not energized. The oil enters the cylinders extending the rams and lifts the front of the tractor.
- As oil is added to the piston side, the oil will leave the rod side and be regulated by the rod pressure regulating valve (3).

## 7.2.1.2 Level control - Lower




DTM_CT_STGV_7003

**Reasons for suspension system lowering:**

- Calibration procedure of the suspension system;
- Load removed from front of tractor;
- Suspension position needs correction.

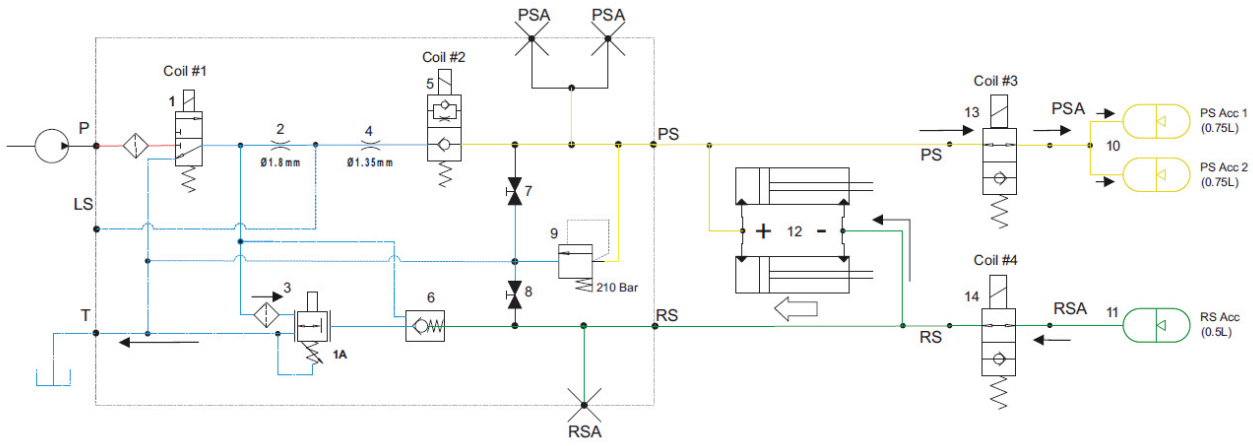
**Suspension system lowering:**

- The solenoid coil #2 is energized, this switches the lower suspension valve (5) to its open position that allows oil flow from the piston port across the restrictor (4), orifice (2) and valve (1) to the tank.
- As the oil flows across the orifice (3), the flow becomes restricted, which controls the speed of the cylinders during the suspension system lowering.
- As the oil flow passes across orifice (2), the amount of oil flow is restricted that causes a small increase in the load sense pressure, according to the circuit design.

**What happens rod pressure during lower?**

- Although during the suspension system lowering, the oil is not added or removed from the rod port, the rod pressure does change during lowering. As soon as the position is corrected, the rod pressure returns to the pre-set value, set during the previous raise command.
- Basically, the rod has a fixed volume at mid position, if the cylinder is extended this volume reduces and the pressure increases. When the cylinder is returned to mid-position the volume and pressure are also restored. Both piston and rod pressures are adjusted.

## 7.2.1.3 Suspension Operation - Compression




DTM_CT_STGV_7004

**Suspension Operation:**

During the suspension operation, the piston and rod lockout valves (13) and (14) are activated, this allows unrestricted flow between the cylinders and accumulators.

**Compression Stroke**

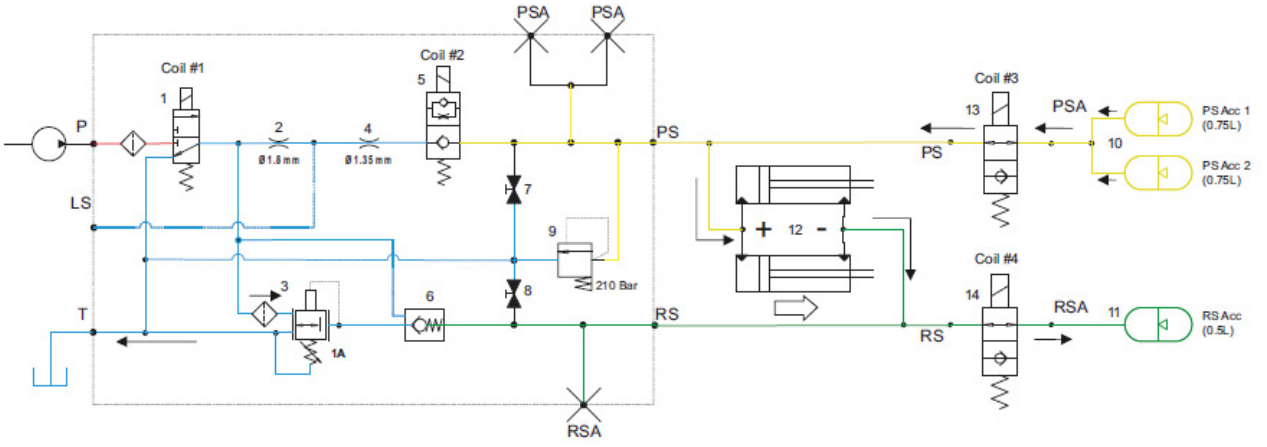
- When the tractor is moving and the wheels encounter a bump this is transmitted though the axle to the cylinders (in a non-suspended tractor this is passed to the chassis). The cylinders absorb the impact by compressing the piston rods.
- During the compression, the oil leaves the piston side of the cylinder, passes across the piston lockout valve (13) and enters the piston accumulators. The gas in the accumulators is compressed storing the energy.
- As the cylinders compress, the pressure drops in the rod side, this drop in pressure pulls oil from the rod accumulator across rod lockout valve (14).

**Returning to the mid-position**

- As the wheels move over the bump, the stored oil in the piston accumulators returns to the piston side of the cylinders.
- The pressure drops in the circuit and the friction in the cylinder seals converts the energy from the bump into heat, providing damping.

•

### 7.2.1.4 Suspension Operation - Rebound




**Suspension Operation:**

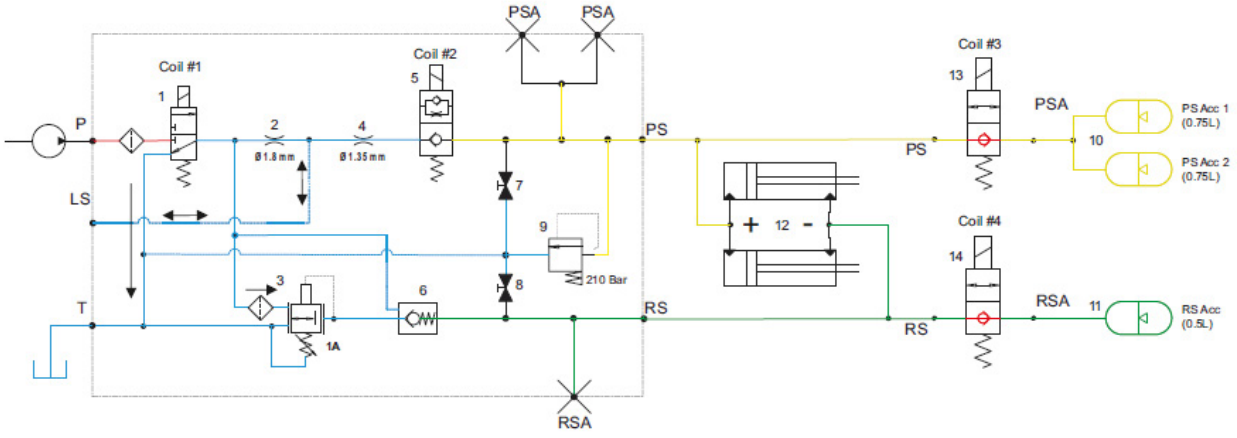
During the suspension operation the piston and rod lockout valves (13) and (14) are activated, this allows unrestricted flow between the cylinders and the accumulators.

**Rebound Stroke**

- When the tractor is moving and the wheels fall into a hole or trench the cylinders will extend (rebound).
- The pressure in the piston side will reduce and the oil will flow from the piston accumulators (10) through the piston lockout valve (13) into the piston side of the cylinders.
- The oil will be pushed out of the cylinder rod port across the rod lockout valve (14) into the rod accumulator (11).

The suspension's ability to rebound allows the wheels to follow undulation, which improves the wheel contact with the ground.

## 7.2.1.5 Suspension Operation – Lockout




DTM_CT_STGV_7006

**Lockout Operation:**

In certain conditions or operation, it may be necessary to disable the suspension. In this case, it is possible to select the lockout (blocked) mode. Lockout is the default condition when the tractor is turned off and electrical power is cut to the suspension.

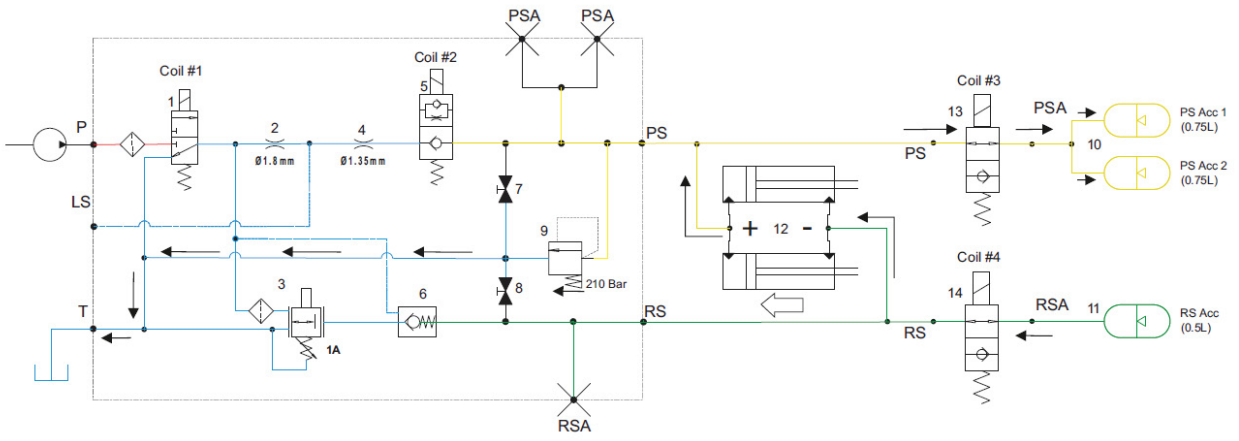
**Lockout mode:**

In lockout mode, the axle can be held in any position hydraulically. However if the load pressure exceeds the relief valve pressure the axle will move.
Lockout is achieved by de-energizing the valves (13) and (14). These valves isolate the piston and rod accumulators from the cylinders. The suspension cannot travel in compression or rebound.

**Safety**

Due to the use of single blocking lockout valves, if required the accumulators can still be drained. This ensures the pressure from being trapped, which is important when completing maintenance on the suspension system.

## 7.2.1.6 Overpressure Protection




DTM_CT_STGV_7007

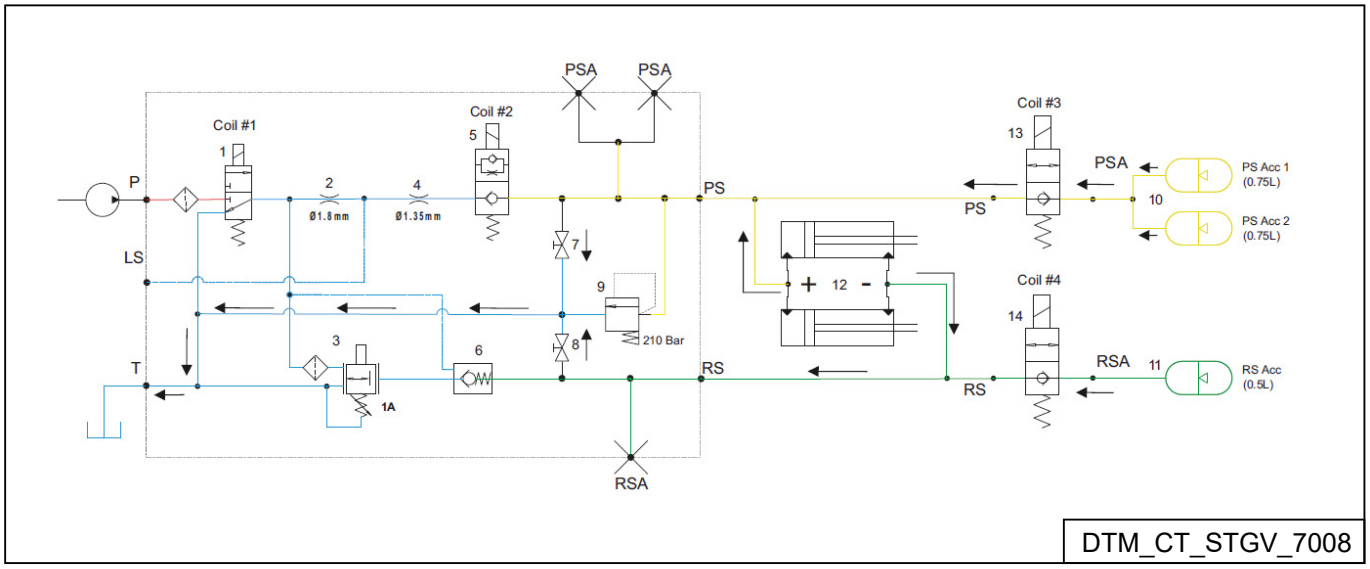
**Suspension Operation:**

During normal suspension operation, the pressure range in the piston section of the circuit will fluctuate from 40-210 bar. This pressure is driven by the loading of the tractor, the ground conditions and the travel speed.
In some instances, the pressure in the piston section of the circuit may exceed the safe working pressure of 210 bar. The suspension components have been certified to 210 bar, higher pressure may cause damage or premature failure.

**Overpressure protection:**

A piston pressure spike is caused by a compression movement of the cylinders. This pressure is sensed by the system relief valve (9) that opens allowing oil flow to the tank port. When the pressure reduces to below 210 bar the relief valve closes.
When the oil is vented from the system in this way the suspension system will need to add oil with a raise command that occurs automatically.

## 7.2.1.7 Manual Overrides - Depressurising System




**Suspension Operation - Manual Draining:**

**IMPORTANT: Before any maintenance is carried out on the suspension system (hydraulic valves, cylinders, accumulators, pipes or any other component from the hydraulic circuit), the suspension system must be drained (decompressed). The suspension accumulators are energy storage devices and if this energy is not properly released, it can cause serious injury.**

**IMPORTANT: Ensure that the tractor is parked on level ground with the parking brake engaged and the ignition keys removed from the instrument panel before working on the suspension system.**

**Manual Override operation:**

**CAUTION: Trapping hazard. Loosen the decompression screws slowly.**

The manual overrides consist of two 13 mm A/F screws. Steadily loosen (by two turns) the decompression screws of the hydraulic suspension control unit, to release the pressure from the suspension system. The oil pressure will be released and the suspended front axle will lower.

**IMPORTANT: Do not remove manual overrides, or retract more than 3 turns, which can cause damage to the seals and external leakage.**

After maintenance the manual overrides should be closed.

- Screws tightening torque = 9.5 Nm

# 7.3. ADJUSTING THE CONNECTING TIE ROD OF THE SUSPENSION POSITION SENSOR

**Preliminary Operations**

1. Prior to access the service facility, raise the suspended front axle to the maximum height:
   - Turn the ignition key ON;
   - Move the vehicle with speed threshold major than 2 Km/h;
   - Press the activation switch (A) on the right “3” to activate the Manual mode of the suspension system: the LED indicator light is flashing green (fast blinking);
   - Adjust the height of the suspension system by turning the regulation potentiometer knob (B) clockwise to the maximum height “MAX”: the LED indicator light is flashing green (slow blinking);
   - Switch the ignition key OFF.

**NOTE: As alternative, attach a suitable hoist on the front lifting points respecting the safety measures provided and slightly raise the front part of the tractor.**



RMIIIBOB_4002

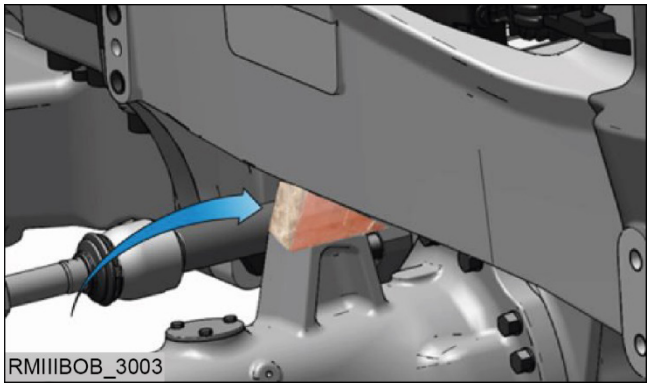
2. Place a suitable lifting device under the front lifting points and raise the front side of the tractor.

**NOTE: For the specific lifting points, follow the instructions provided in the Operator’s Manual.**

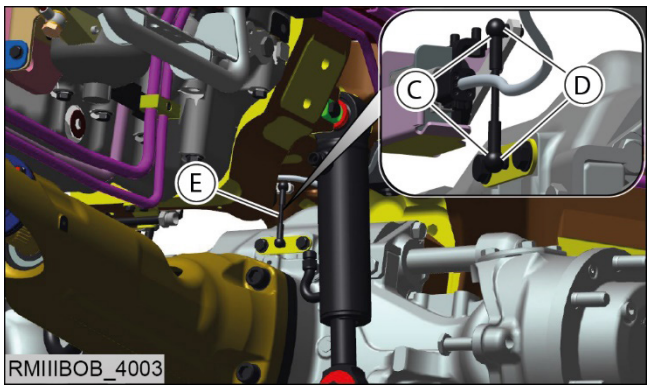
3. Remove the right front wheel and mudguard - if fitted.
4. Using the lifting device, regulate the front support to allow sufficient space to access the connecting tie rod assembly; then position an additional suitable axle stand under the front lifting points to immobilize securely the tractor.


RMIIIBOB_3013

5. Place suitable chocks at both sides to immobilize the front axle preventing any swinging.


RMIIIBOB_3003

6. Remove the retaining rings (C) from the upper and lower ball joints (D) to release the connecting tie rod (E) from the front support and suspension axle.

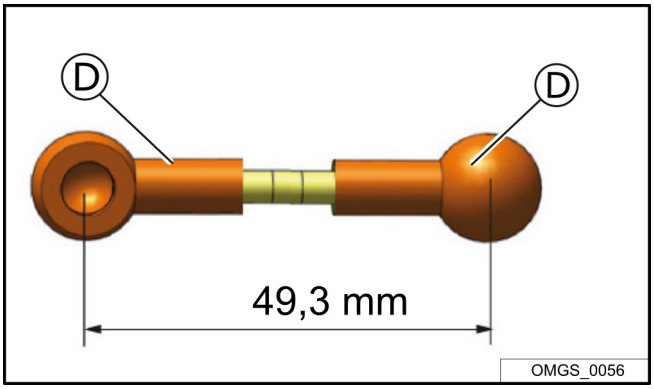


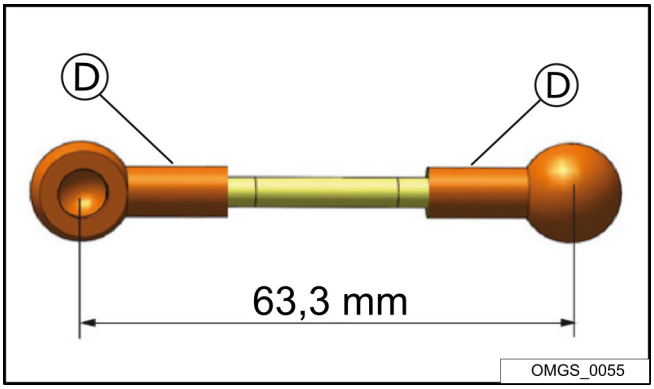
RMIIIBOB_4003

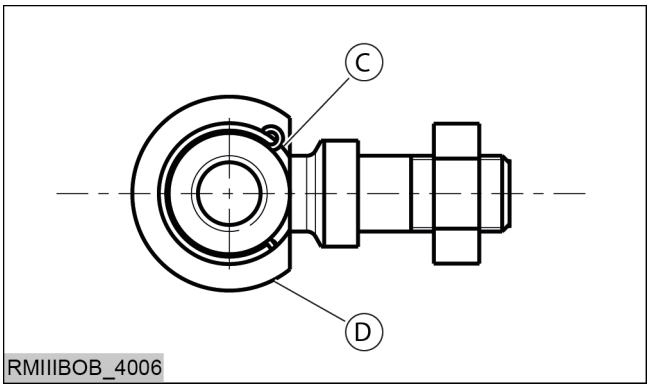
**Procedure**

7. Check or adjust the length value of the connection tie rod by screwing or unscrewing the ball joints on the threaded rod.
   The value measured between the central axes of the two ball-joints has to be:
   - 49,3 mm F model
   - 63,3 mm V and N models.

**NOTE: Make sure that the ball joints are in line and properly oriented in order to be correctly assembled with the counter-nuts on the lever of the position sensor and the fixing bracket.**




**Refitting**

8. Refit the tie rod assembly by carrying out the removal steps in reverse order.

**NOTE: Inspect the retaining rings to make sure that are intact, if necessary replace them with new ones using original parts. Make sure that the retaining rings (C) are properly and securely assembled to the respective ball joints (D).**

9. Perform a calibration procedure of the suspension assembly.
10. Perform operation test and make sure the suspended front axle assembly is functioning properly.
11. Make sure that no error codes are triggered.

# 7.1. CALIBRATION PROCEDURE OF THE FRONT AXLE SUSPENSION SYSTEM

**WARNING: Before operating on the suspension system, make sure the surrounding area is clear of all bystanders.**

The calibration of the front axle suspension system is required after each replacement of a hydraulic component of the suspension system or after replacement of the suspended axle position sensor.

**IMPORTANT: The calibration procedure has to be performed only by a specialized service technician and authorized service center.**

**IMPORTANT: The calibration has to be performed every time the hydraulic circuit is discharged through the decompression screws (B) on the hydraulic suspension control unit (A).**

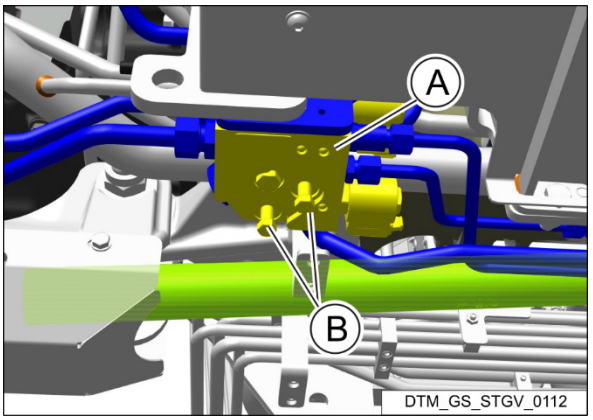
**NOTE: The layout and the position of some suspension system components can differ according to the specific model configuration.**

**Prior to carry out the calibration procedure**

1. Place the tractor on a flat, horizontal and sufficiently firm surface, apply the park brake;
2. Make sure that the area surrounding the suspension system is clear of all bystanders;
3. Make sure that the front axle is free to move along the entire route of the suspension system until the highest and the lowest end of stroke of the suspension ram pistons.

**Suspension system calibration button**

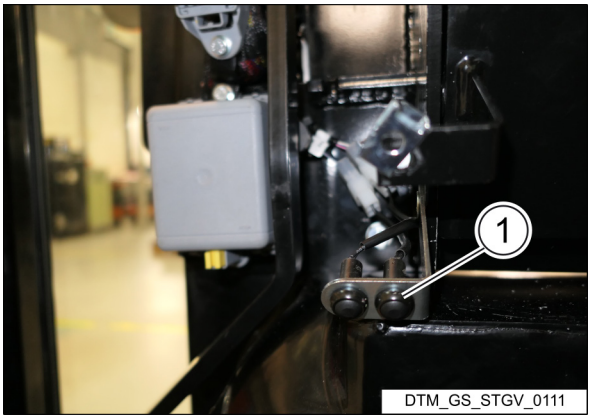
The calibration button (1) is located under the instrument panel on the right side of the console near the brake pedals.




**Suspension system calibration procedure**

**NOTE: If the tractor moves during the procedure, the calibration operation is interrupted.**

1. With the tractor parked, start the engine and within the first 30 seconds, press the calibration button (1) and hold it down for at least 3 seconds.
2. At this point starts the automatic calibration procedure of the suspended system: the suspended front axle performs a series of movements along the entire useful route up to the highest and the lowest end of stroke of the suspension rams.
3. At the end of calibration, the suspended front axle moves to the central position.

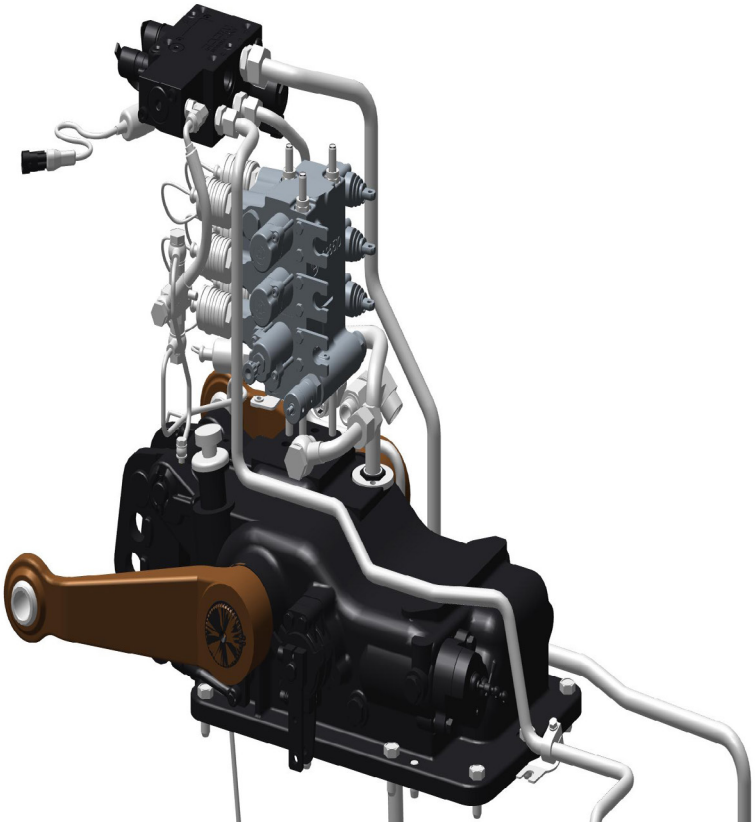


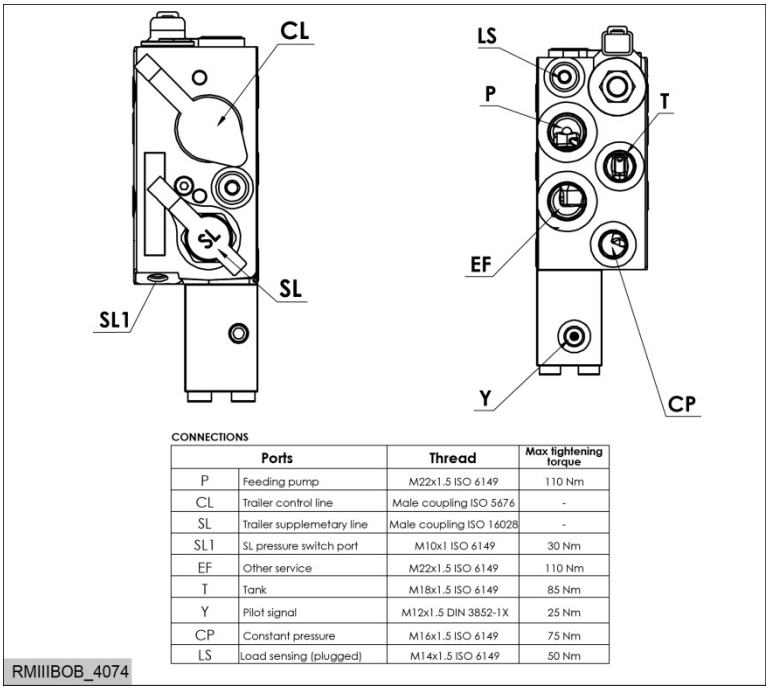
# 8 Trailer Brake Valve (EEC Auto Select)

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***8.4. Hydraulic Schemes (open center valve) ..... 103***

# 8.1. COMPONENTS LOCATIONS AND FUNCTIONALITY

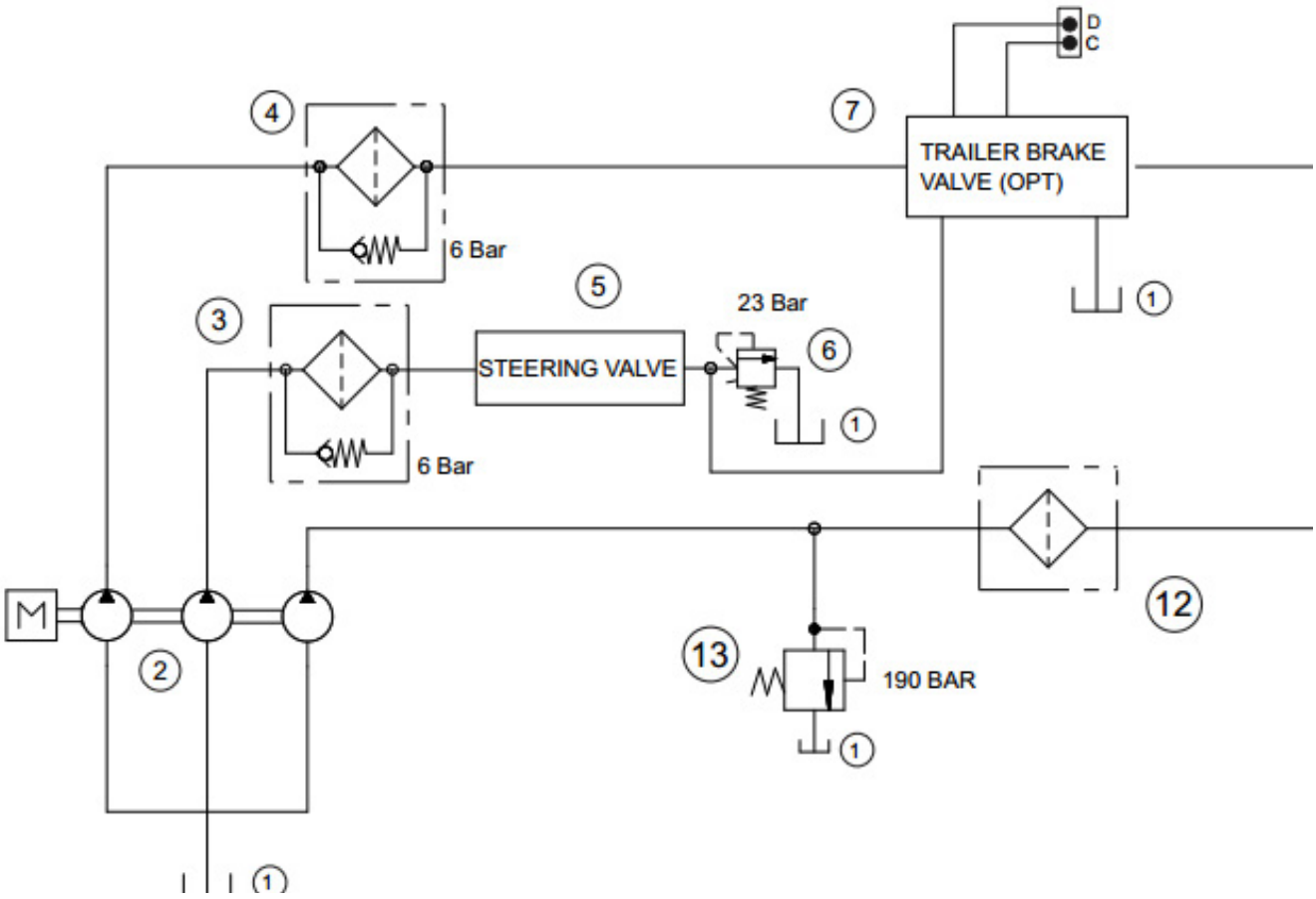


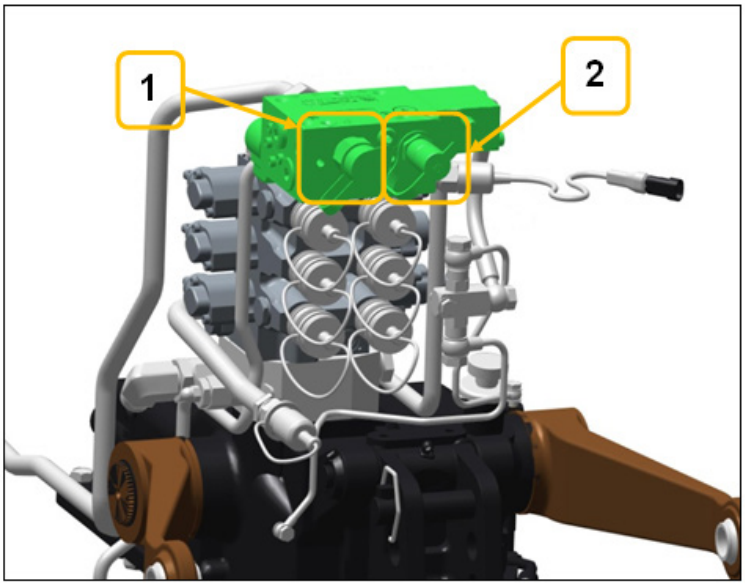



CONNECTIONS

| Ports | | Thread | Max tightening torque |
|---|---|---|---|
| P | Feeding pump | M22x1.5 ISO 6149 | 110 Nm |
| CL | Trailer control line | Male coupling ISO 5676 | - |
| SL | Trailer supplemetary line | Male coupling ISO 16028 | - |
| SL1 | SL pressure switch port | M10x1 ISO 6149 | 30 Nm |
| EF | Other service | M22x1.5 ISO 6149 | 110 Nm |
| T | Tank | M18x1.5 ISO 6149 | 85 Nm |
| Y | Pilot signal | M12x1.5 DIN 3852-1X | 25 Nm |
| CP | Constant pressure | M16x1.5 ISO 6149 | 75 Nm |
| LS | Load sensing (plugged) | M14x1.5 ISO 6149 | 50 Nm |

RMIIIBOB_4074




**FUNCTION:**

To provide hydraulic pressure for the trailer brakes.

**MAJOR COMPONENTS:**

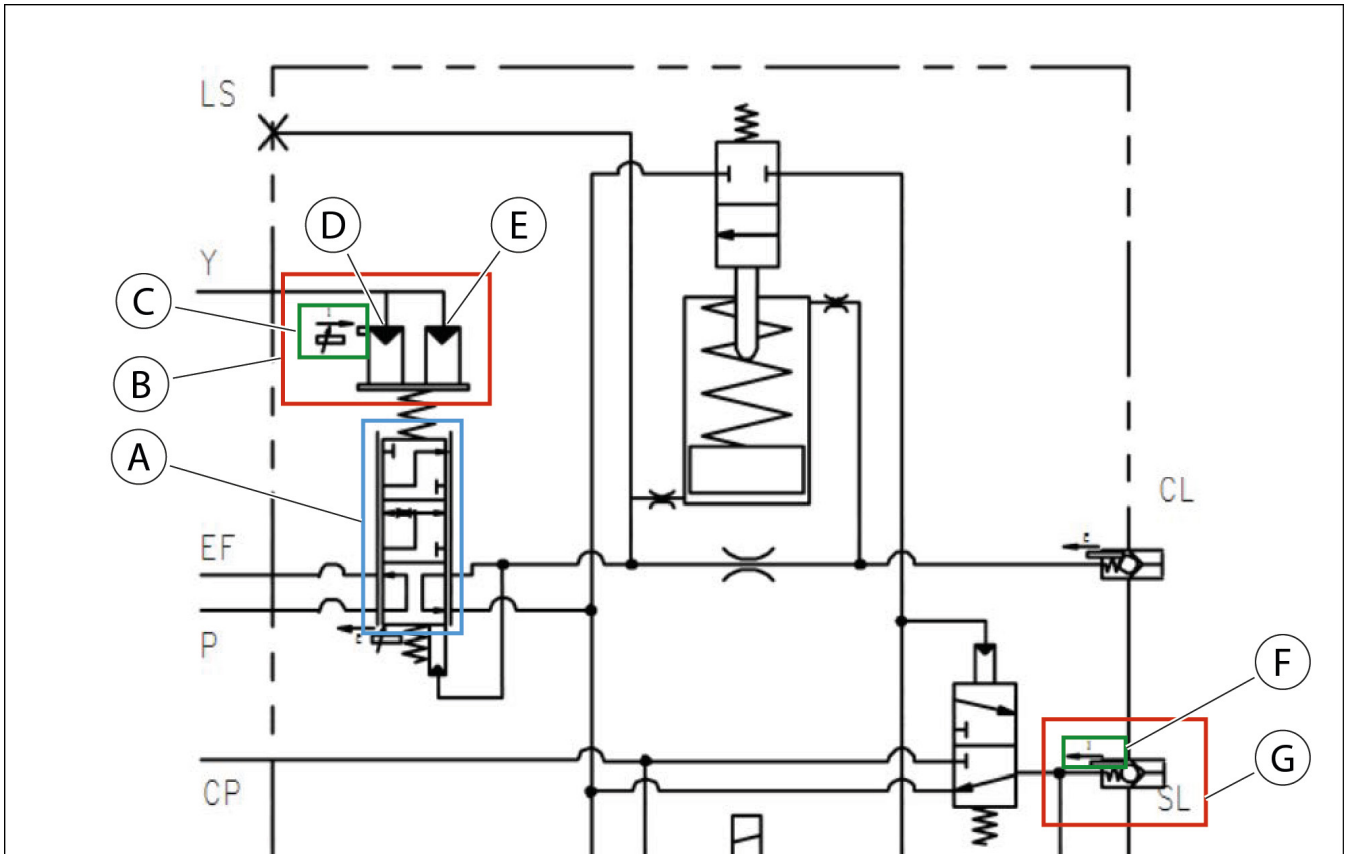
- Trailer brake valve (valve, solenoid, switch)
- Flip/flop selective valve
- Couplers (trailer control line and supplementary line)

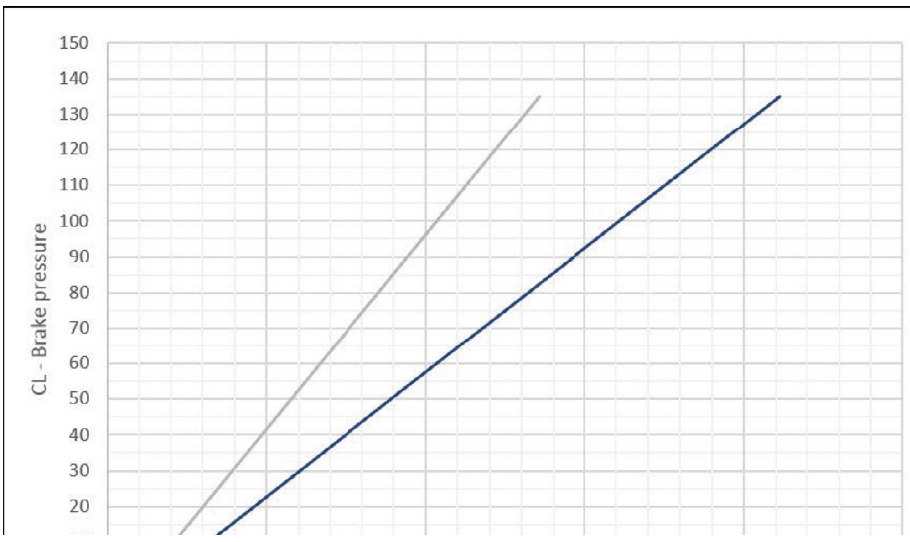
**THEORY OF OPERATION:**

When the brake pedals are pressed, the brake cylinder unit forces oil under pressure from the brake oil reservoir to

the hydraulic actuators  and the flip/flop selective valve . Oil flows from the flip/flop selective valve to the trailer brake valve through the pilot pressure line, which moves the spool of trailer brake valve .
The trailer brake valve diverts pressurized oil from the hydraulic pump and sends it through the supply line to the trailer brake couplers . The trailer is thus braked simultaneously with the tractor. The trailer brake is applied at the same rate as the tractor brake.
The Auto-select trailer brake valve can operate with a single line or double line connection.
In case of ***double line connection***, both coupler ines (1&2) are connected. The command line diverts a constant oil pressure (15 - 35 bar) into the supplementary line to open the trailer brakes that are normally braked without oil pressure. The pressure switch verifies the presence or absence of the constant oil pressure (15 - 35 bar) in the command line, and if there is not feedback, diverts the oil into the exceeding flow line,  through the opening of TBV solenoid valve and the trailer is braked. The solenoid valve is also used to divert in exceeding flow the oil flow of the command line when the parking brake is actuated and the engine is on. So, also the trailer is braked.
In case of ***single line connection***, the supplementary line (2) is not connected on the relevant coupler, only the control line coupler (1) is connected to the trailer brake. The trailer brake valve will change mechanically the internal ratio on the activation piston valve. In these conditions the valve is working like the old Cuna brake valve, the pressure in the control line coupler will increase according to the brake force applied on the brake pedals.

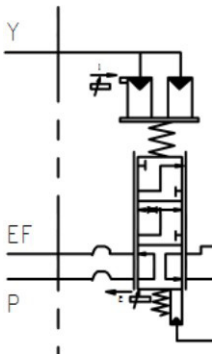
## 8.1.1. Double Ratio Pilot Head - Mechanical Selection



# 8.2. PILOT PISTONS CONDITIONS



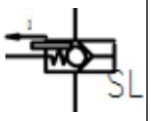

Basically, there are two different pistons that can drive the main spool that manages the trailer braking.
The “inner” one is compliant to RVBR norm, while “the inner + the outer” ones together provide the correct braking for trailer single line.

Selection from “inner piston” to “inner + outer pistons” is obtained by a mechanical lever connected to SL coupling.

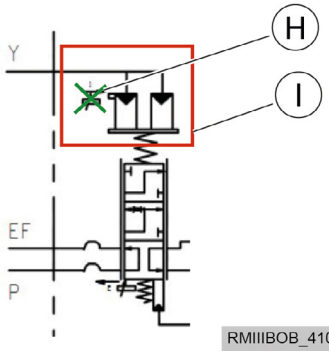
If SL line is not connected (trailer is **single** line) “inner and outer” pistons work together.
If SL line is connected (trailer is **double** line) “outer” piston is locked and “inner” piston works alone.

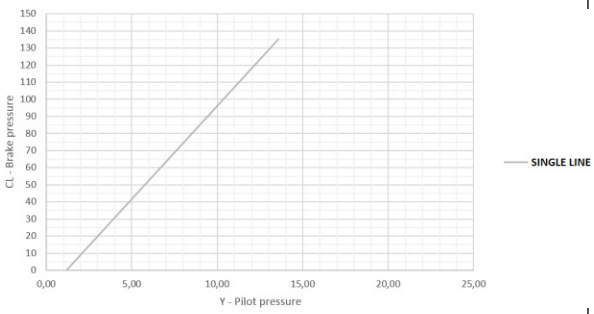
On this way tractor can provide two different bands depending on which trailer is connected.

**TRAILER SINGLE LINE**




**NOT** CONNECTED

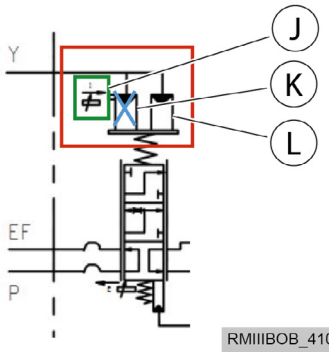


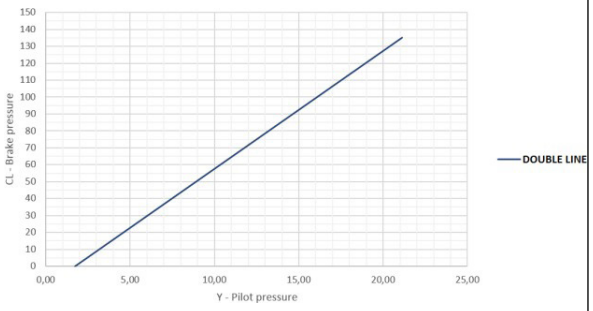




**TRAILER DOUBLE LINE**




CONNECTED




| Description |
|---|
| A - Main spool |
| B - Double ration pilot head |
| C - Mechanical selector |
| D - Additional annular pilot |
| E - RVBR pilot piston |
| F - Mechanical Actuator |
| G - SL coupling |
| H - Not activated |
| I - Pistons work together |
| J - Activated |
| K - Locked |
| L - Inner piston works alone |

# 8.3. TRACTOR CONDITIONS

| | TRACTOR BRAKING | | | OUTPUT TBU | | TRAILER CONDITION |
|---|---|---|---|---|---|---|
| | | | | CL | SL | |
| | Service Brake | Secondary Brake | Parking Brake | Control Line [bar] | Supplementary Line [bar] | |
| Condition 0 | --- | --- | --- | 0 | 0 | Stopped (Tractor is **OFF**) |
| Condition 1 | ON | ON | ON | 0-115/150 | 0-1 | Is braking / Stopped (Tractor is in **emergency**) |
| Condition 2 | ON | ON | OFF | 0-115/150 | 0-1 | Is braking / Stopped (Tractor is in **emergency**) |
| Condition 3 | ON | OFF | OFF | 0-115/150 | 15/35 | Is braking (Tractor is **braking normally**) |
| Condition 4 | ON | OFF | ON | 0-115/150 | 0-1 | Stopped (Tractor is **parked normally**) |
| Condition 5 | OFF | ON | ON | 0-2 | 0-1 | Is braking / Stopped (Tractor is in **emergency**) |
| Condition 6 | OFF | OFF | ON | 0-2 | 0-1 | Stopped (Tractor is **parked normally**) |
| Condition 7 | OFF | ON | OFF | 0-2 | 0-1 | Is braking / Stopped (Tractor is in **emergency**) |
| Condition 8 | OFF | OFF | OFF | 0-2 | 15/35 | Running condition (Tractor is **running**) |

1) It has been supposed that:
   - Tractor service brake acts on CL of the TBU
   - Tractor secondary brake acts on SL of the TBU
   - Tractor parking brake acts on SL of the TBU

2) If the tractor brakes, CL will be in pressure - in a range from 0 to the maximum pressure (115/150 bar); otherwise not. (YELLOW CELLS)

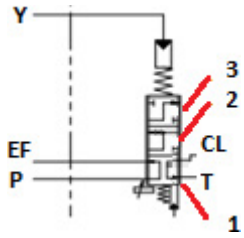
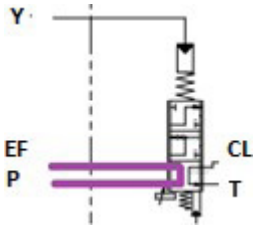
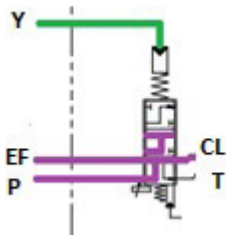
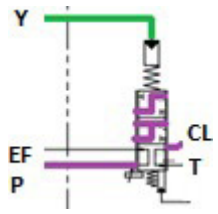
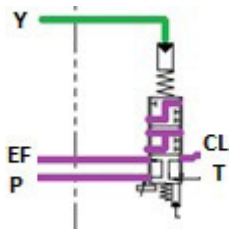
3) If the tractor is parked or in emergency condition, SL will not be in pressure (around 0 bar), and the trailer is being braked by negative brakes. (GREEN CELLS)
   This means that:
   - conditions 1,2,4 have the same scheme
   - conditions 5,6,7 have the same scheme

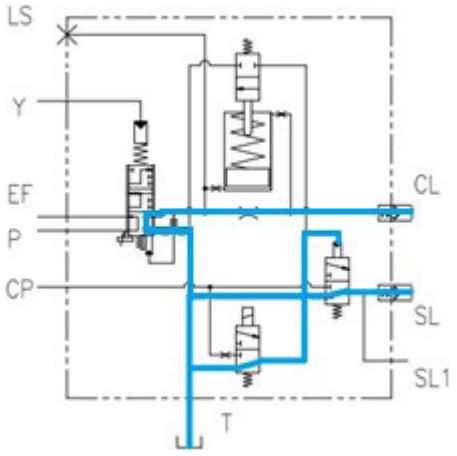
4) CL line can be modulated from 0 to the maximum pressure (115/150 bar).

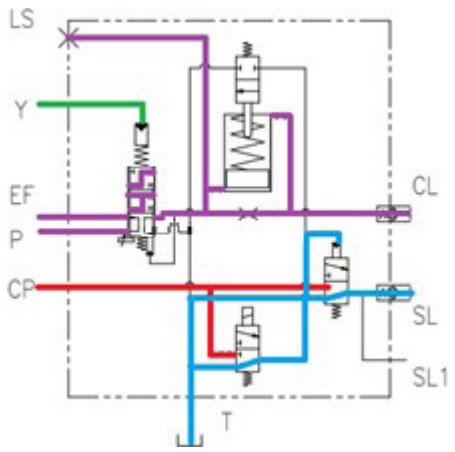
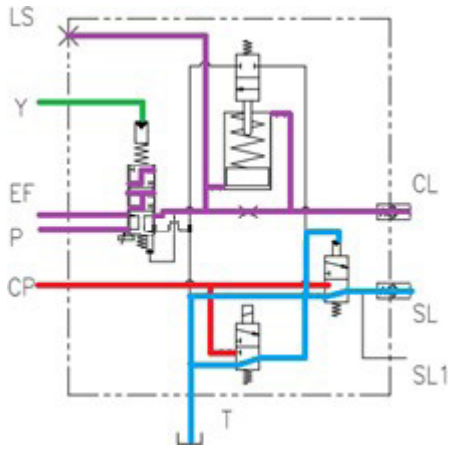
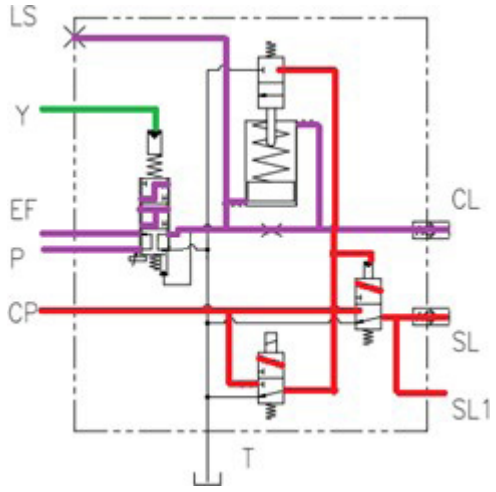
5) SL line cannot be modulated (ON/OFF), so the tractor must have a maximum speed of 40 km/h.
   SL pressure can be 0 or CP pressure.
   CP pressure can be accepted from 15 to 35 bar.

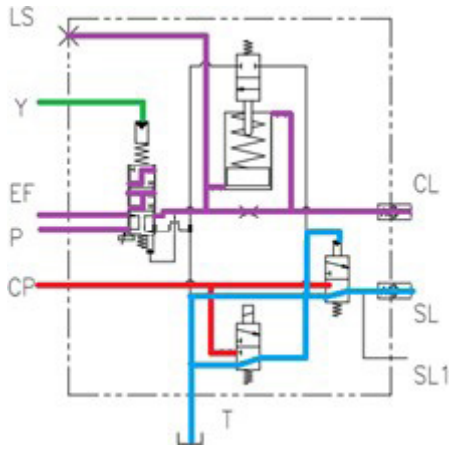
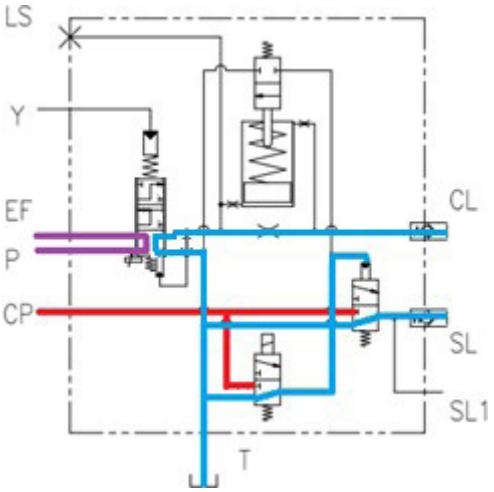
6) In the next schemes not all the lines have been painted based on the pressure, but just the ones needed for the explanation of the analyzed condition.

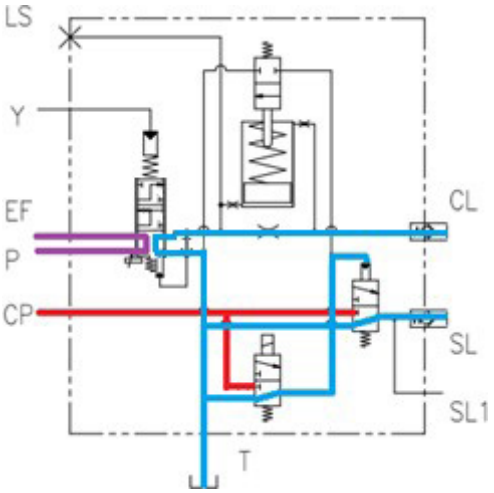
# 8.4. HYDRAULIC SCHEMES (OPEN CENTER VALVE)

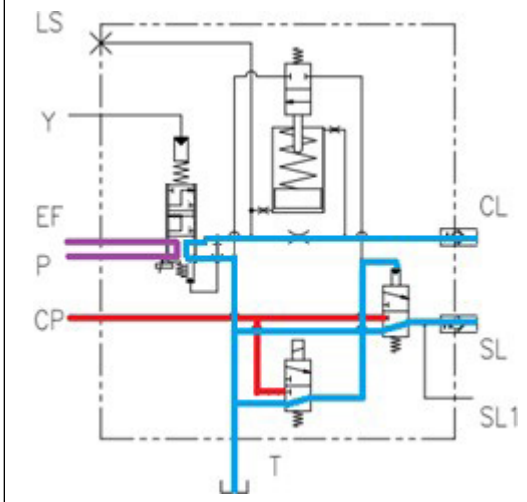
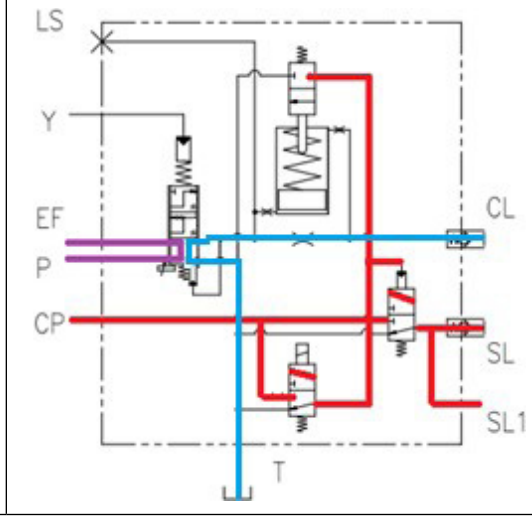
| | | |
|---|---|---|
| |  | The spool has 3 different positions, that do not depend only on the Y pressure, but also on P, EF and CL pressures. |
| | | |
| **1)** |  | You are not braking: P is connected to EF and CL is connected to T. |
| **2)** |  | You are braking (modulating in a range from 0 to 115/150 bar), with <u>EF pressurized</u>, thus spool modulates braking between position 1) and 2). |
| **3)** |  | You are braking (modulating in a range from 0 to 115/150 bar), with <u>EF not pressurized</u>, thus spool modulates braking between position 2) and 3). |
| | | |
| **NORMAL BRAKING** |  | In the next schemes will be used the image on the left in order to represent both **2)** and **3)** positions (normal braking). |

| | | |
|---|---|---|
| **Condition 0** |  | The tractor is OFF.<br><br>This means that coil is OFF, so SL has 0 bar and the trailer is braked. |

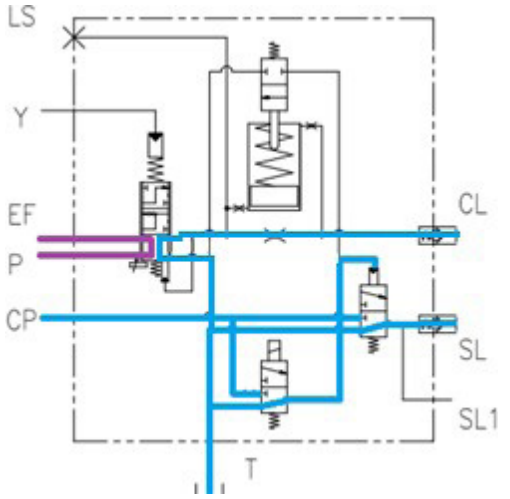
| | | |
|---|---|---|
| **Condition 1** |  | Tractor is using<br>- Service brake<br>- Secondary brake<br>- Parking brake<br>so is in emergency condition.<br><br>Tractor is using service brake, so CL line can be modulated from 0 to 150 bar (the trailer is braked).<br><br>Tractor is using both secondary and parking brakes, so the coil is OFF and SL line has 0-1 bar (and the trailer is braked by negative brakes). |
| **Condition 2** |  | Tractor is using<br>- Service brake<br>- Secondary brake<br>so is in emergency condition.<br><br>Tractor is using service brake, so CL line can be modulated from 0 to 150 bar (the trailer is braked).<br><br>Tractor is using secondary brake, so the coil is OFF and SL line has 0-1 bar (and the trailer is braked by negative brakes). |
| **Condition 3** |  | Tractor is using<br>- Service brake<br>so is in running condition.<br><br>Tractor is using service brake, so CL line can be modulated from 0 to 150 bar (the trailer is braked).<br><br>Tractor is not using parking or secondary brakes, so the coil is ON and SL line has 15/35 bar (and the trailer is not braked by negative brakes). |

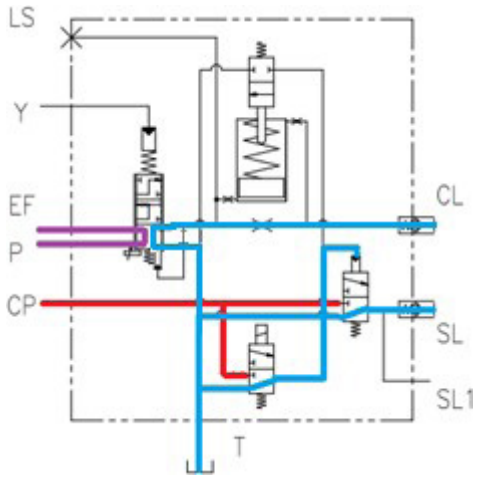
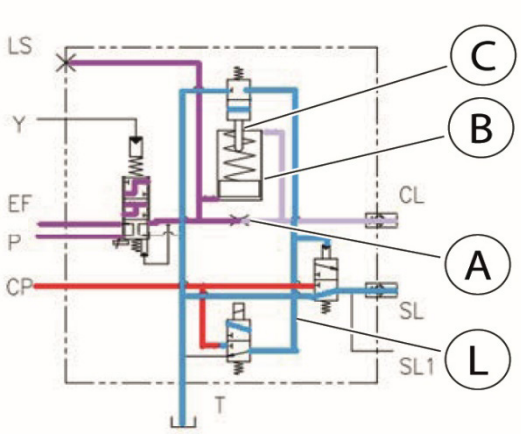
| | | |
|---|---|---|
| **Condition 4** |  | Tractor is using<br>- Service brake<br>- Parking brake<br>so is parked.<br><br>Tractor is using service brake, so CL line can be modulated from 0 to 150 bar (the trailer is braked).<br><br>Tractor is using parking brake, so the coil is OFF and SL line has 0-1 bar (and the trailer is braked by negative brakes). |
| **Condition 5** |  | Tractor is using<br>- Secondary brake<br>- Parking brake<br>so is in emergency condition.<br><br>Tractor is not using service brake, so CL line has 0-2 bar.<br><br>Tractor is using both secondary and parking brakes, so the coil is OFF and SL line has 0-1 bar (and the trailer is braked by negative brakes). |

| | | |
|---|---|---|
| **Condition 6** |  | Tractor is using<br>- Parking brake<br>so is parked.<br><br>Tractor is not using service brake, so CL line has 0-2 bar.<br><br>Tractor is using parking brake, so the coil is OFF and SL line has 0-1 bar (and the trailer is braked by negative brakes). |

| | | |
|---|---|---|
| **Condition 7** |  | Tractor is using<br>- Secondary brake<br>so is emergency condition.<br><br>Tractor is not using service brake, so CL line has 0-2 bar.<br><br>Tractor is using secondary brake, so the coil is OFF and SL line has 0-1 bar (and the trailer is braked by negative brakes). |
| **Condition 8** |  | Tractor is not using any braking devices, so it is running. Tractor is not using service brake, so CL line has 0-2 bar.<br>Tractor is not using parking or secondary brakes, so the coil is ON and SL line has 15/35 bar (and the trailer is not braked by negative brakes). |

## 4.5 **Trailer Emergency Conditions**

| | | |
|---|---|---|
| **Condition 9.1** |  | CP line broke.<br><br>SL line is connected to T, so has 0 bar and the trailer is being braked. |

| | | |
|---|---|---|
| **Condition 9.2** |  | Solenoid electrical default.<br><br>SL is connected to T, so SL pressure decreases from 15/35 to 0 bar, and the trailer is being braked. |
| **Condition 9.3** |  | The CL hose broke.<br><br>At **A** point there is an orifice, that transmits the different pressures to the different faces of piston **B.**<br>In a normal braking flow passes through the orifice and fills up the braking cylinders in less than 0,5 sec. Piston **B** moves but has no time to end the stroke until **C** spool.<br>If flow continues to pass through the orifice after 1,0 sec. (over a normal brake), the valve identifies that CL hose broke, so piston **B** ends the stroke and moves until **C** spool and connects **L** line to T.<br>On this way SL pressure decreases from 15/35 to 0 bar, and the trailer is being braked. |

# 9 Electrical system

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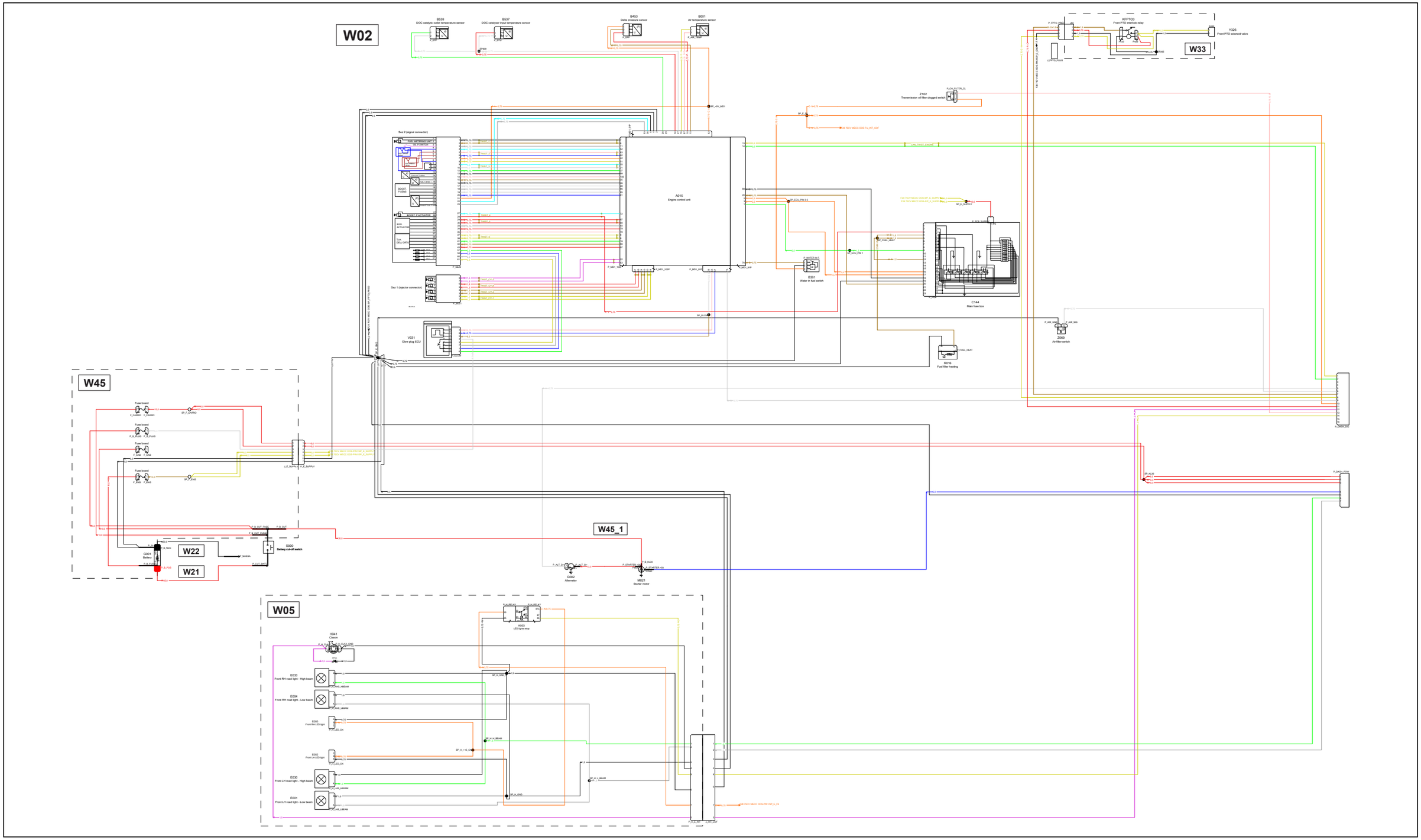
# 9.1. OOS VERSION

## 9.1.1. Electrical schematics

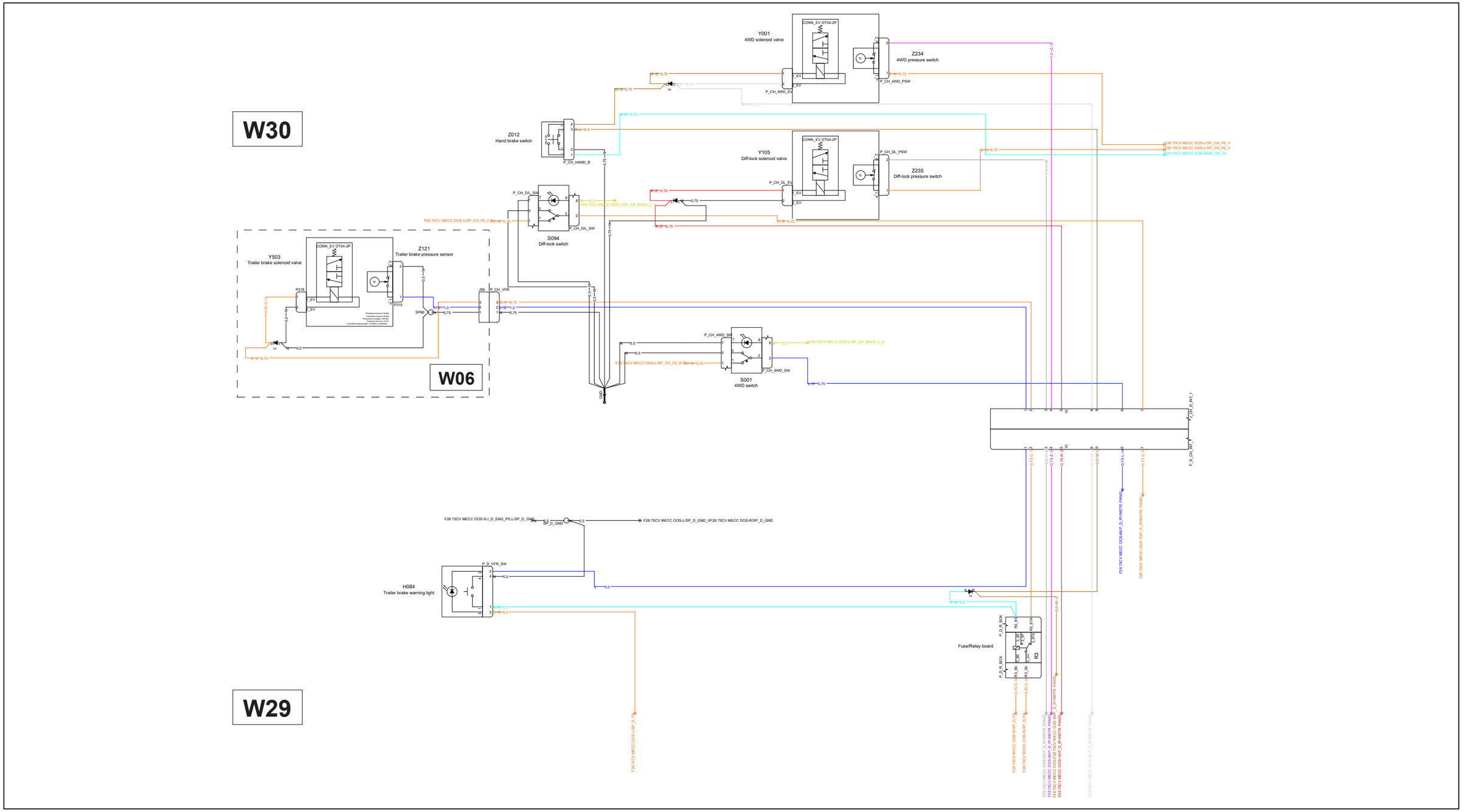
### 9.1.1.1 Mechanical version 75HP

| Harness name | Harness description |
|---|---|
| W02_LH | ENGINE < 75 CV OOS |
| W02_RH | ENGINE < 75 CV OOS |
| W05 | BONNET F28 |
| W06 | VFR AUTO-SELECT |
| W12LH | HEADLIGHT EXTENSION |
| W12RH | HEADLIGHT EXTENSION |
| W14 | LICENSE PLATE EXTENSION |
| W17 | BEACON LIGHT EXTENSION |
| W21 | BATTERY POSITIVE CABLE 75CV |
| W22 | BATTERY NEGATIVE CABLE F28 |
| W22_1 | GROUND CONNECTION L = 400 |
| W25 | GEAR LEVER EXTENSION |
| W29 | DASHBOARD MECH |
| W29_1 | BRAKE PEDALS SWITCH EXTENSION (LHS & RHS ) |
| W30_3 | HUSCO PRESSURE SWITCH |
| W30_LH | WAGON MECH |
| W30_RH | WAGON MECH |
| W31_2 | REAR PTO SWITCH EXTENSION |
| W31_3 | FRONT PTO ADAPTER |
| W33 | FRONT PTO |
| W33_1 | PTO FRONT SOLENOID VALVE |
| W44 | DIAGNOSTIC SOCKET |
| W45 | SUPPLY POWER 75CV |
| W45_1 | STARTER MOTOR F28 < 75 HP |

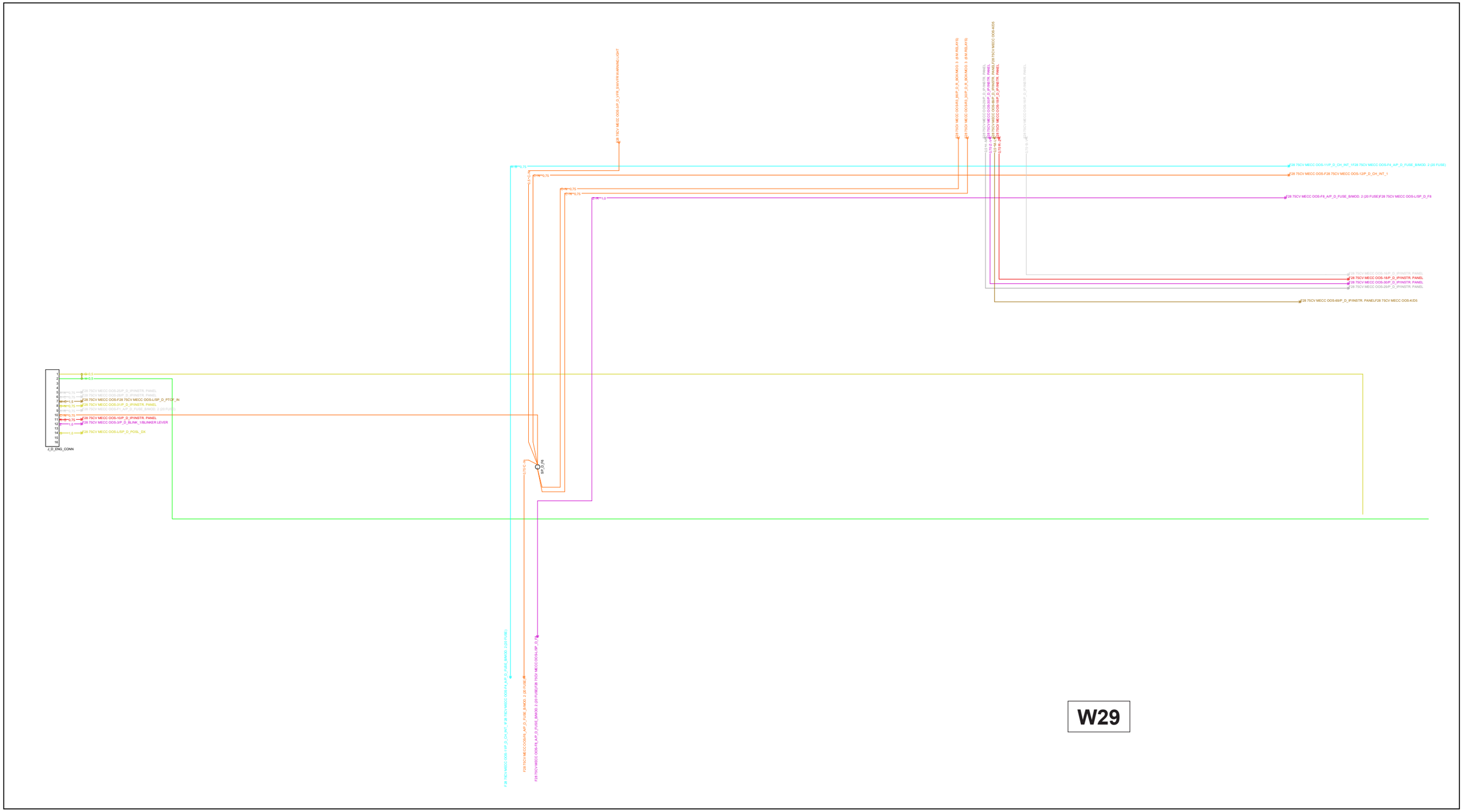
## 9.1.1.1.1 Schematic 1



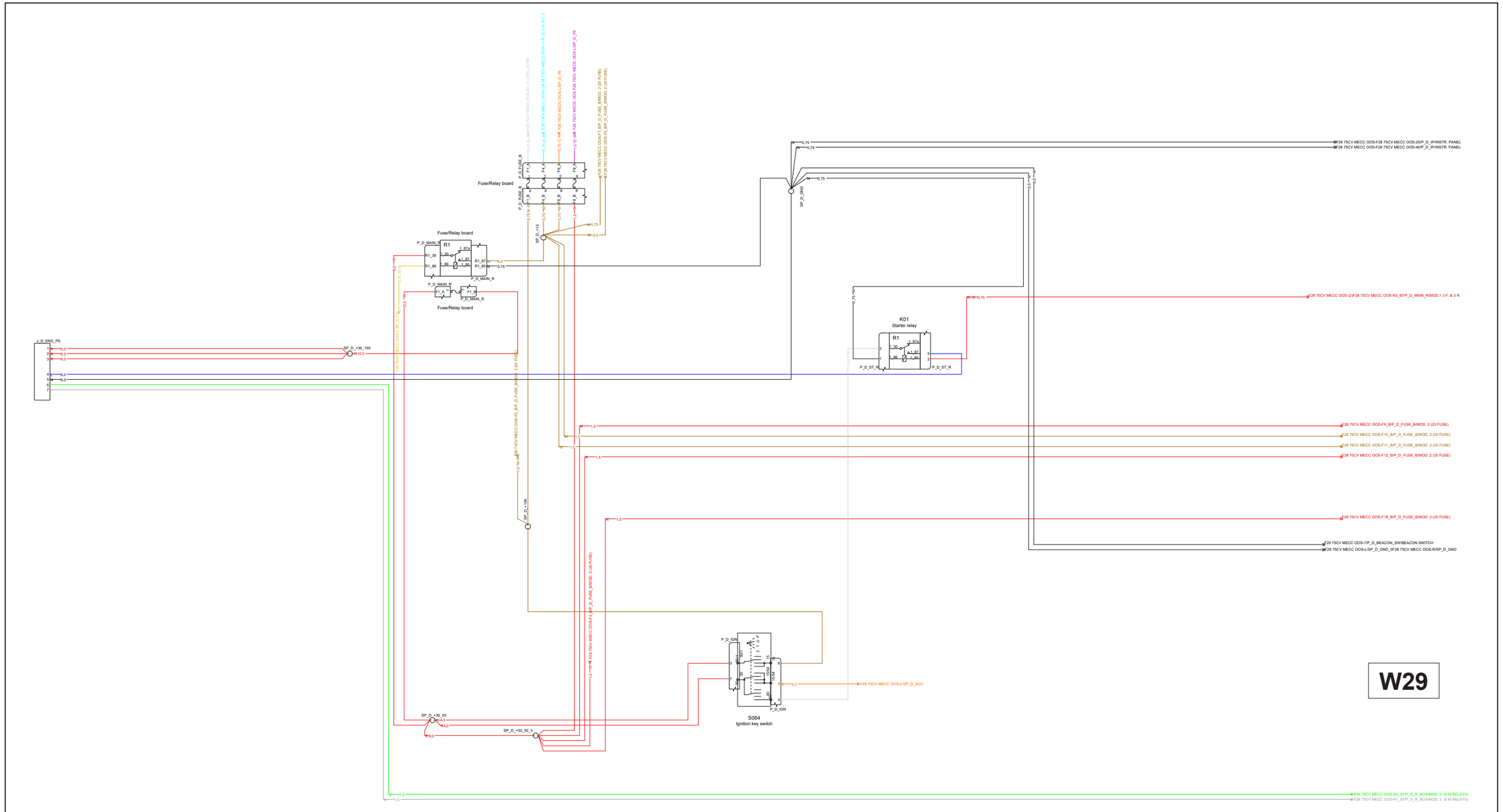
## 9.1.1.1.2 Schematic 2



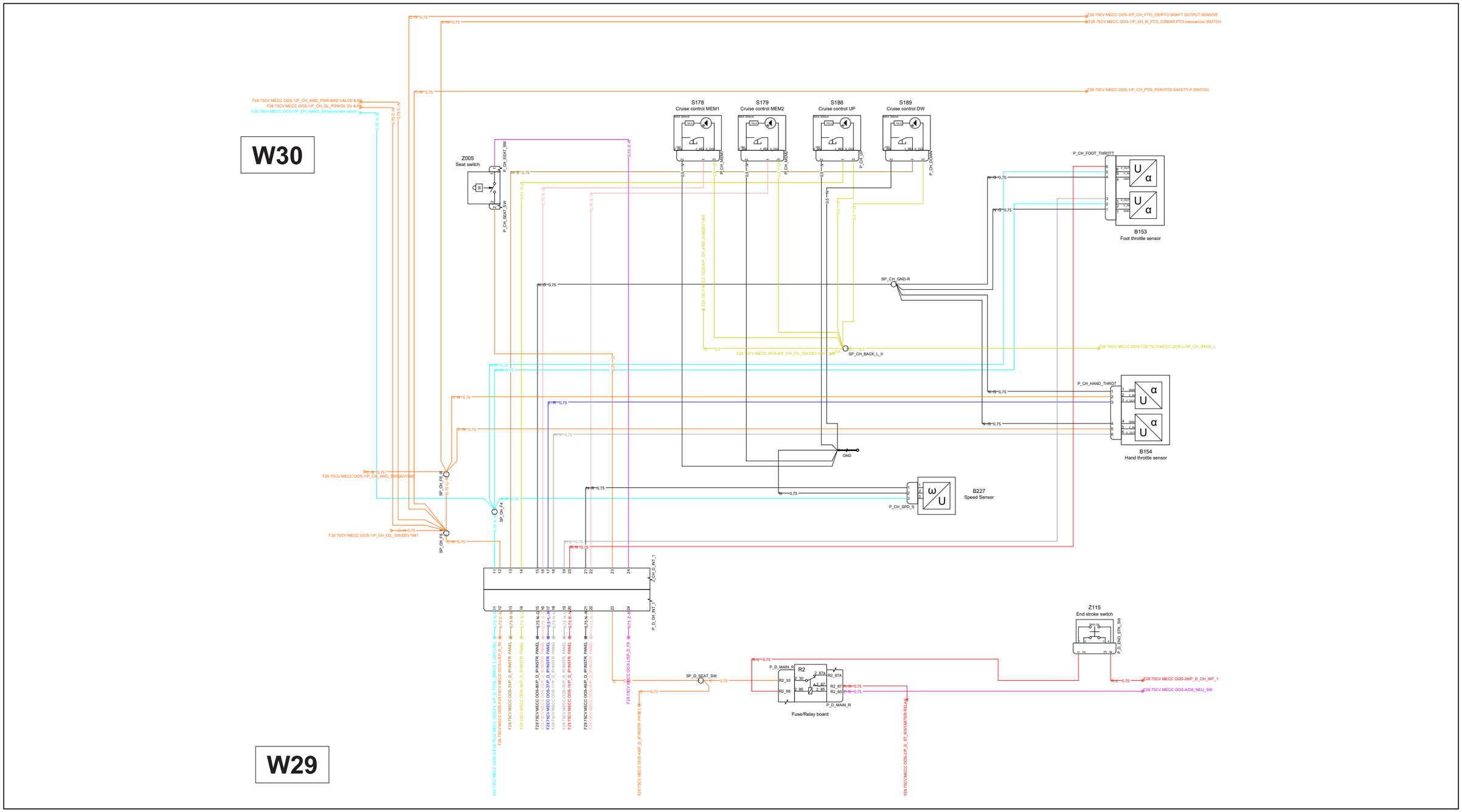
### 9.1.1.1.3 Schematic 3



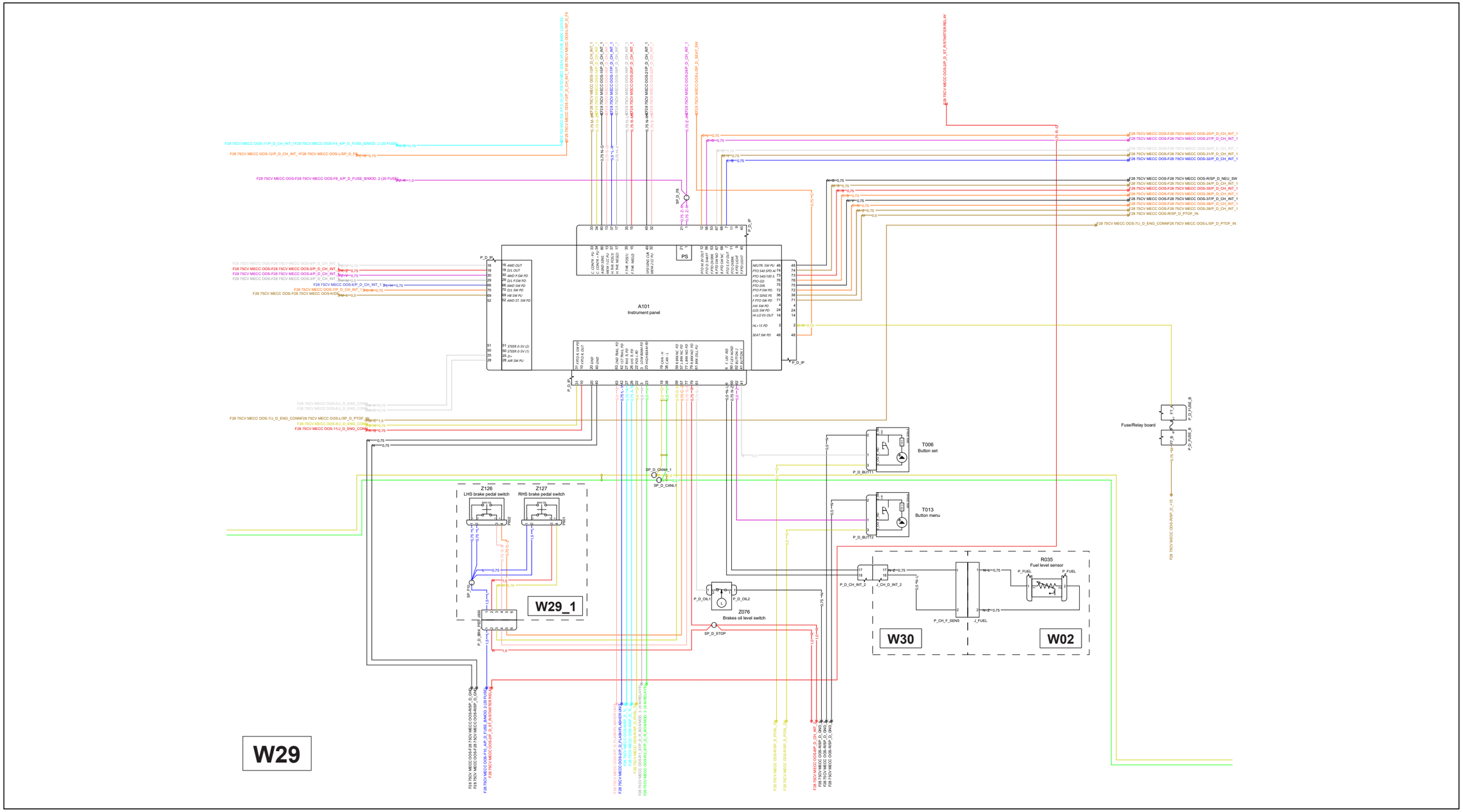
## 9.1.1.1.4 Schematic 4



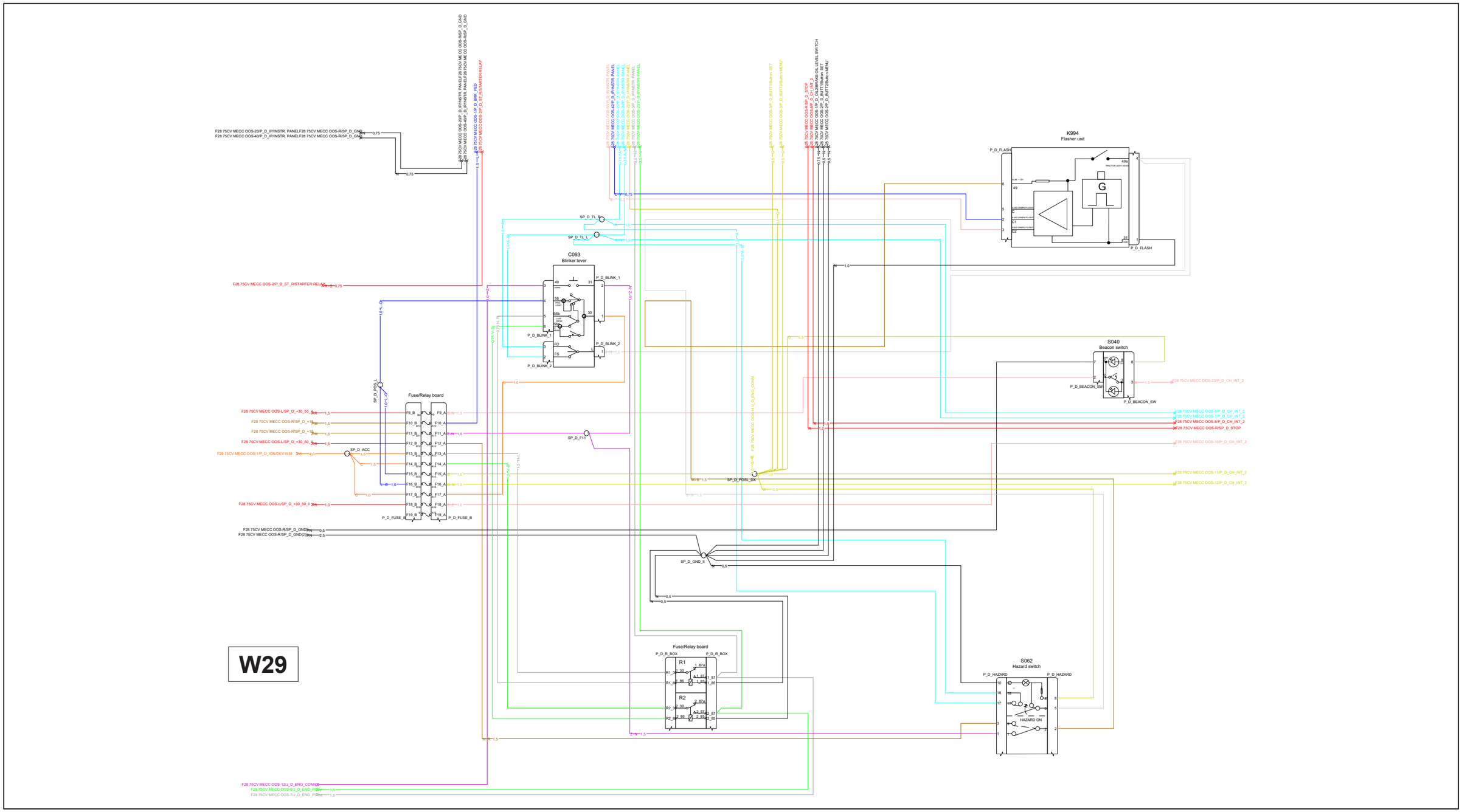
## 9.1.1.1.5 Schematic 5



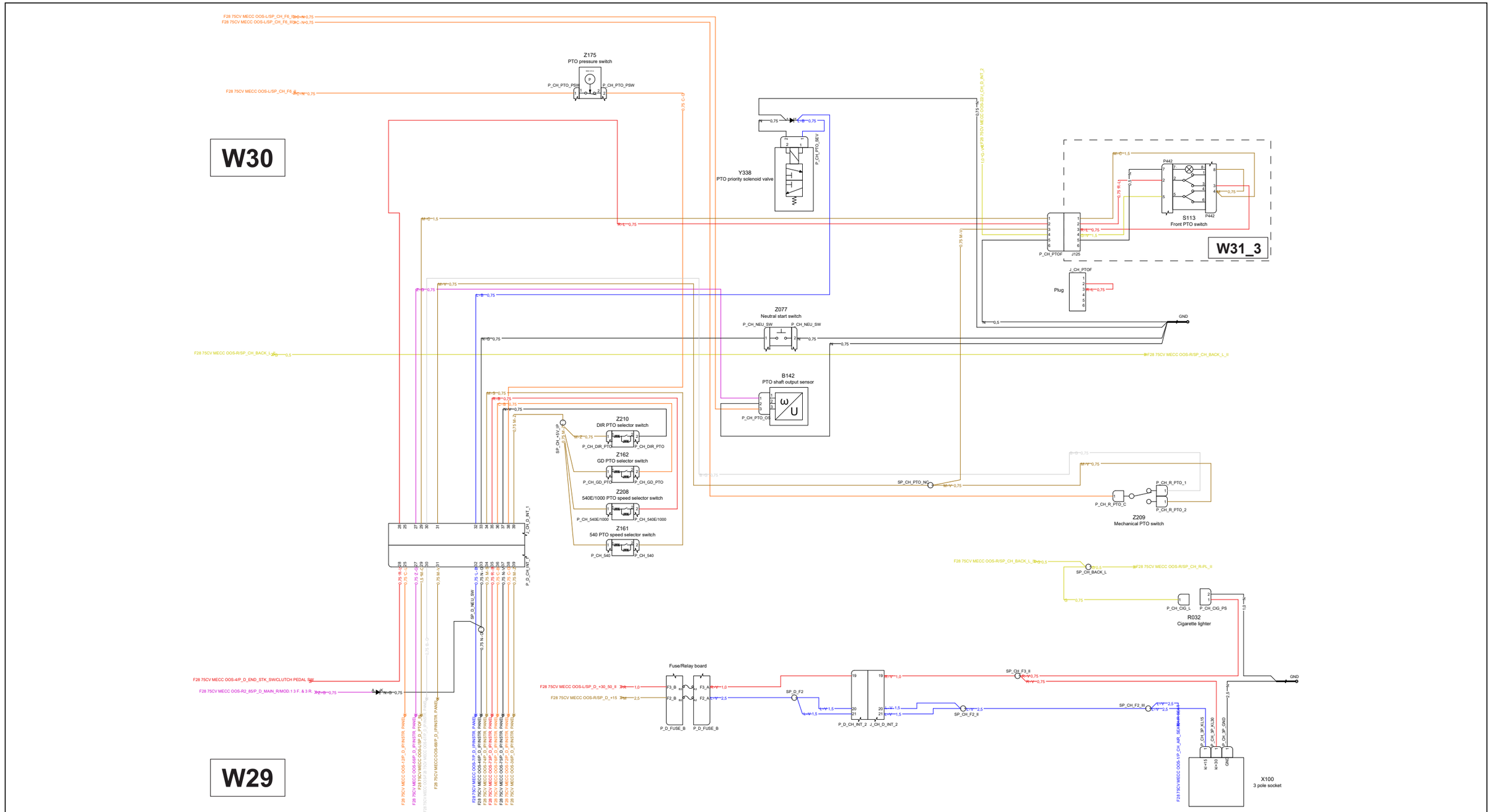
## 9.1.1.1.6 Schematic 6



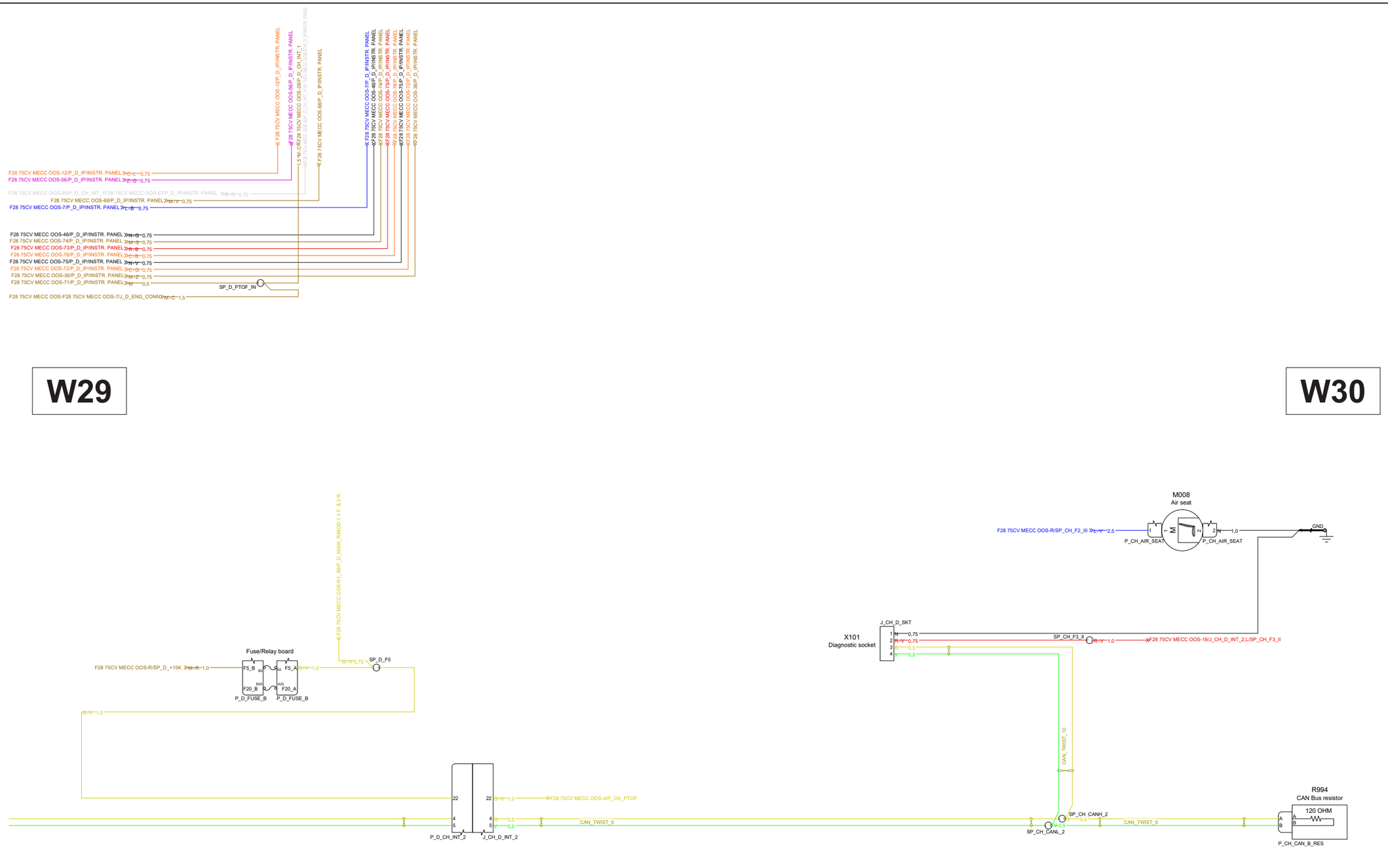
## 9.1.1.1.7 Schematic 7



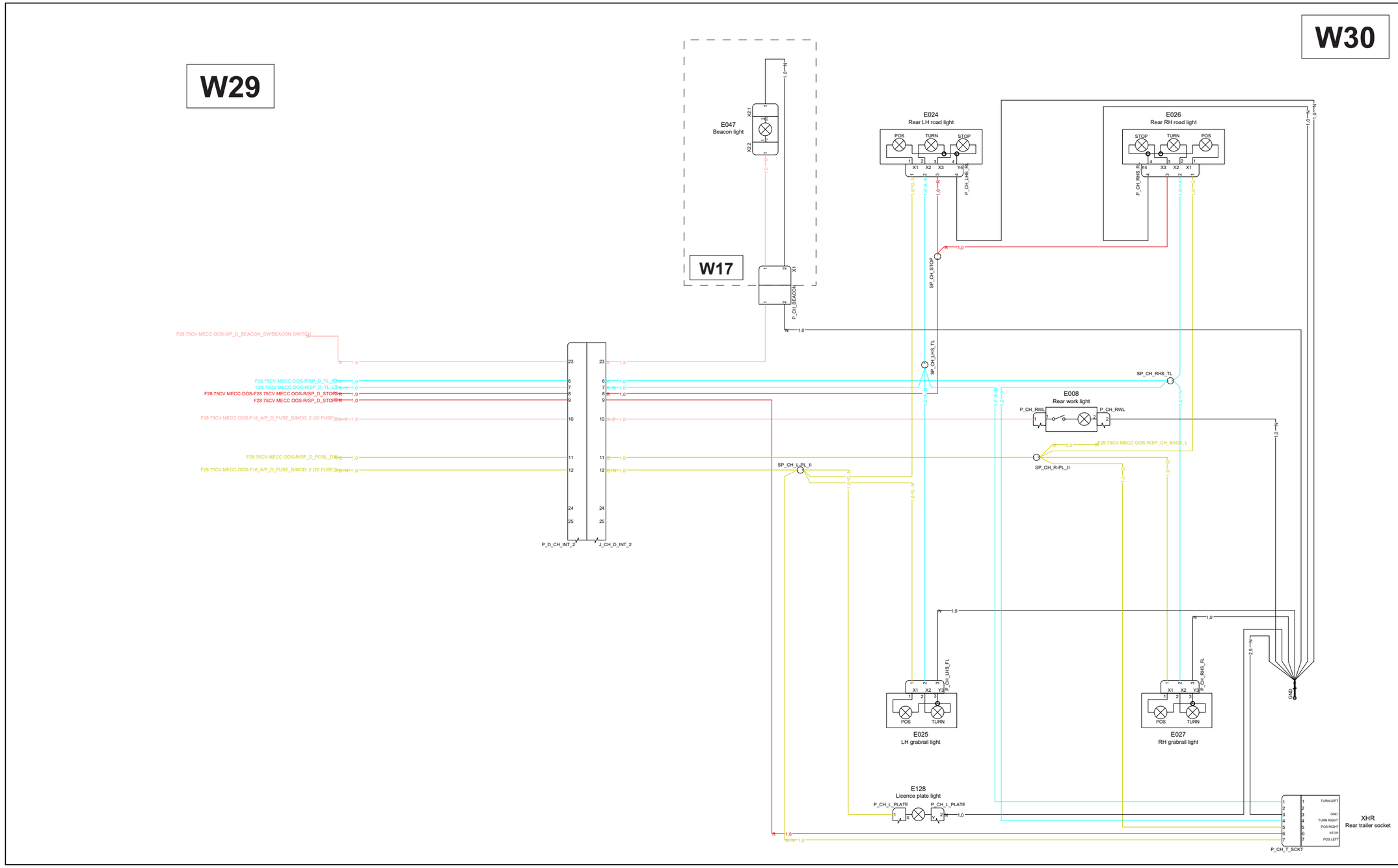
## 9.1.1.1.8 Schematic 8



## 9.1.1.1.9 Schematic 9



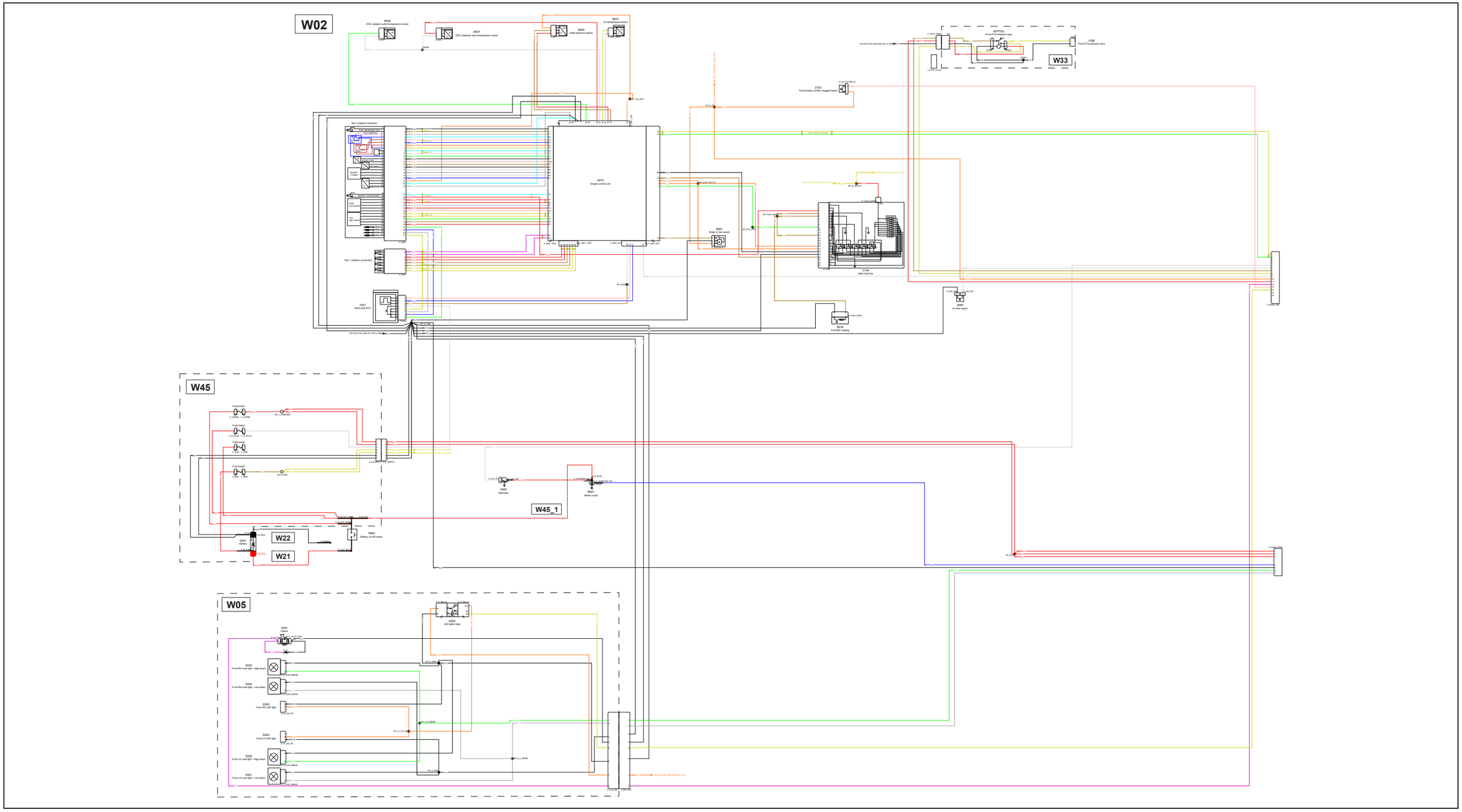
## 9.1.1.1.10 Schematic 10



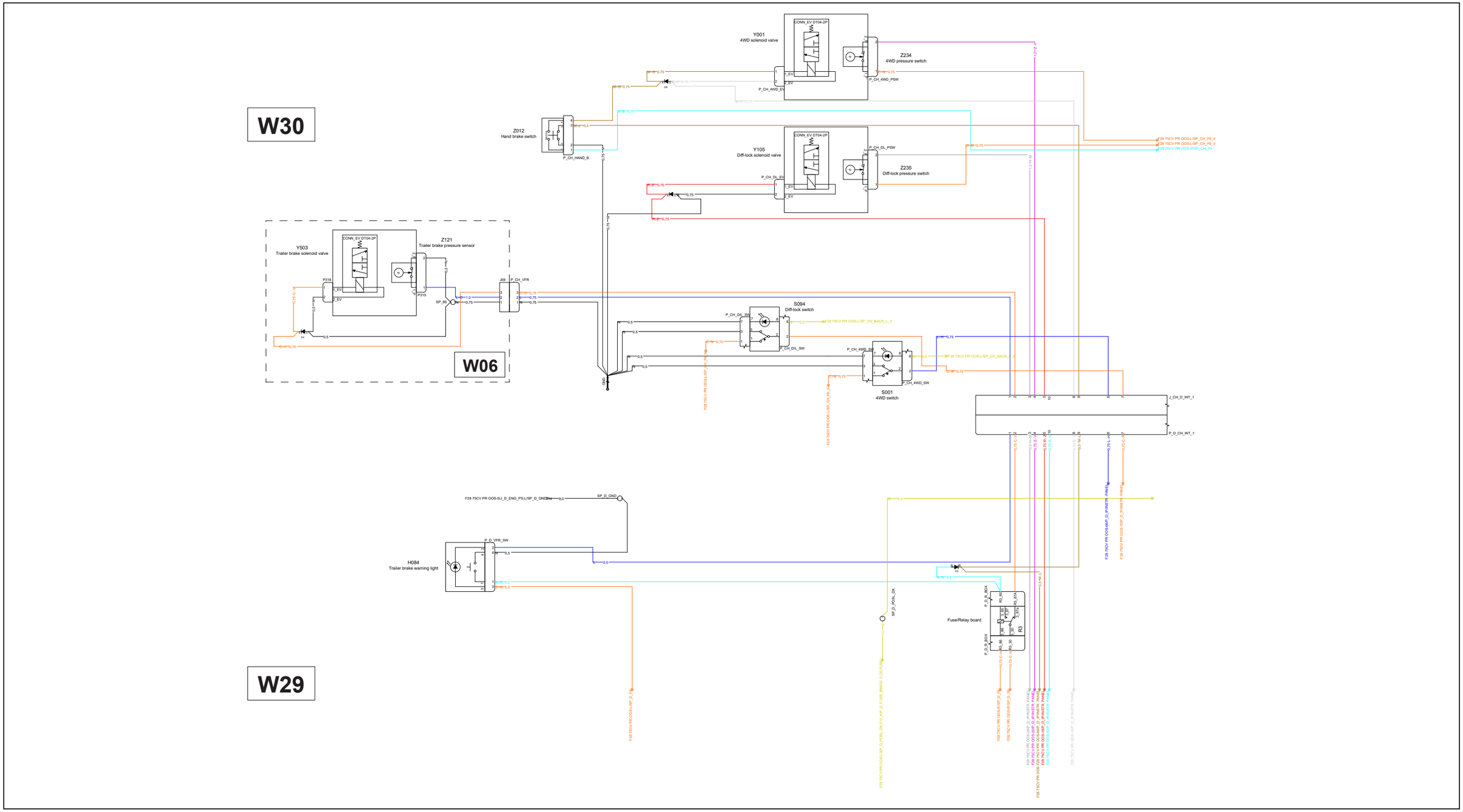
### 9.1.1.2 Power Reverser version 75HP

| Harness name | Harness description |
|---|---|
| W02_LH | ENGINE < 75 CV OOS |
| W02_RH | ENGINE < 75 CV OOS |
| W05 | BONNET F28 |
| W06 | VFR AUTO-SELECT |
| W12LH | HEADLIGHT EXTENSION |
| W12RH | HEADLIGHT EXTENSION |
| W14 | LICENSE PLATE EXTENSION |
| W17 | BEACON LIGHT EXTENSION |
| W21 | BATTERY POSITIVE CABLE 75CV |
| W22 | BATTERY NEGATIVE CABLE F28 |
| W22_1 | GROUND CONNECTION L = 400 |
| W25 | GEAR LEVER EXTENSION |
| W29 | DASHBOARD MECH |
| W29_1 | BRAKE PEDALS SWITCH EXTENSION (LHS & RHS ) |
| W30_3 | HUSCO PRESSURE SWITCH |
| W30_LH | WAGON MECH |
| W30_RH | WAGON MECH |
| W31_2 | REAR PTO SWITCH EXTENSION |
| W31_3 | FRONT PTO ADAPTER |
| W33 | FRONT PTO |
| W33_1 | PTO FRONT SOLENOID VALVE |
| W44 | DIAGNOSTIC SOCKET |
| W45 | SUPPLY POWER 75CV |
| W45_1 | STARTER MOTOR F28 < 75 HP |

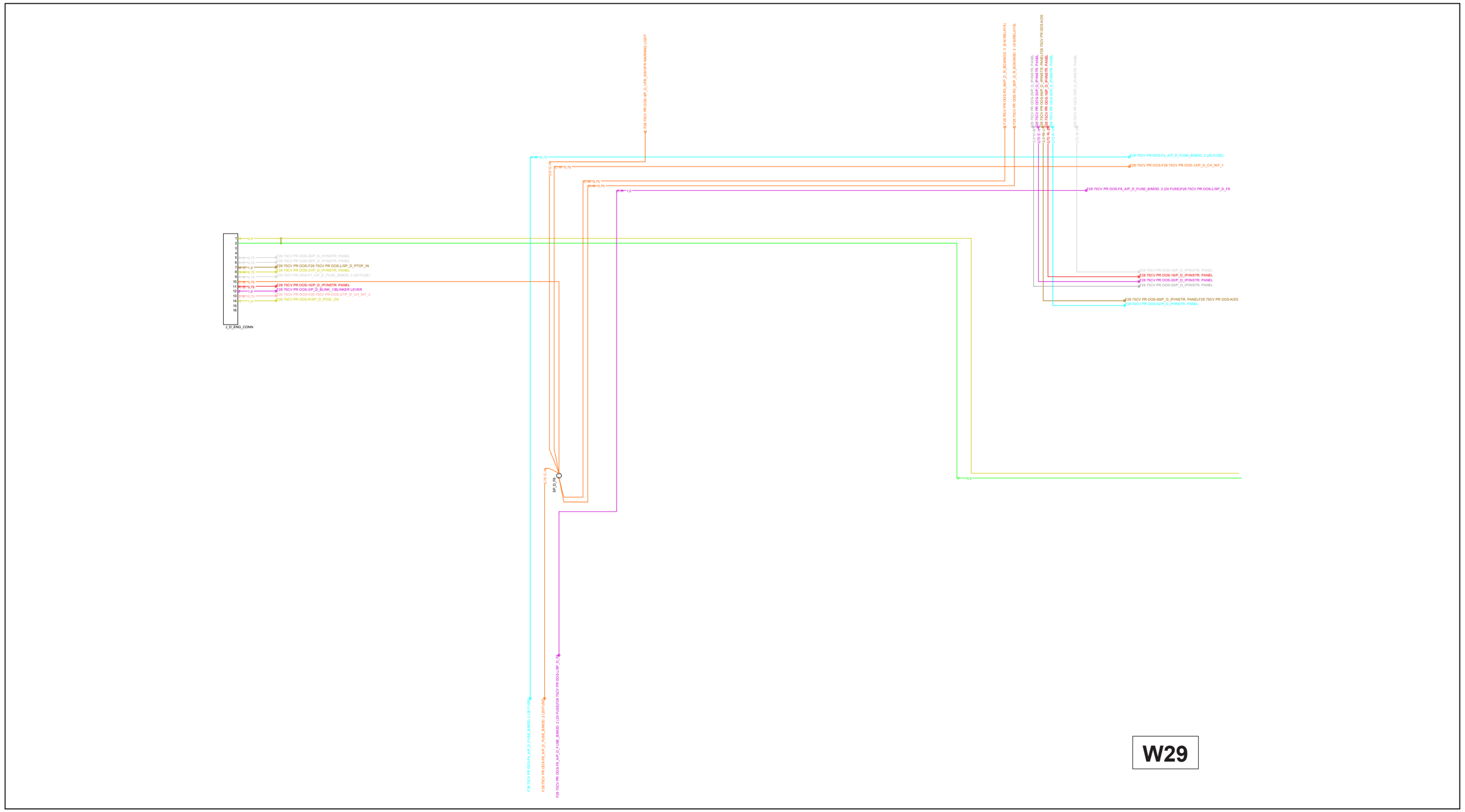
### 9.1.1.2.1 Schematic 1



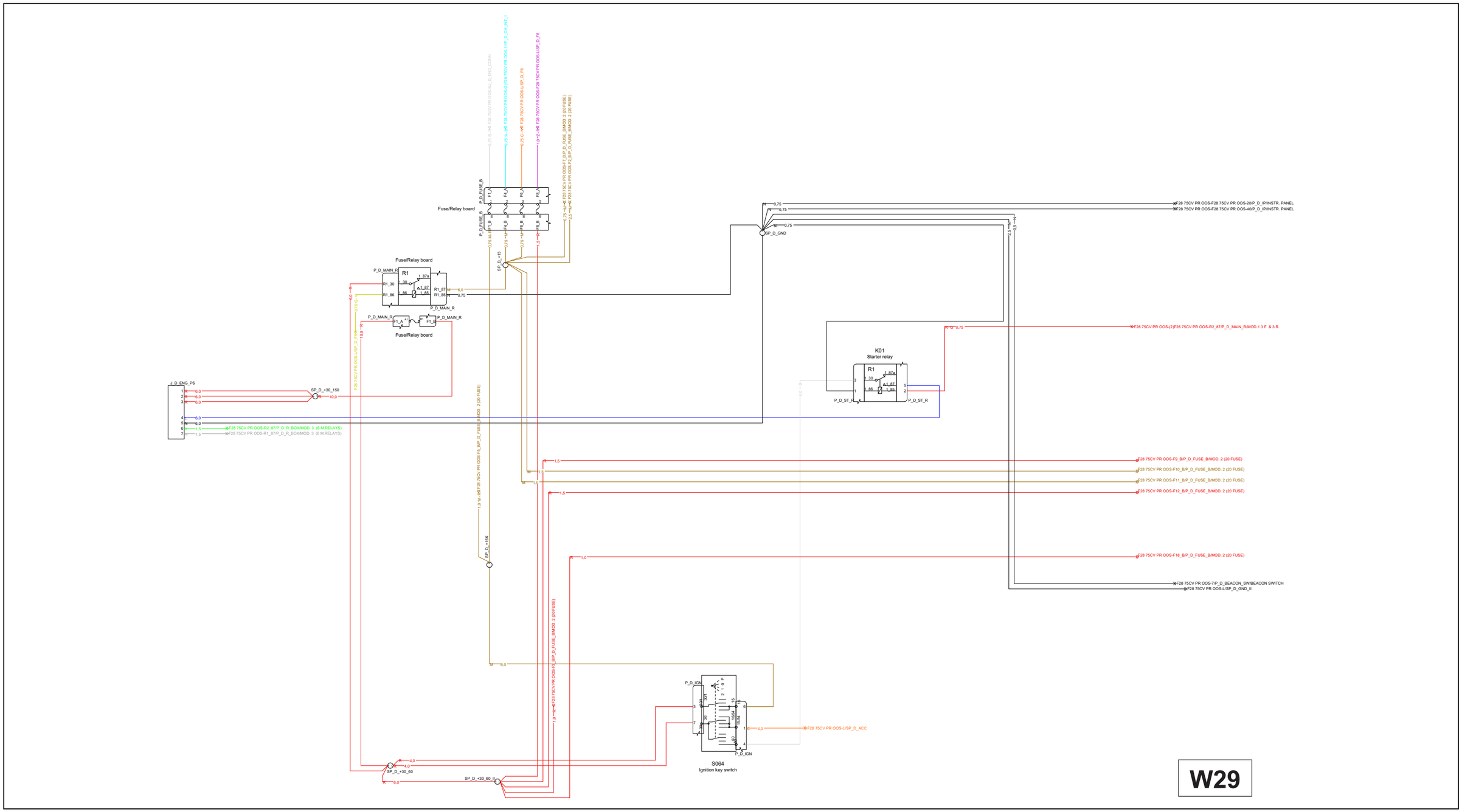
## 9.1.1.2.2 Schematic 2



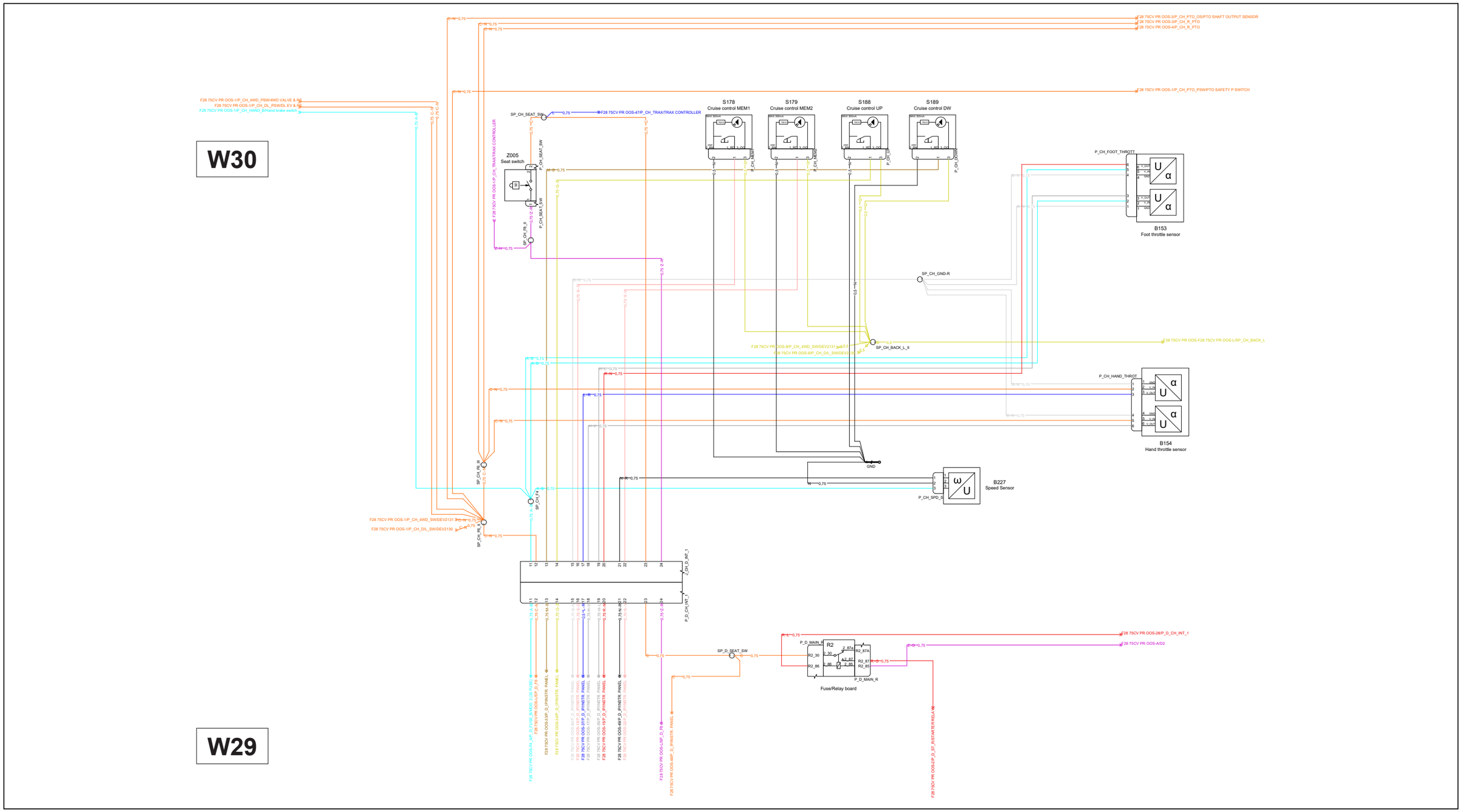
### 9.1.1.2.3 Schematic 3



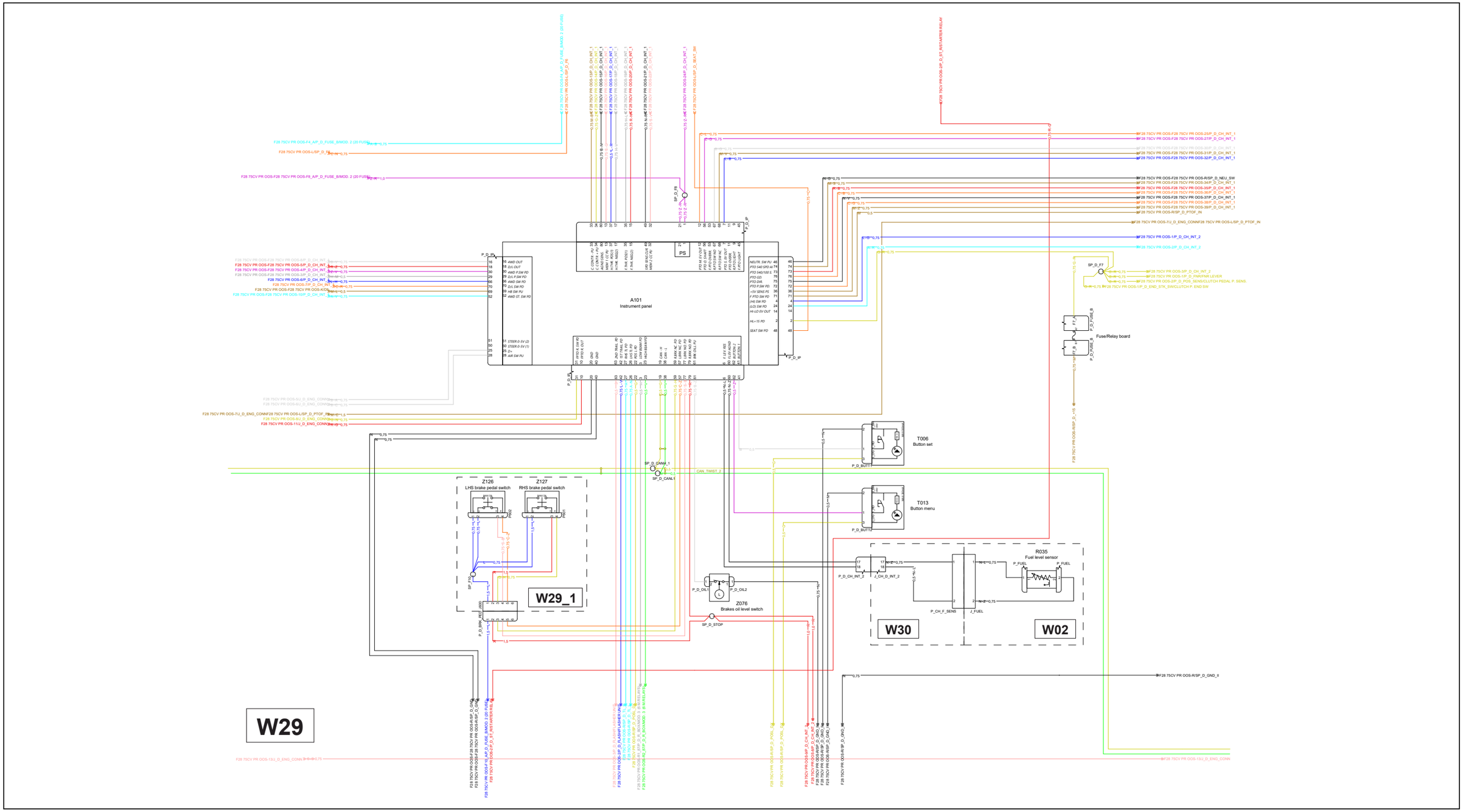
## 9.1.1.2.4 Schematic 4



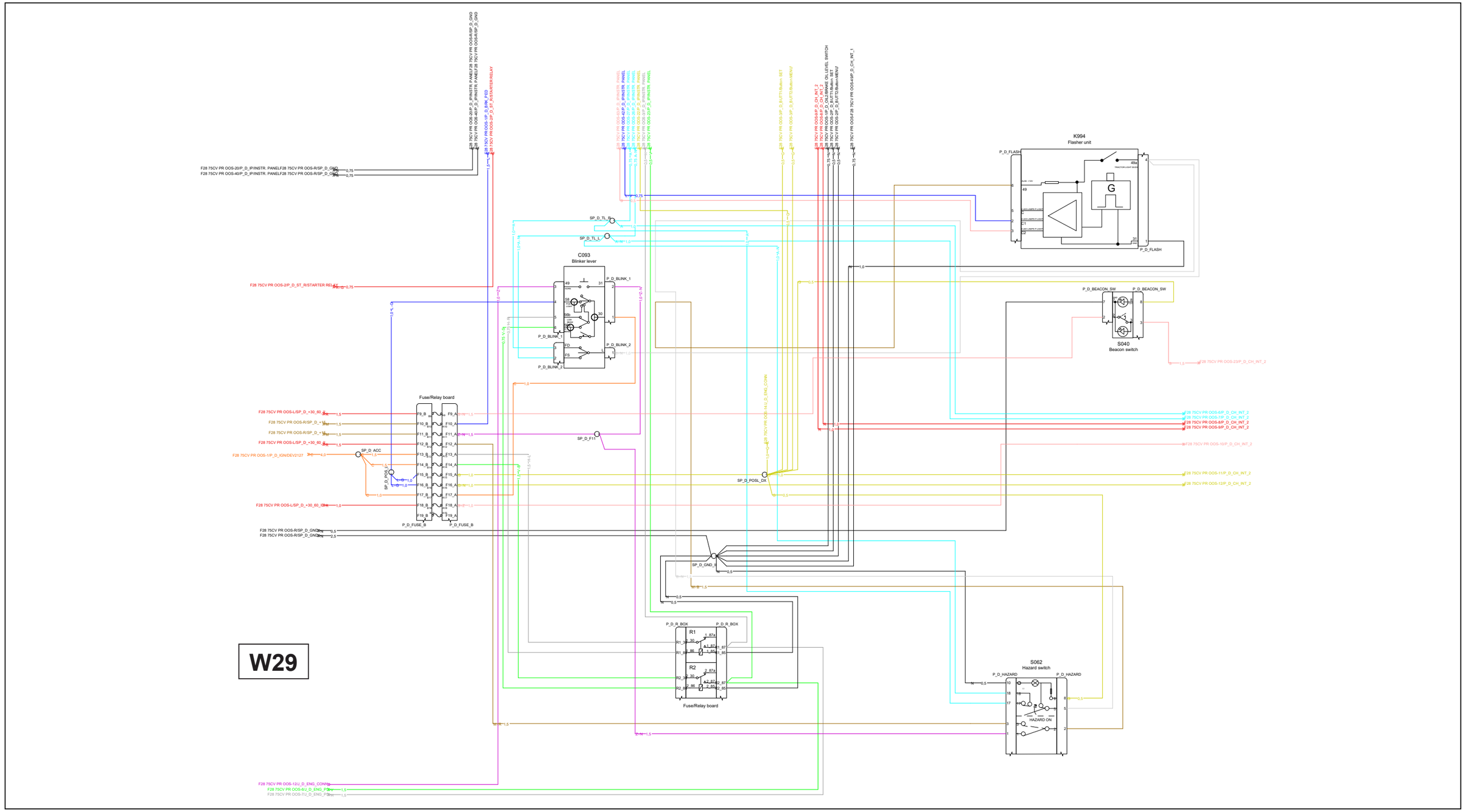
## 9.1.1.2.5 Schematic 5



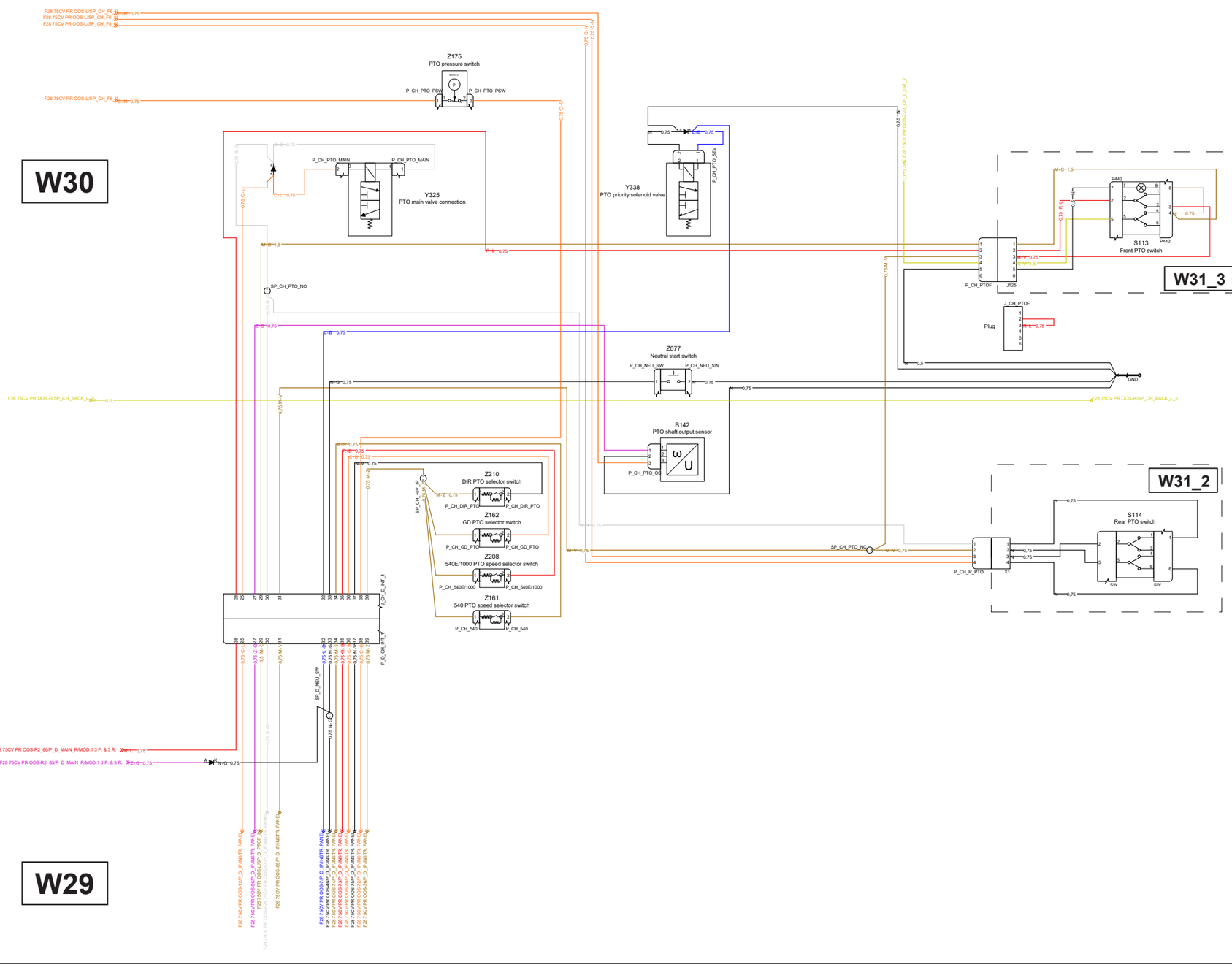
## 9.1.1.2.6 Schematic 6



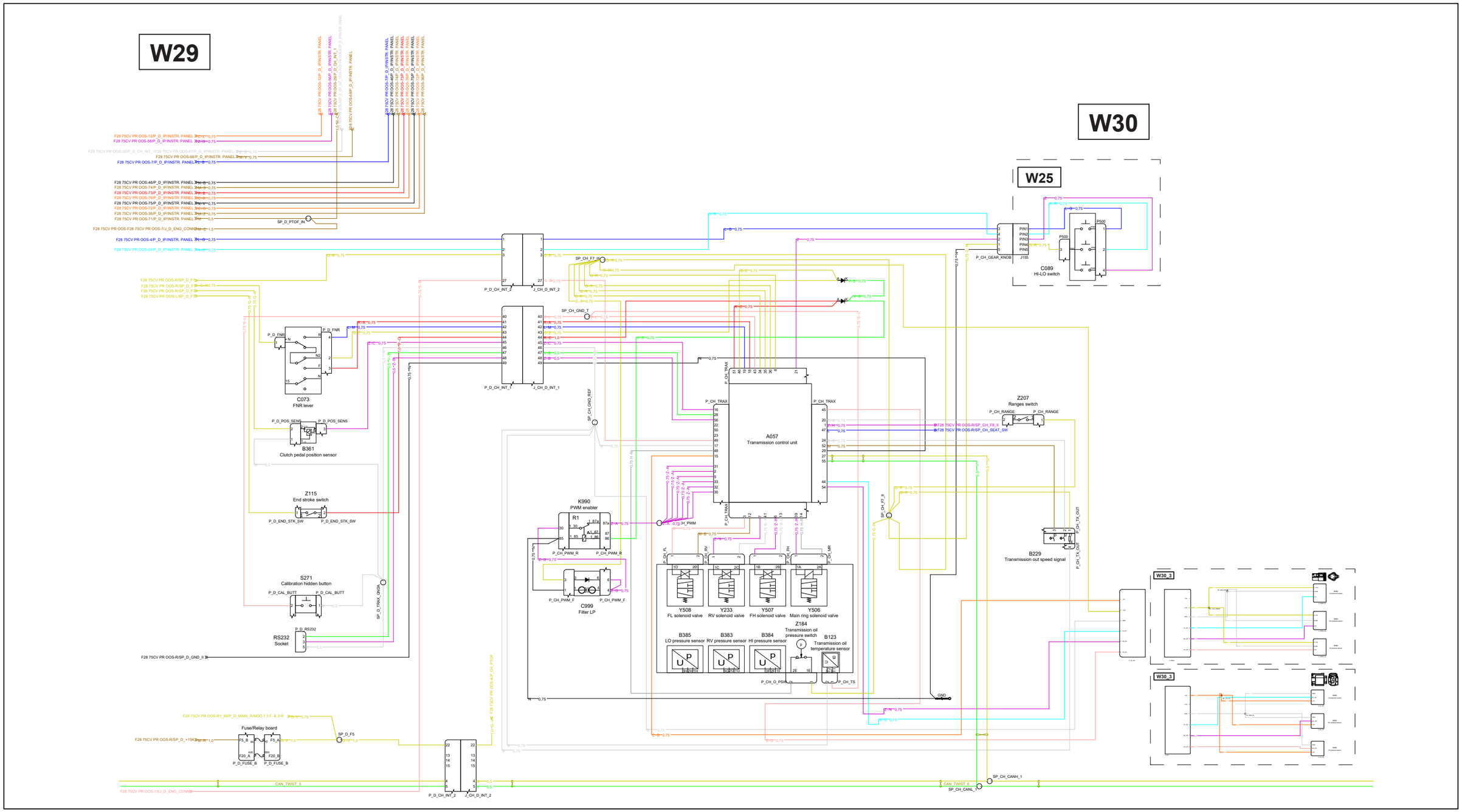
## 9.1.1.2.7 Schematic 7



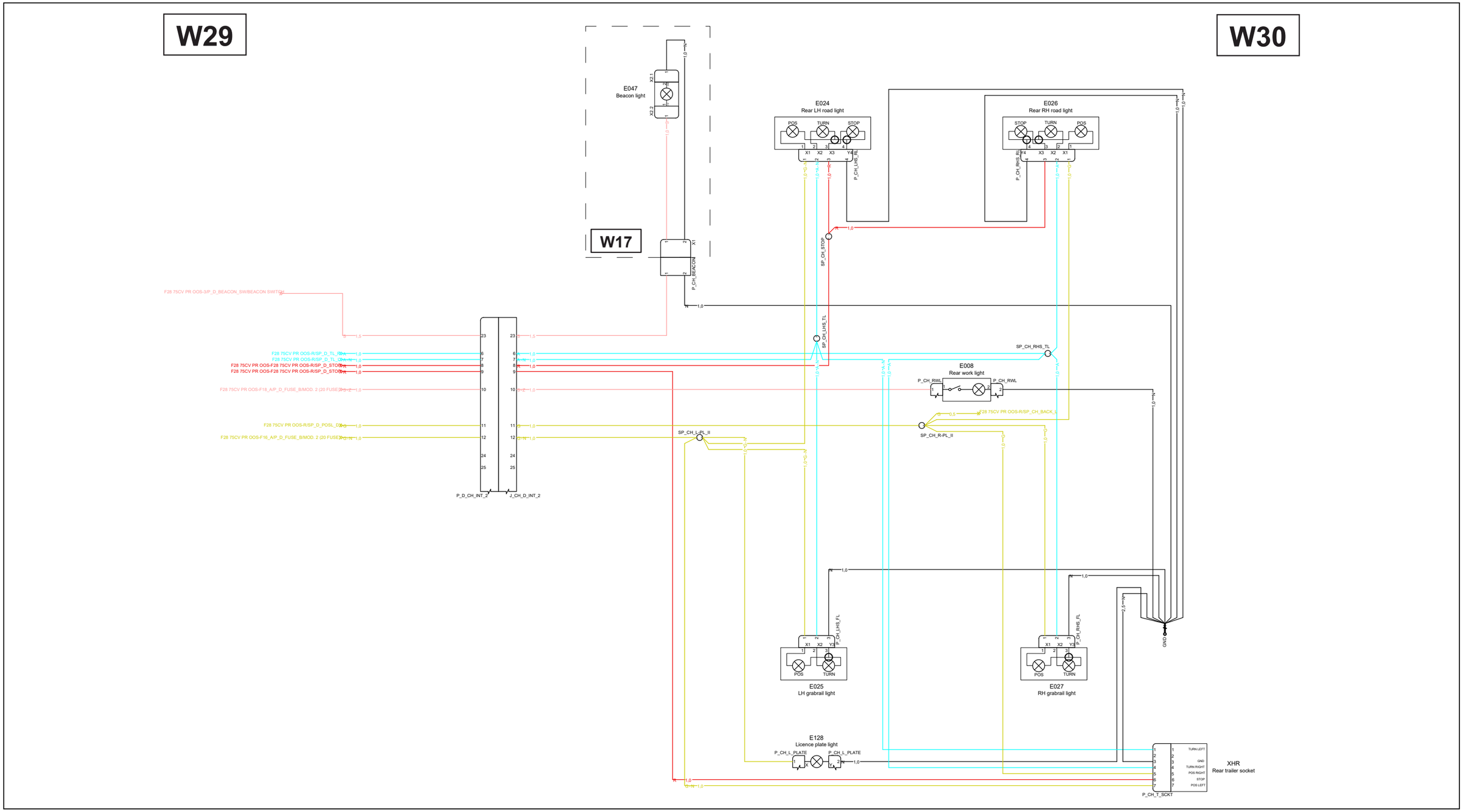
## 9.1.1.2.8 Schematic 8



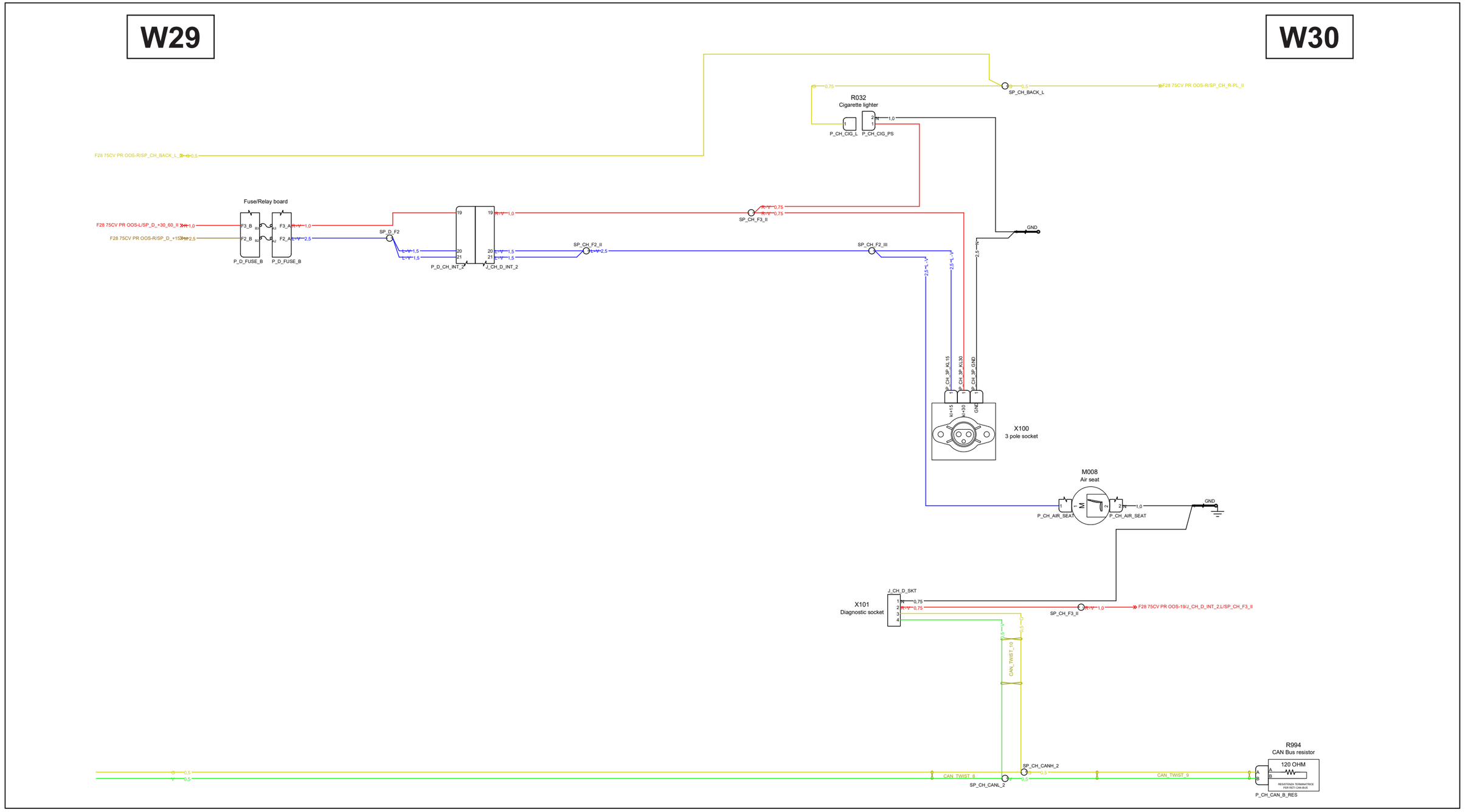
## 9.1.1.2.9 Schematic 9



## 9.1.1.2.10 Schematic 10



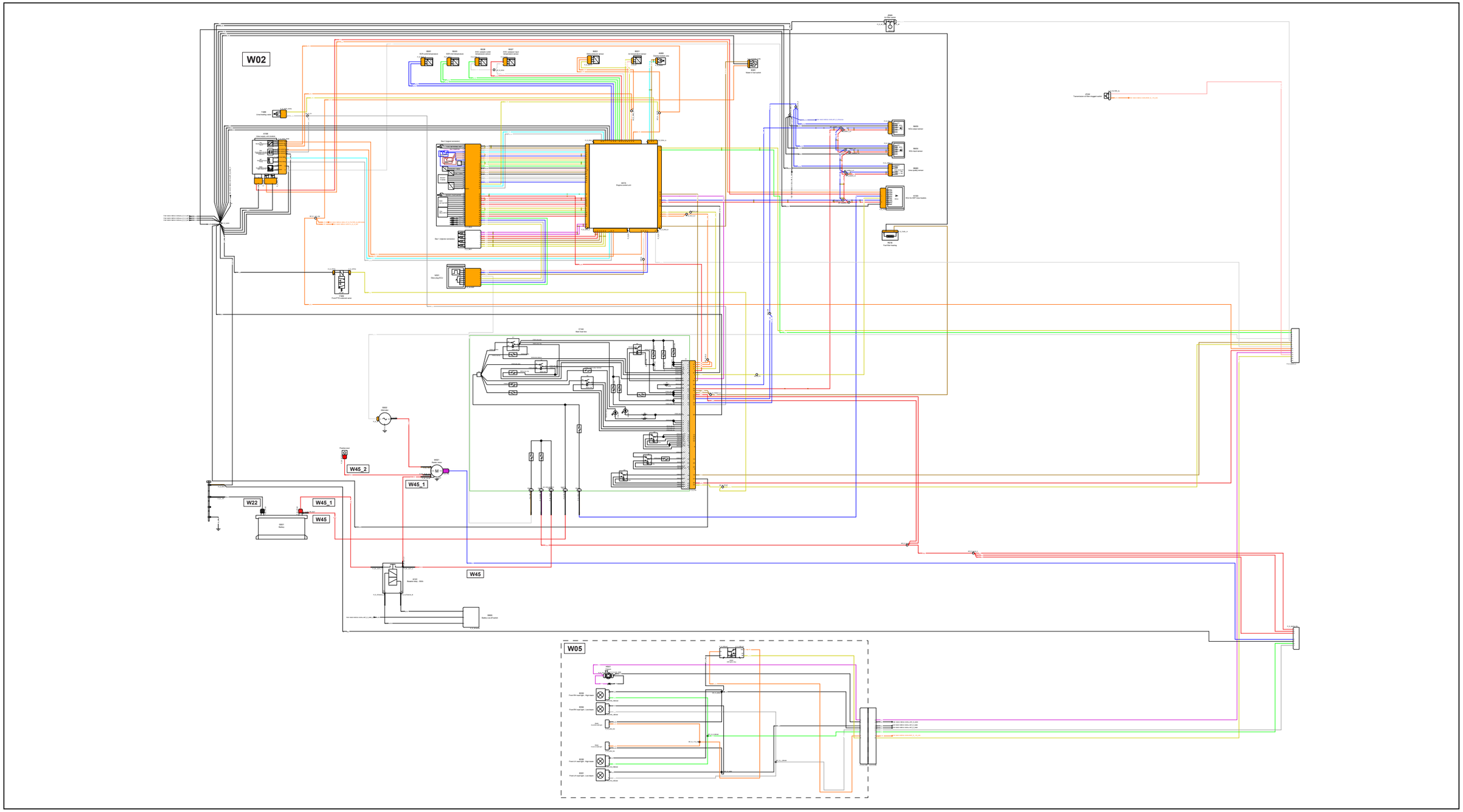
## 9.1.1.2.11 Schematic 11



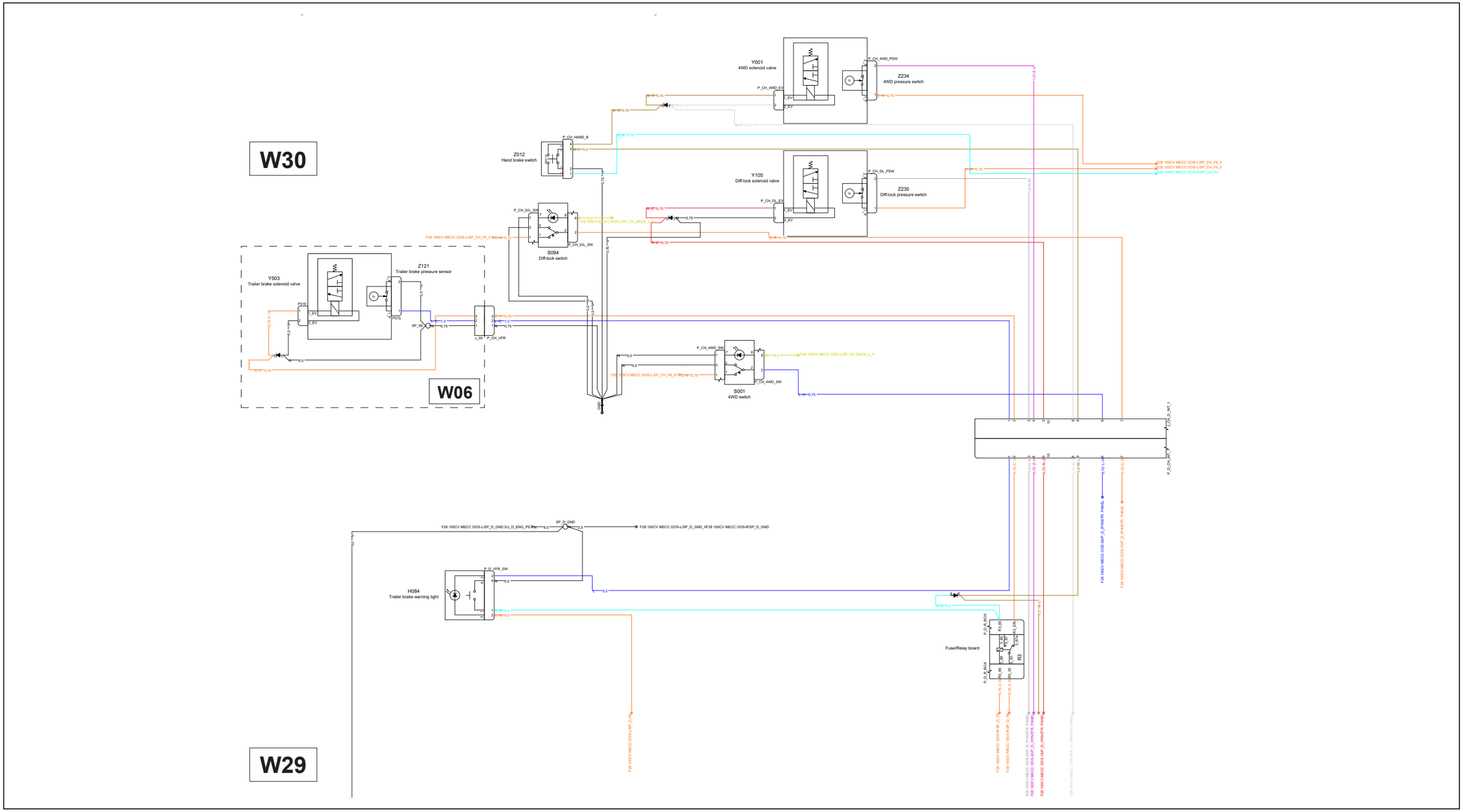
### 9.1.1.3 OOS Mechanical version 100HP

| Harness name | Harness description |
|---|---|
| W05 | BONNET F28 |
| W06 | VFR AUTO-SELECT |
| W12LH | HEADLIGHT EXTENSION |
| W12RH | HEADLIGHT EXTENSION |
| W14 | LICENSE PLATE EXTENSION |
| W17 | BEACON LIGHT EXTENSION |
| W22 | BATTERY NEGATIVE STV > 75 HP |
| W45_2 | JUMP START |
| W45_1 | BATTERY POSITIVE CABLE STV > 75 HP T100 EVO / CVT |
| W45 | POWER BOX SUPPLY CABLE STV > 75 HP |
| W25 | GEAR LEVER EXTENSION |
| W29 | DASHBOARD MECH |
| W29_1 | BRAKE PEDALS SWITCH EXTENSION (LHS & RHS ) |
| W30_3 | HUSCO PRESSURE SWITCH |
| W30_LH | WAGON MECH |
| W30_RH | WAGON MECH |
| W02_LH | ENGINE F28 > 75CV OOS |
| W02_RH | ENGINE F28 > 75CV OOS |
| W31_2 | REAR PTO SWITCH EXTENSION |
| W31_3 | FRONT PTO ADAPTER |
| W33_1 | PTO FRONT SOLENOID VALVE |
| W44 | DIAGNOSTIC SOCKET |

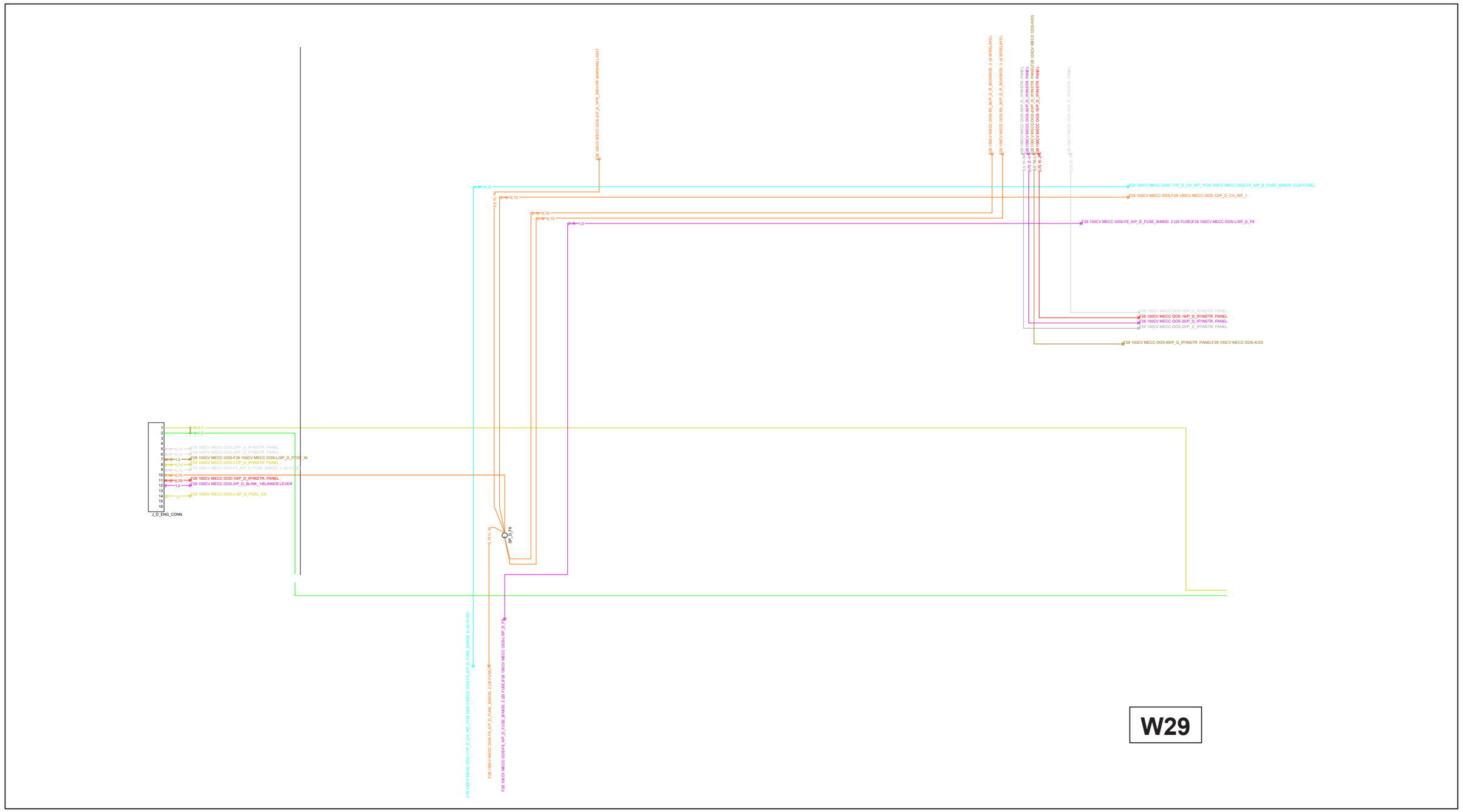
### 9.1.1.3.1 Schematic 1



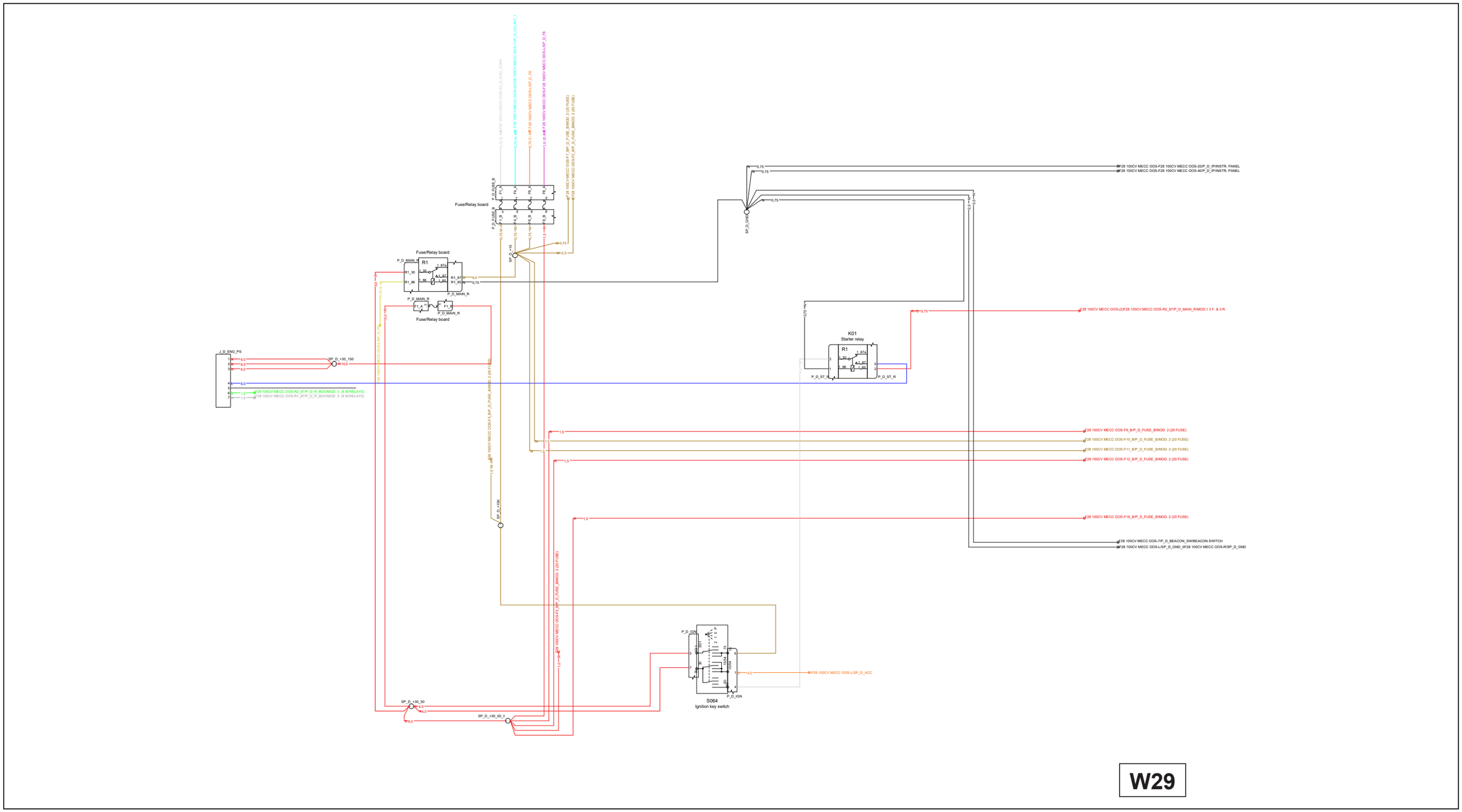
## 9.1.1.3.2 Schematic 2



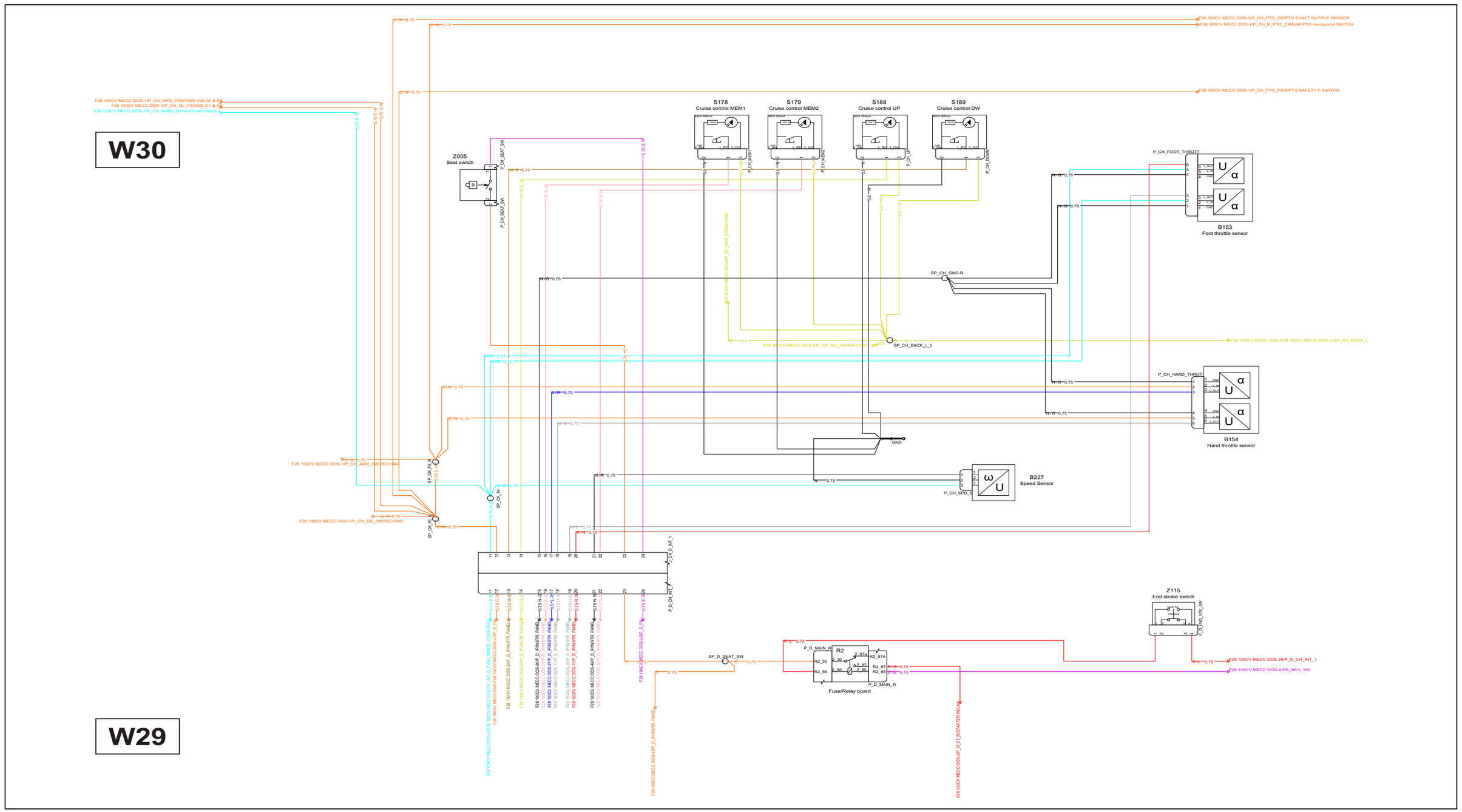
## 9.1.1.3.3 Schematic 3



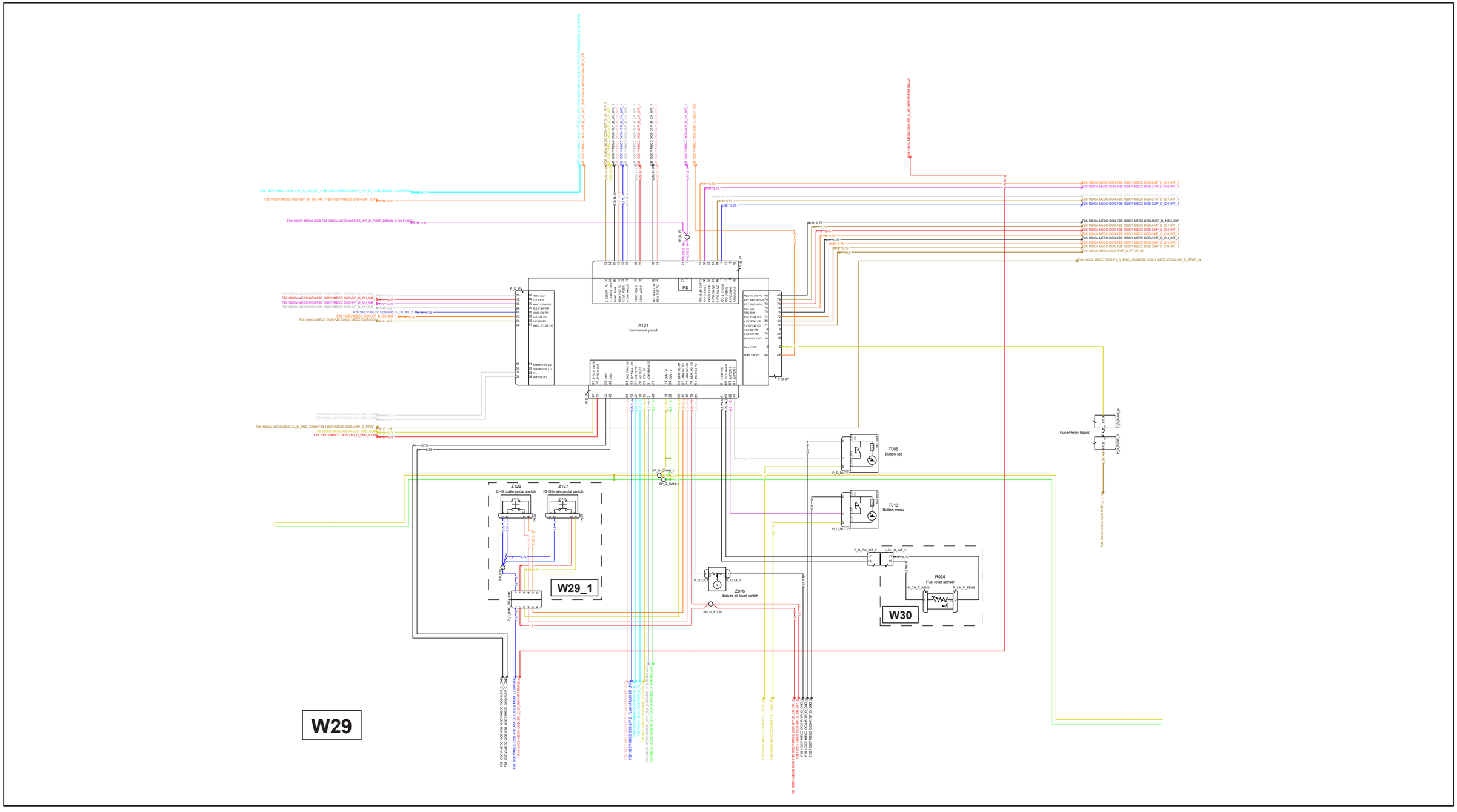
## 9.1.1.3.4 Schematic 4



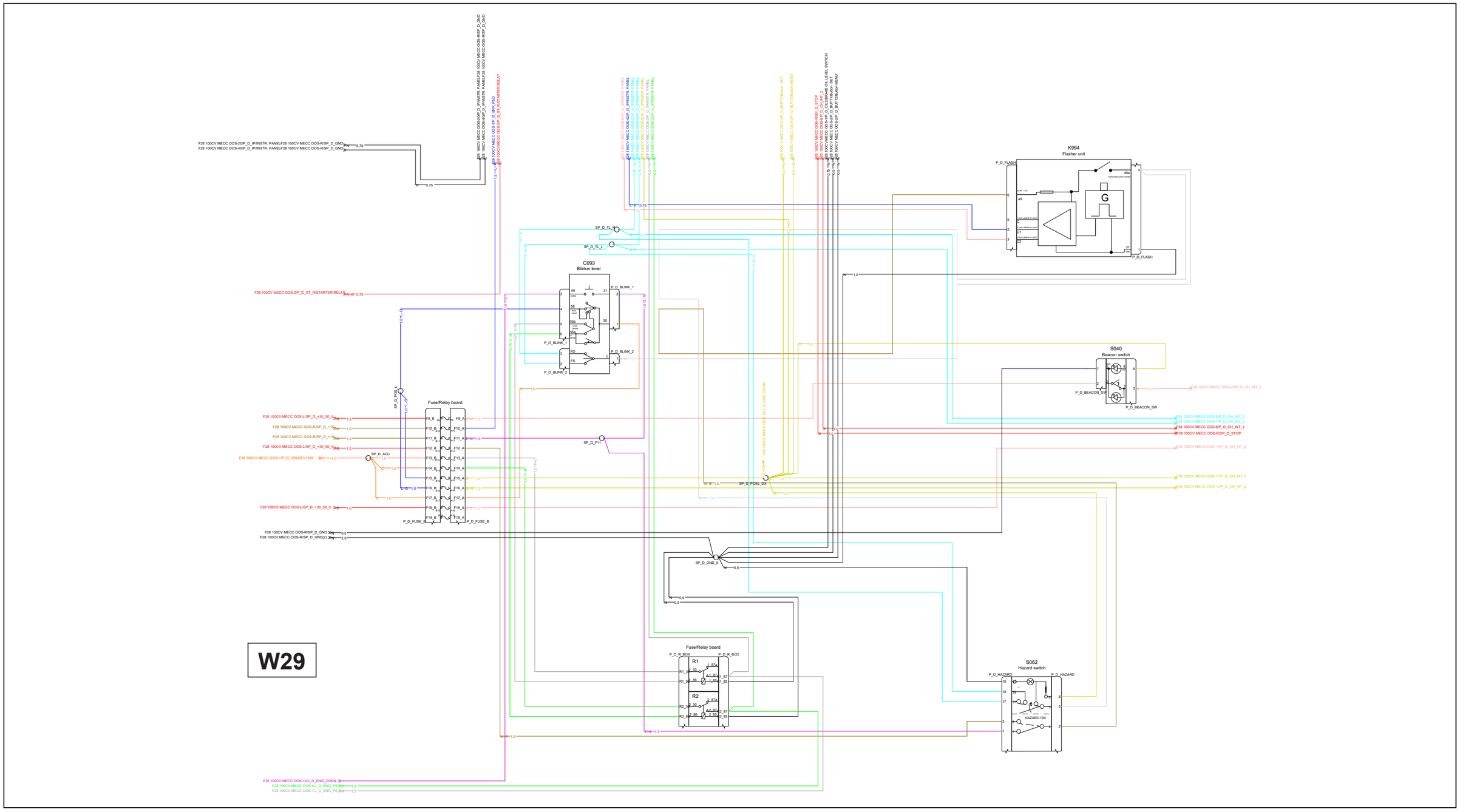
## 9.1.1.3.5 Schematic 5



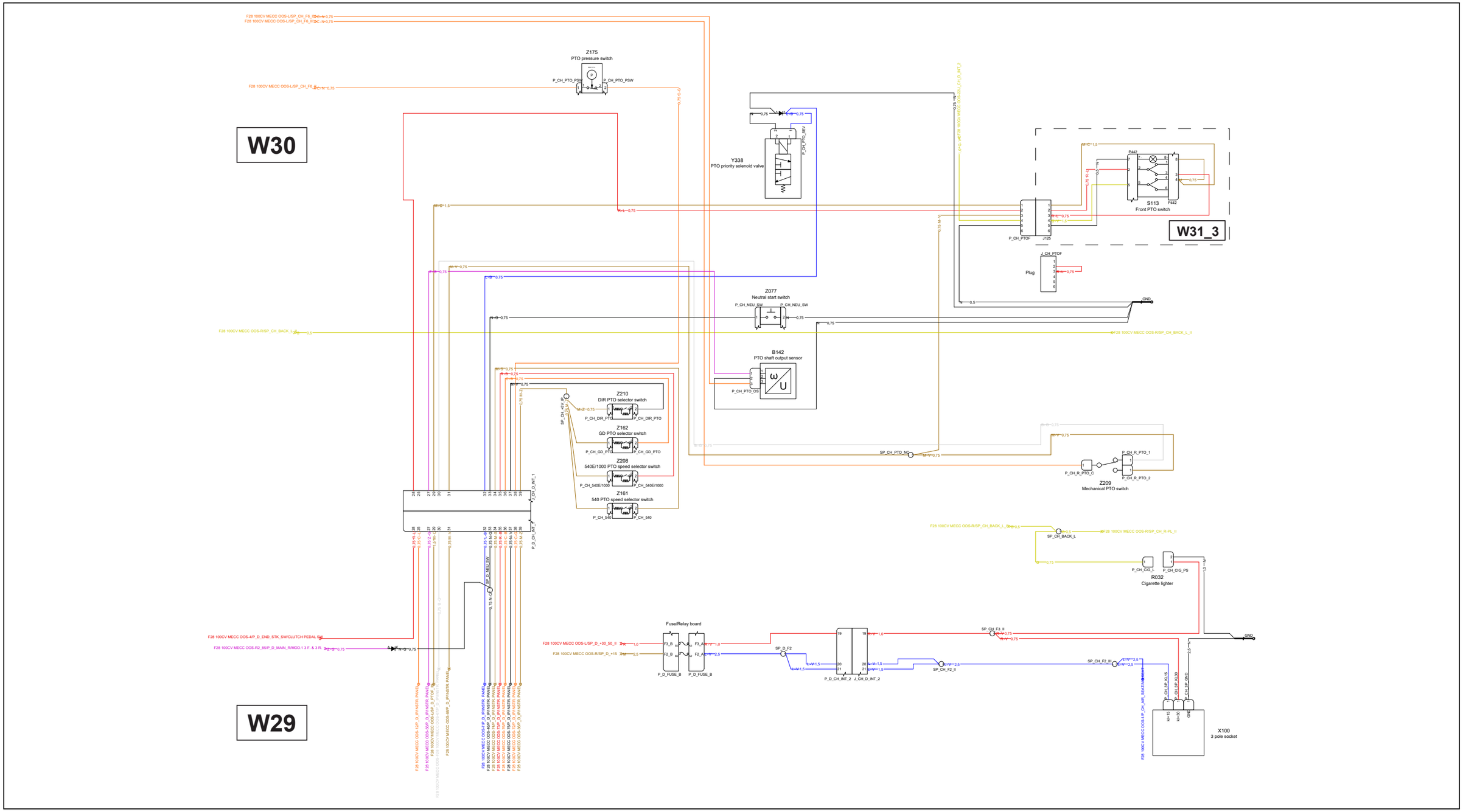
## 9.1.1.3.6 Schematic 6



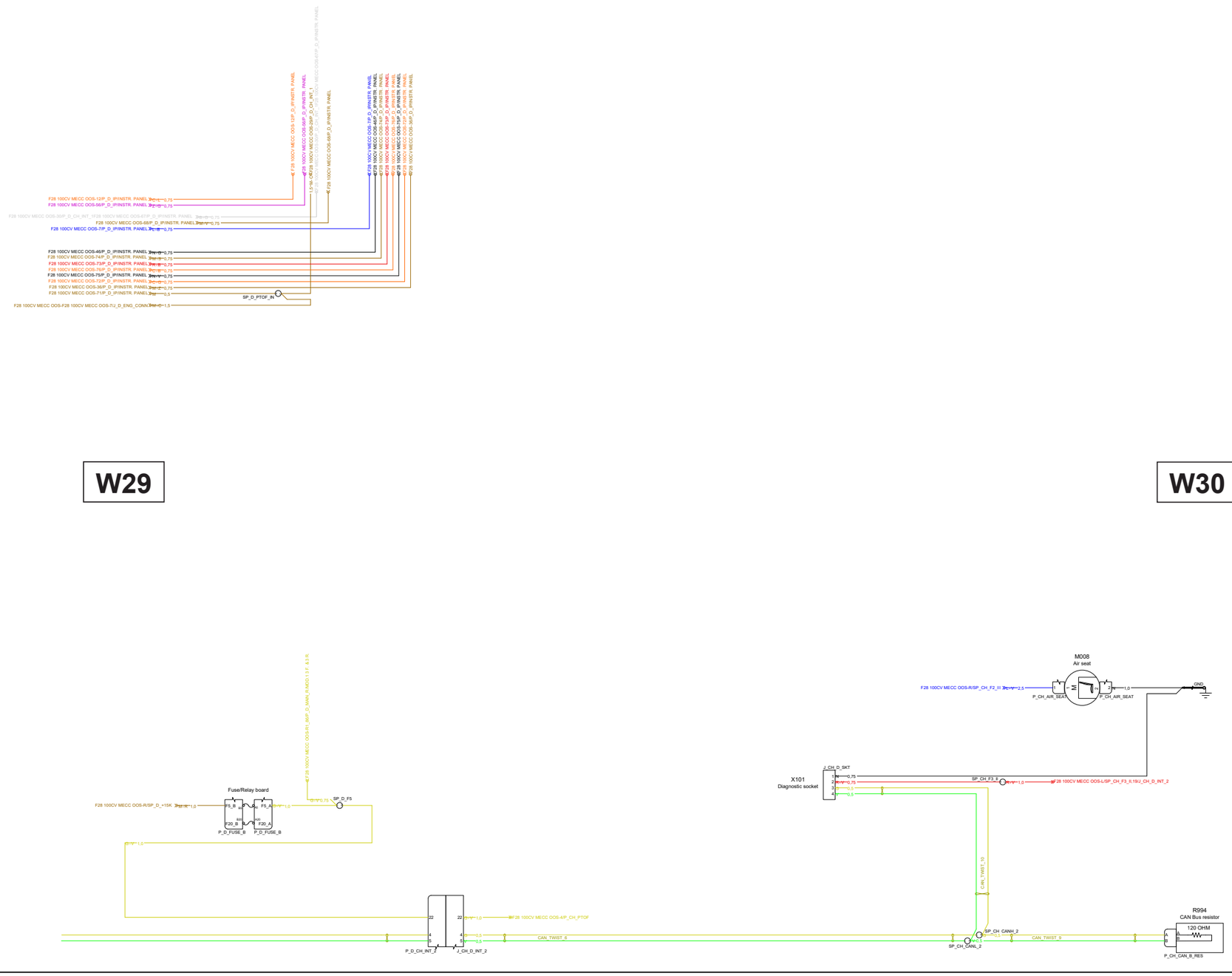
## 9.1.1.3.7 Schematic 7

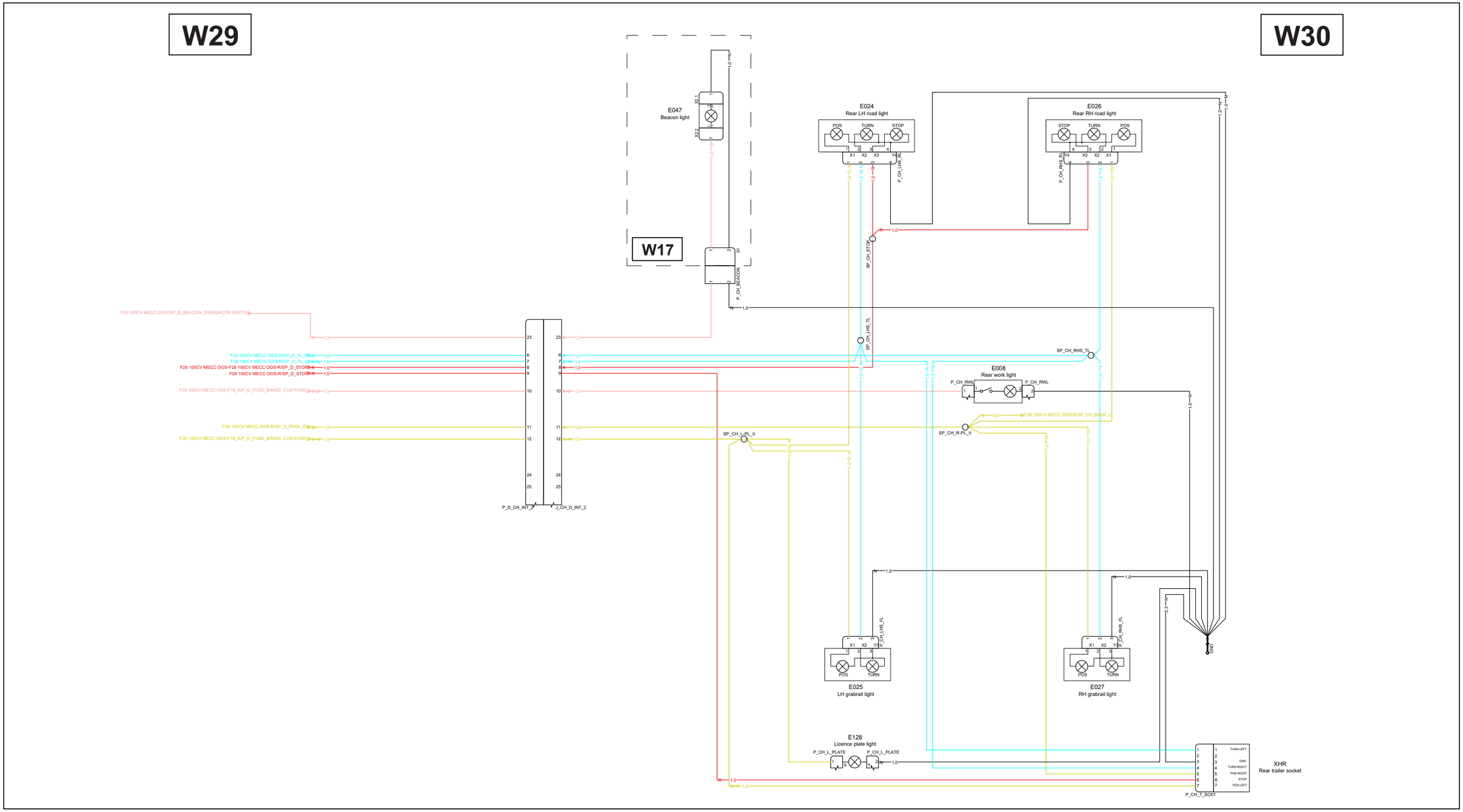


## 9.1.1.3.8 Schematic 8



### 9.1.1.3.9 Schematic 9

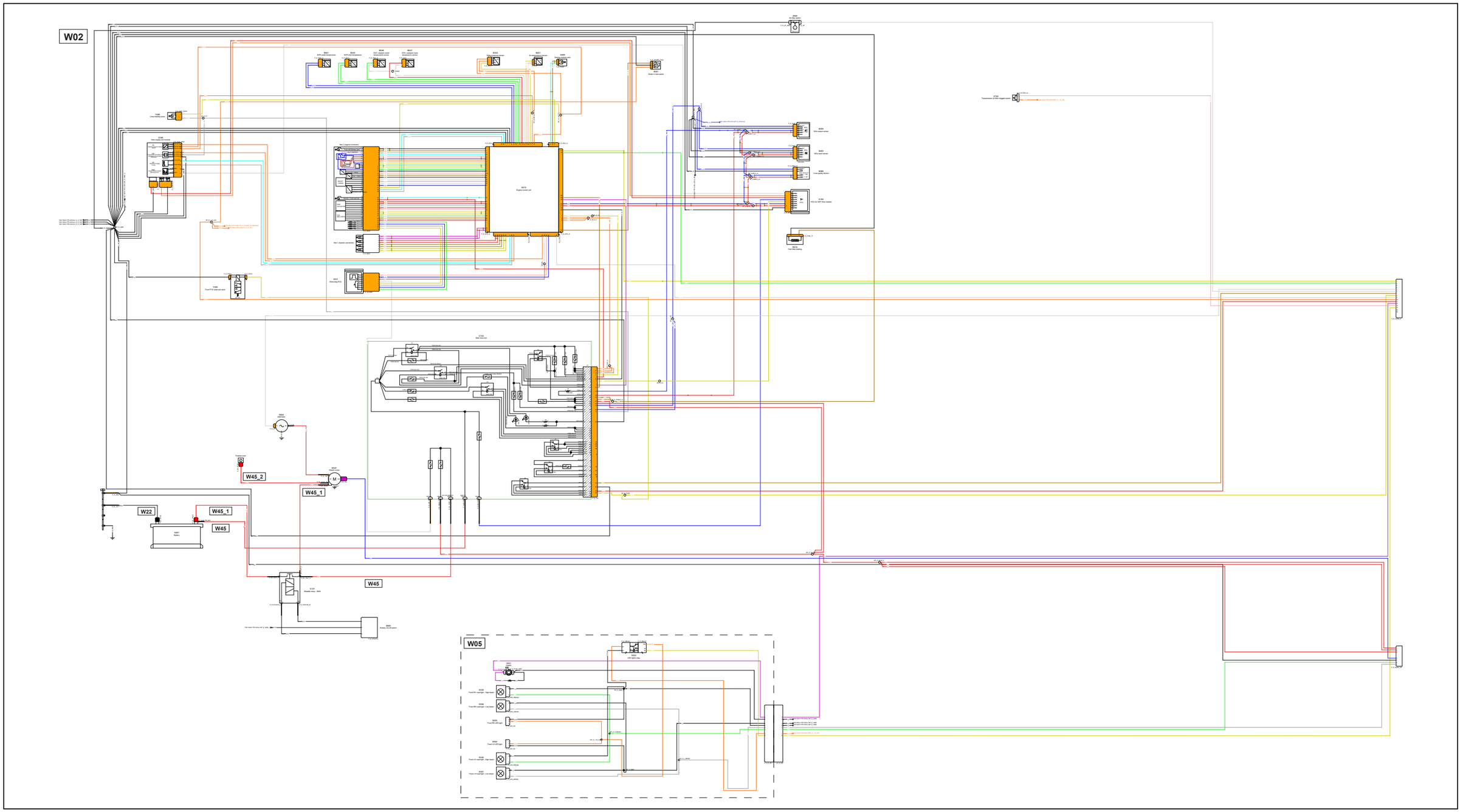



W29
W30
W17
E047
Beacon light
X2.1
X2.2
P_CH_BEACON
E024
Rear LH road light
POS
TURN
STOP
P_CH_LHS_RL
E026
Rear RH road light
P_CH_RHS_RL
SP_CH_STOP
SP_CH_LHS_TL
SP_CH_RHS_TL
E008
Rear work light
P_CH_RWL
SP_CH_L-PL_II
SP_CH_R-PL_II
F28 100CV MECC OOS-R/SP_CH_BACK_L
F28 100CV MECC OOS-3/P_D_BEACON_SW/BEACON SWITCH
F28 100CV MECC OOS-R/SP_D_TL_R
F28 100CV MECC OOS-R/SP_D_TL_L
F28 100CV MECC OOS-F28 100CV MECC OOS-R/SP_D_STOP
F28 100CV MECC OOS-R/SP_D_STOP
F28 100CV MECC OOS-F18_A/P_D_FUSE_B/MOD. 2 (20 FUSE)
F28 100CV MECC OOS-R/SP_D_POSL_D
F28 100CV MECC OOS-F16_A/P_D_FUSE_B/MOD. 2 (20 FUSE)
P_D_CH_INT_2
J_CH_D_INT_2
E025
LH grabrail light
P_CH_LHS_FL
E027
RH grabrail light
P_CH_RHS_FL
GND
E128
Licence plate light
P_CH_L_PLATE
XHR
Rear trailer socket
P_CH_T_SCKT
TURN LEFT
GND
TURN RIGHT
POS RIGHT
STOP
POS LEFT

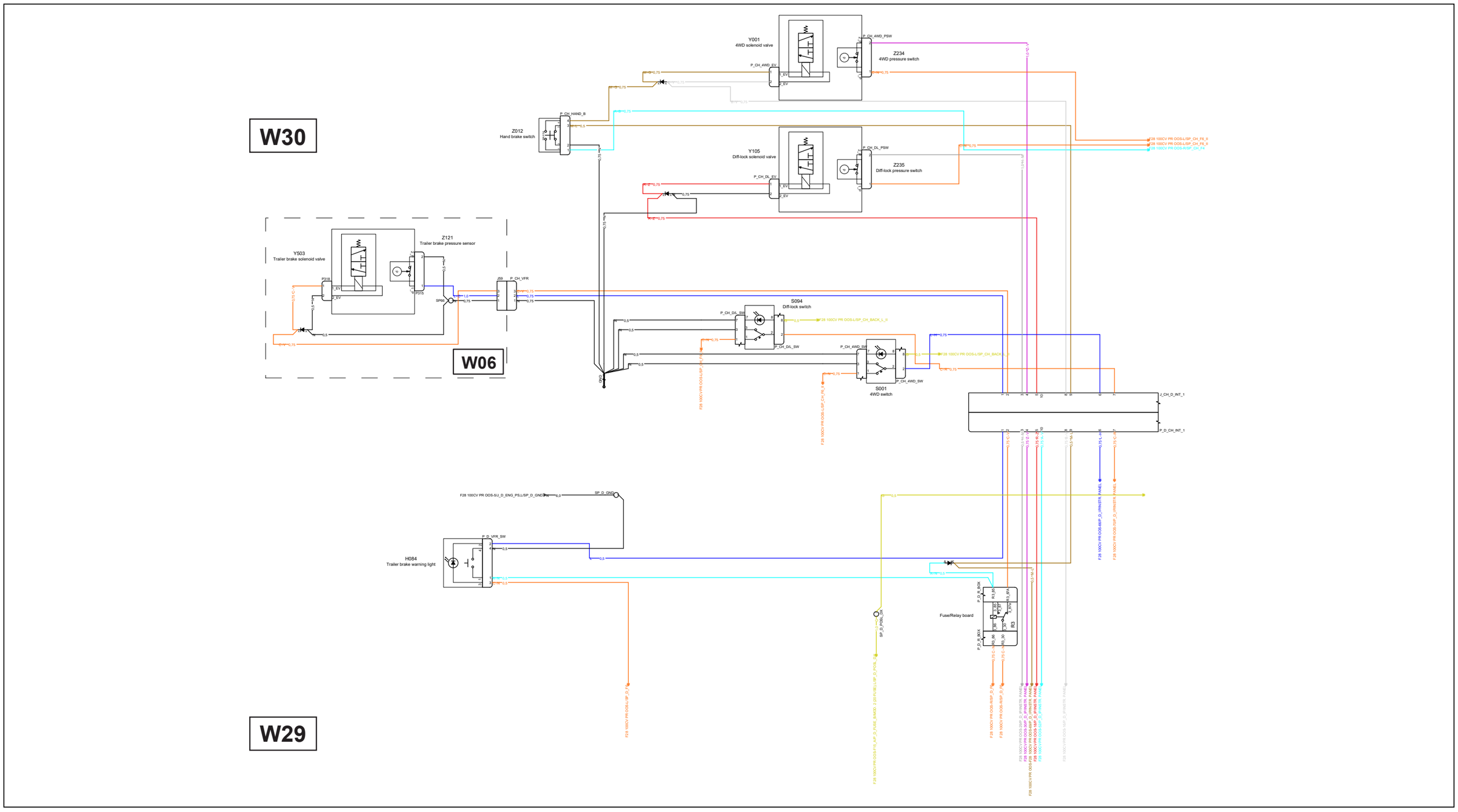
### 9.1.1.4 Power Reverser version 100HP

| Harness name | Harness description |
|---|---|
| W05 | BONNET F28 |
| W06 | VFR AUTO-SELECT |
| W12LH | HEADLIGHT EXTENSION |
| W12RH | HEADLIGHT EXTENSION |
| W14 | LICENSE PLATE EXTENSION |
| W17 | BEACON LIGHT EXTENSION |
| W22 | BATTERY NEGATIVE STV > 75 HP |
| W45_2 | JUMP START |
| W45_1 | BATTERY POSITIVE CABLE STV > 75 HP T100 EVO / CVT |
| W45 | POWER BOX SUPPLY CABLE STV > 75 HP |
| W25 | GEAR LEVER EXTENSION |
| W29 | DASHBOARD PR |
| W29_1 | BRAKE PEDALS SWITCH EXTENSION (LHS & RHS ) |
| W30_3 | HUSCO PRESSURE SWITCH |
| W30_LH | WAGON PR |
| W30_RH | WAGON PR |
| W02_LH | ENGINE F28 > 75CV OOS |
| W02_RH | ENGINE F28 > 75CV OOS |
| W31_2 | REAR PTO SWITCH EXTENSION |
| W31_3 | FRONT PTO ADAPTER |
| W33_1 | PTO FRONT SOLENOID VALVE |
| W44 | DIAGNOSTIC SOCKET |

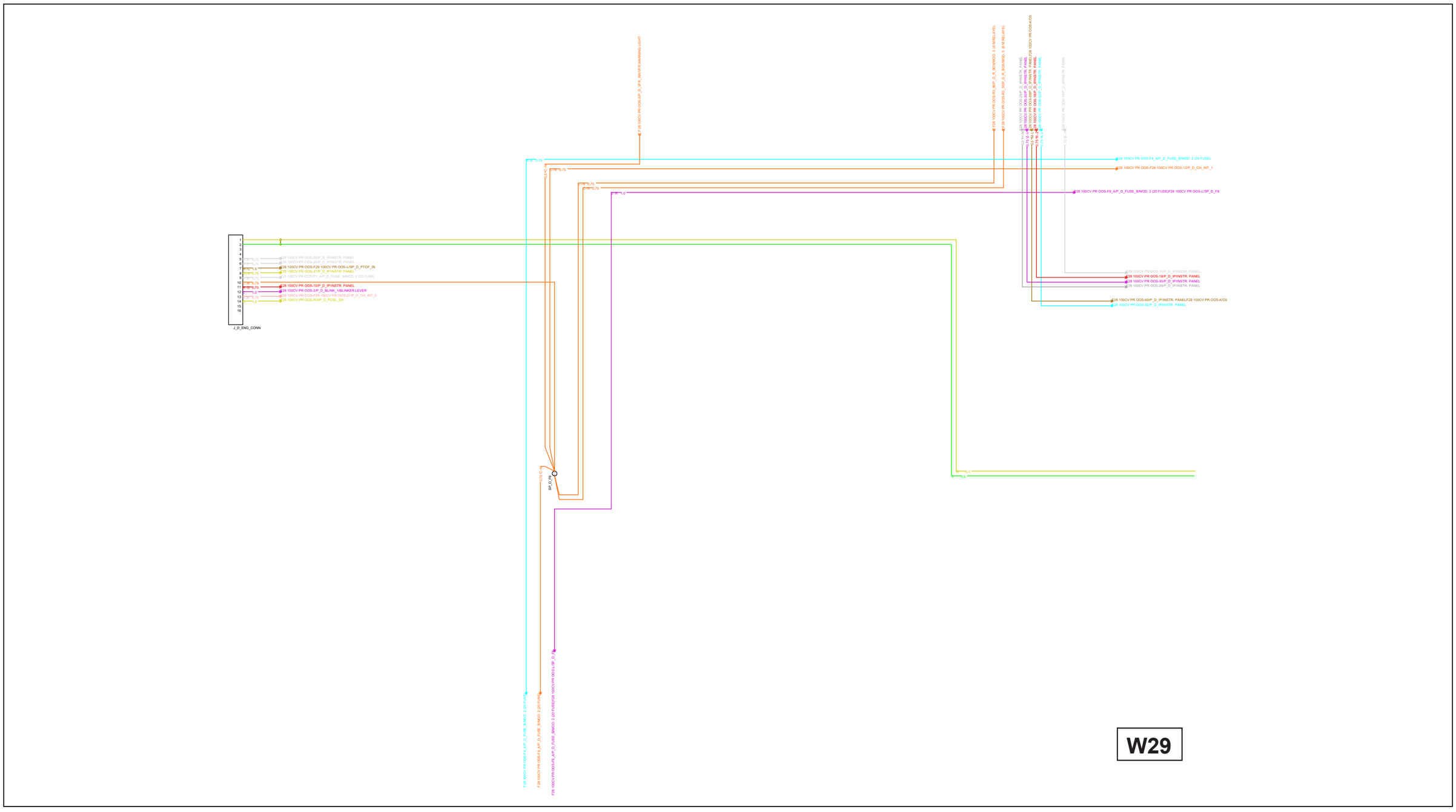
### 9.1.1.4.1 Schematic 1



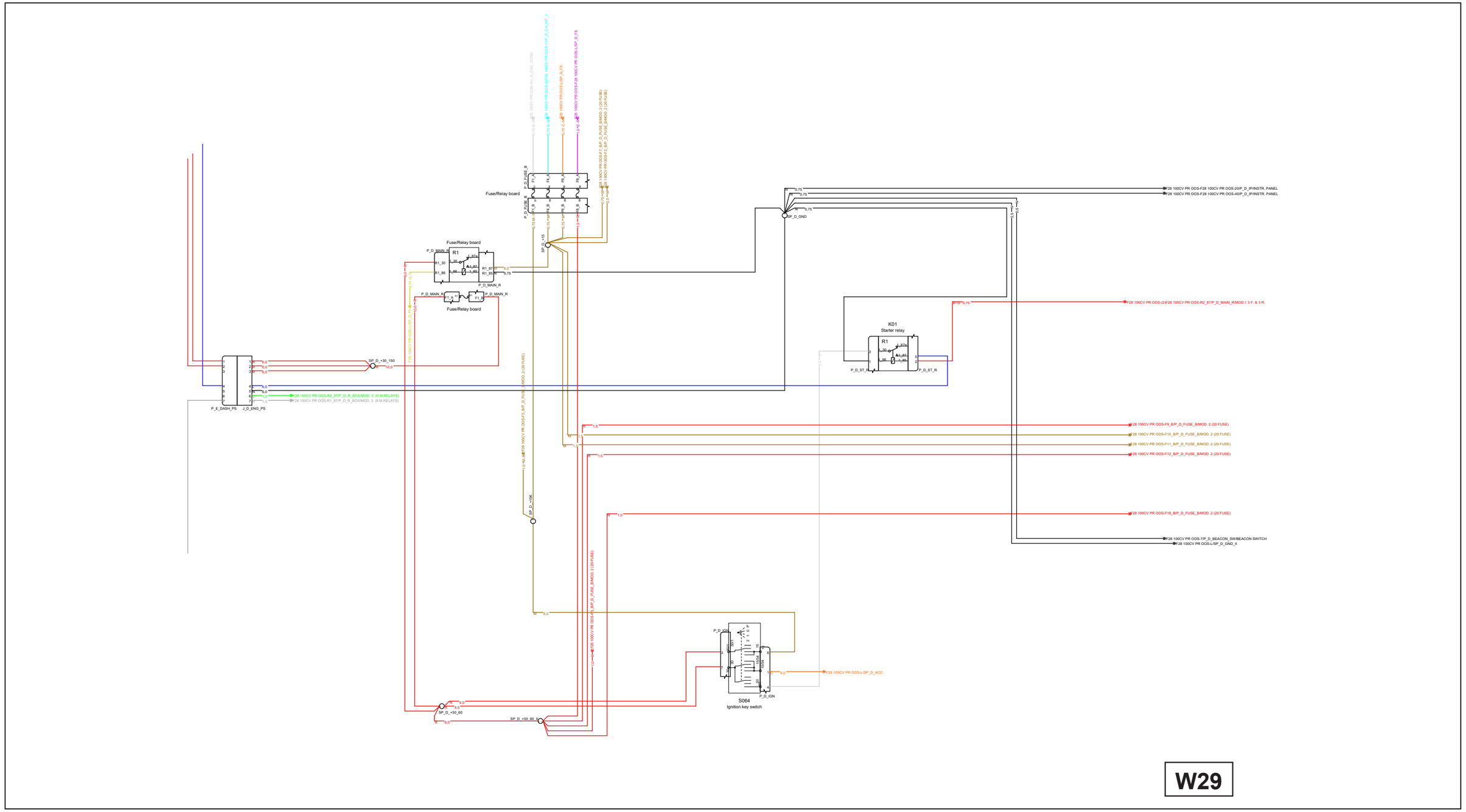
## 9.1.1.4.2 Schematic 2


W30
W06
W29
Y001
4WD solenoid valve
Z234
4WD pressure switch
P_CH_4WD_PSW
P_CH_4WD_EV
Z012
Hand brake switch
P_CH_HAND_B
Y105
Diff-lock solenoid valve
Z235
Diff-lock pressure switch
P_CH_DL_PSW
P_CH_DL_EV
Y503
Trailer brake solenoid valve
Z121
Trailer brake pressure sensor
P318
P315
SP06
J59
P_CH_VFR
S094
Diff-lock switch
P_CH_DL_SW
S001
4WD switch
P_CH_4WD_SW
J_CH_D_INT_1
P_D_CH_INT_1
SP_D_GND
P_D_VFR_SW
H084
Trailer brake warning light
F28 100CV PR OOS-5/U_D_ENG_PS/L/SP_D_GND
F28 100CV PR OOS-L/SP_CH_F6_II
F28 100CV PR OOS-L/SP_CH_F8_II
F28 100CV PR OOS-R/SP_CH_F4
F28 100CV PR OOS-L/SP_CH_BACK_L_II
F28 100CV PR OOS-L/SP_CH_BACK_L_II
F28 100CV PR OOS-L/SP_CH_F8_II
F28 100CV PR OOS-L/SP_CH_F6_II
F28 100CV PR OOS-5/U_D_ENG_PS/L/SP_D_PCHL_DA
F28 100CV PR OOS-5/P15_A/P_D_FUSE_E/MOD_2 (CP)/CYBELL/SP_D_PCHL_DA
F28 100CV PR OOS-R/SP_D_FUSE_E/MOD_2 (CP)/CYBELL/SP_D_PCHL_DA
F28 100CV PR OOS-R/SP_D_FUSE_E/MOD_2 (CP)/CYBELL/SP_D_PCHL_DA
F28 100CV PR OOS-L

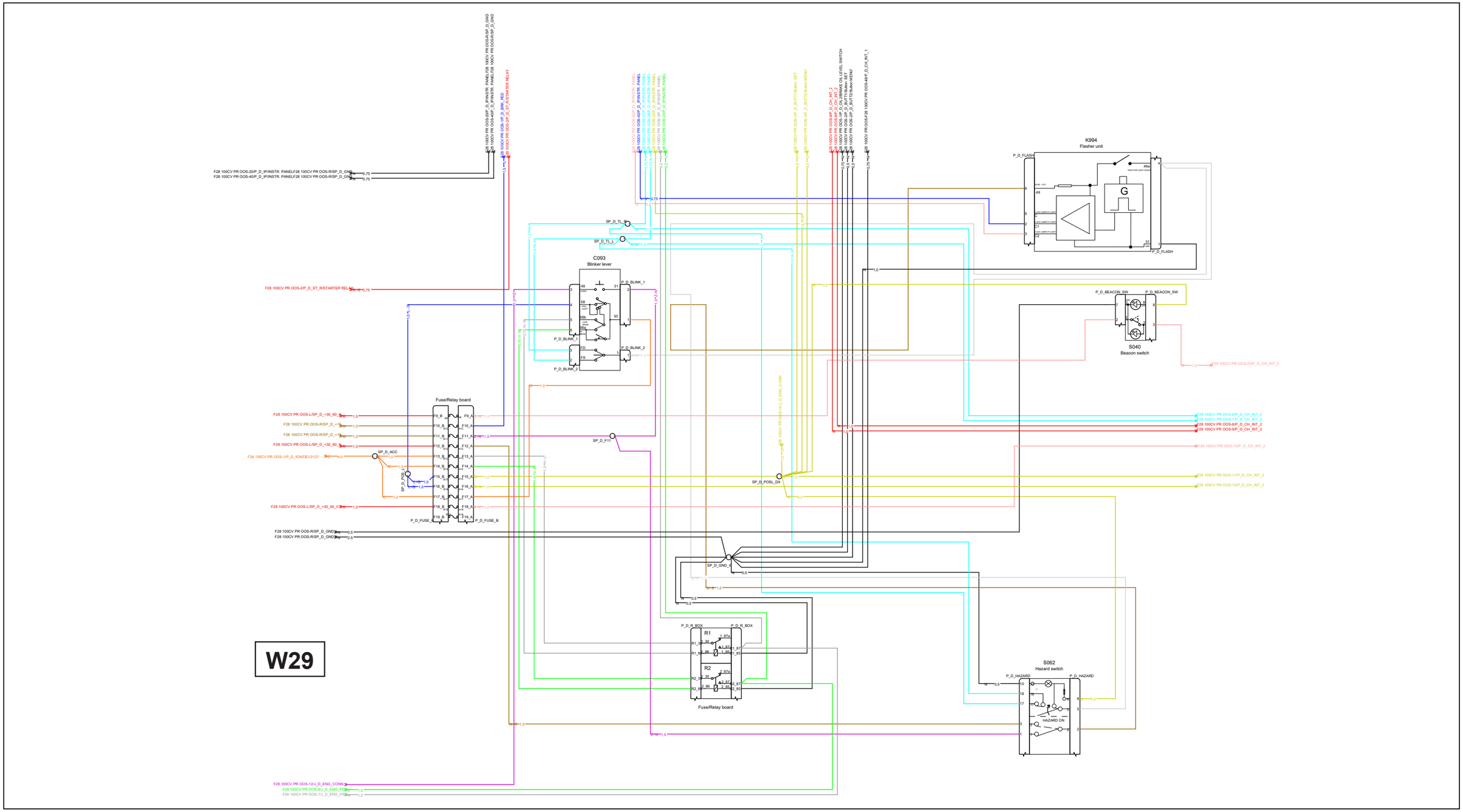
## 9.1.1.4.3 Schematic 3



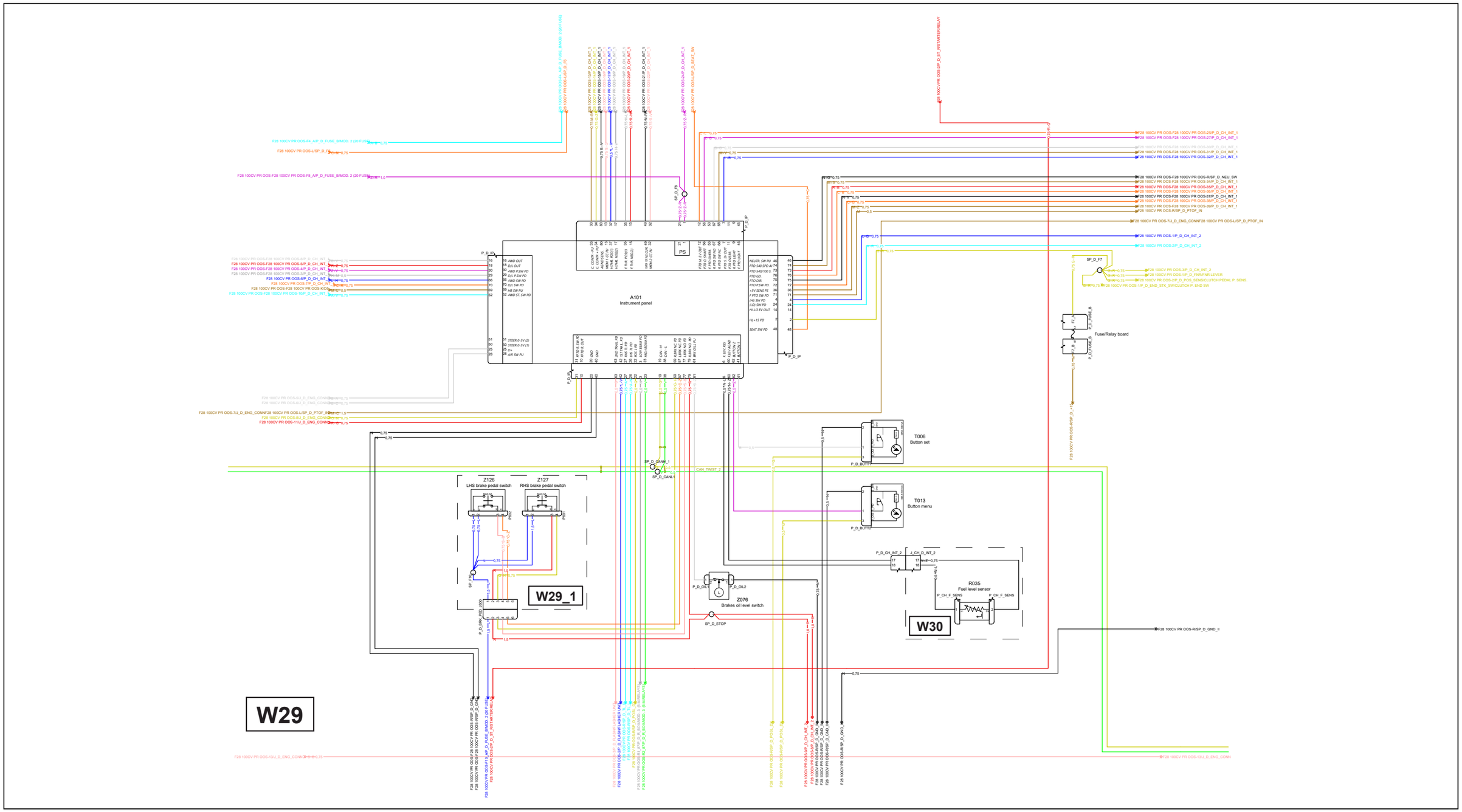
## 9.1.1.4.4 Schematic 4



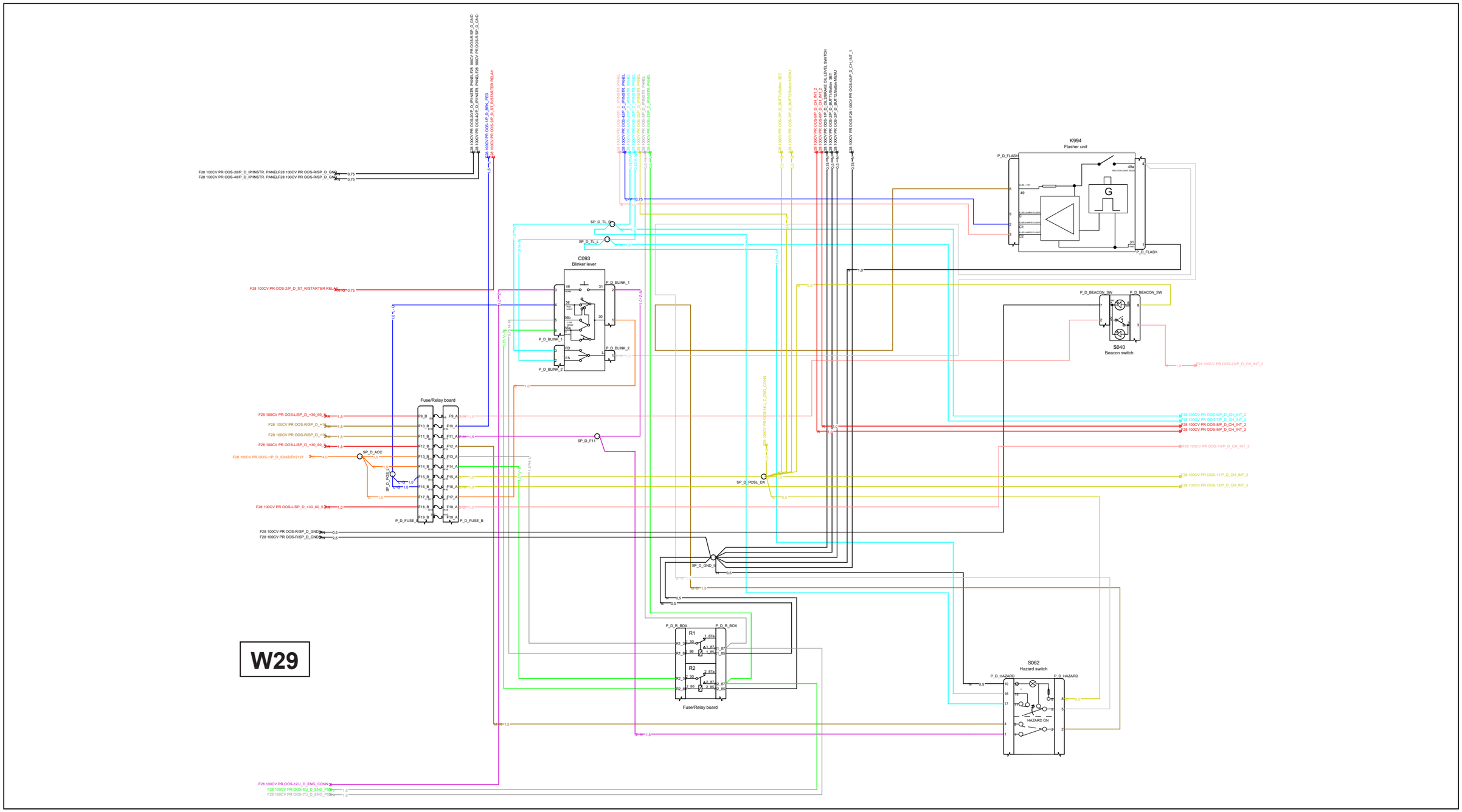
## 9.1.1.4.5 Schematic 5



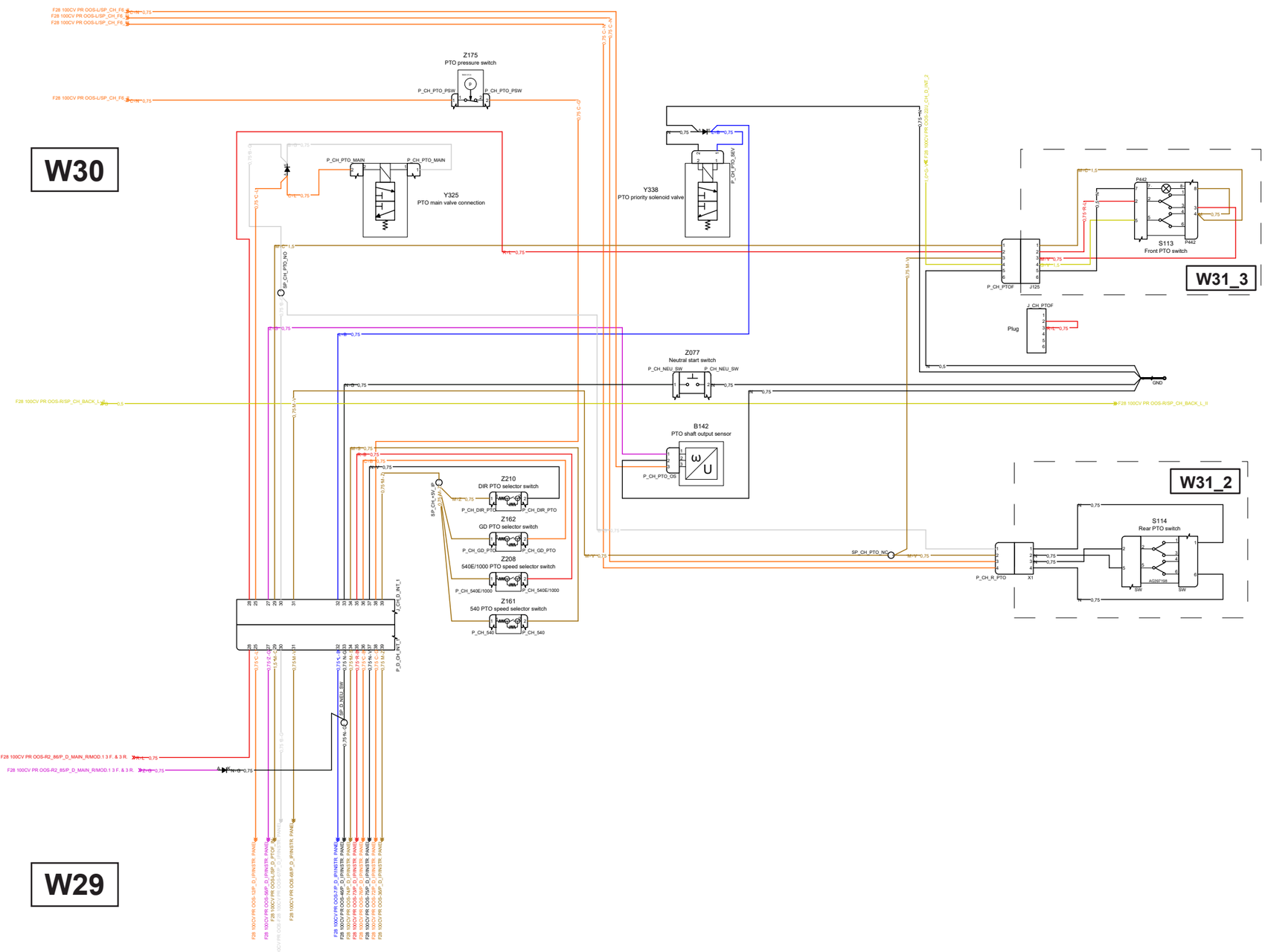
## 9.1.1.4.6 Schematic 6



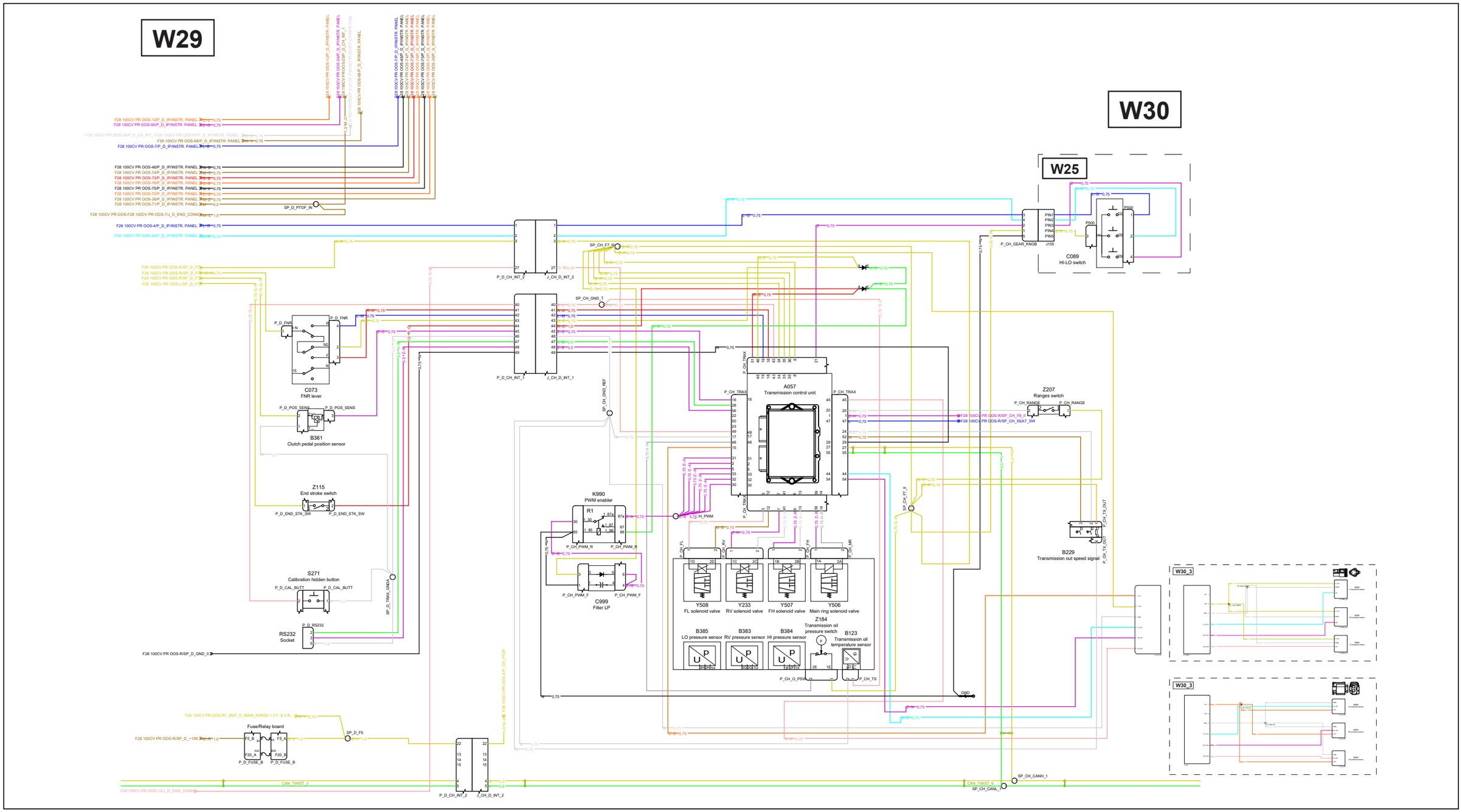
## 9.1.1.4.7 Schematic 7



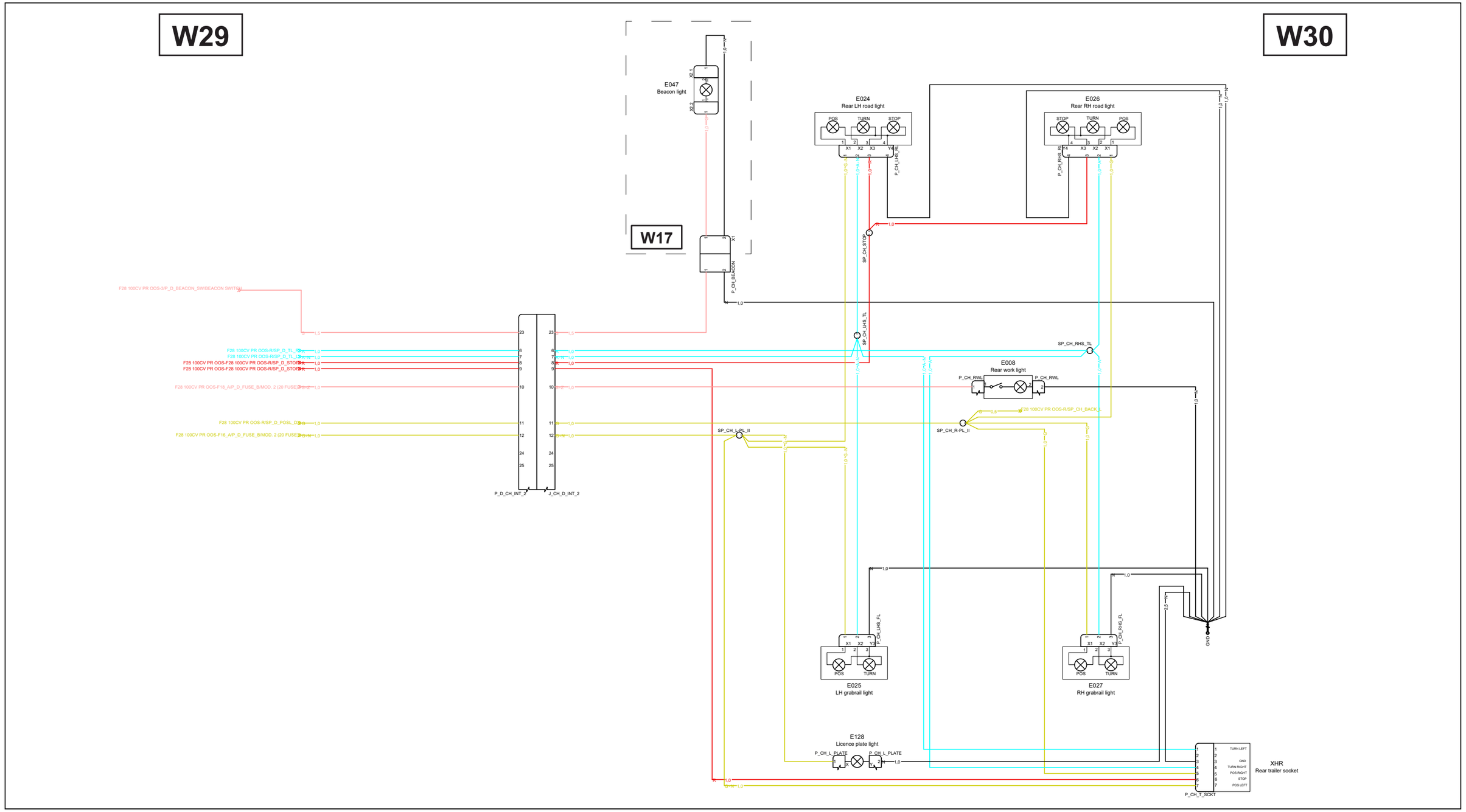
## 9.1.1.4.8 Schematic 8



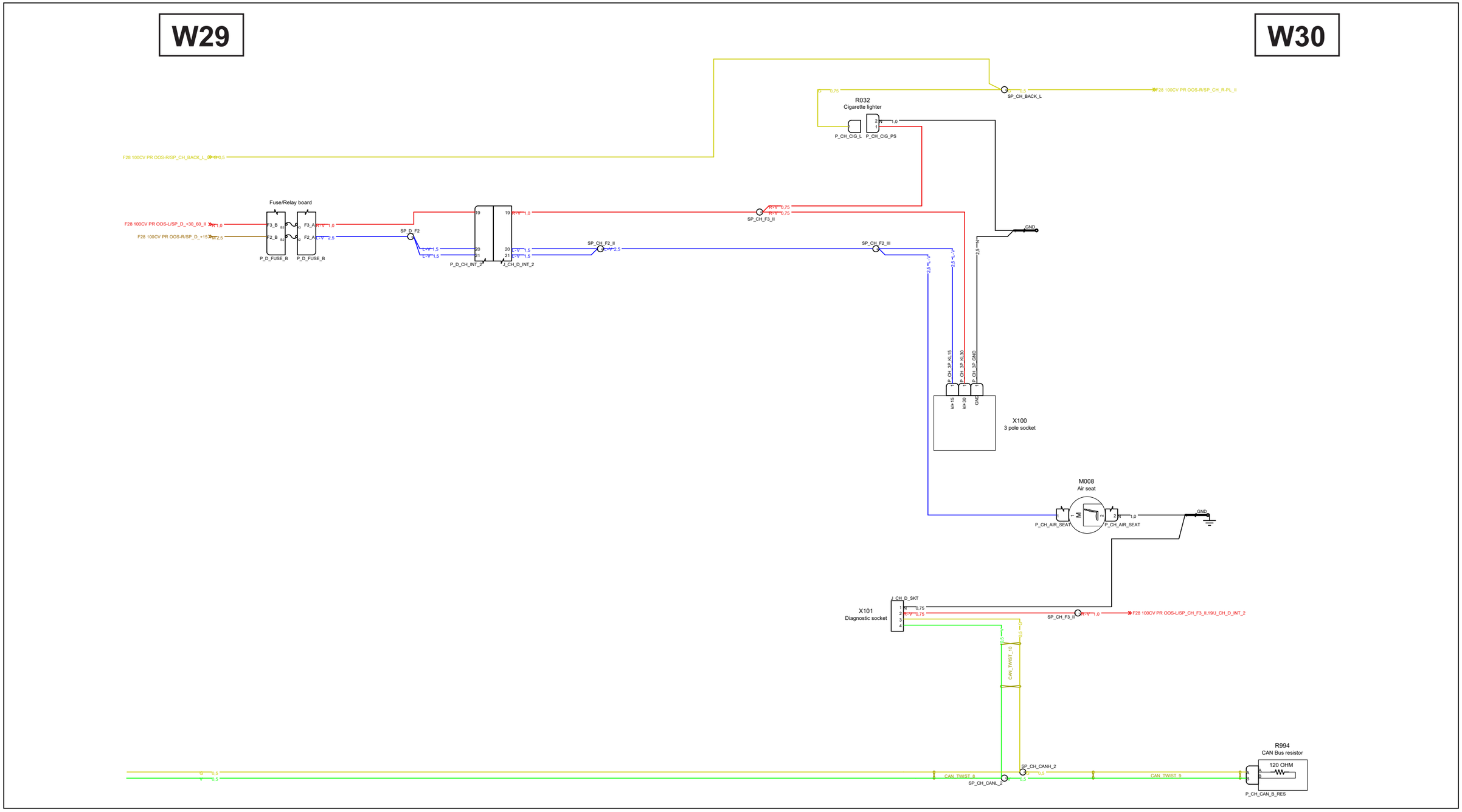
## 9.1.1.4.9 Schematic 9



## 9.1.1.4.10 Schematic 10



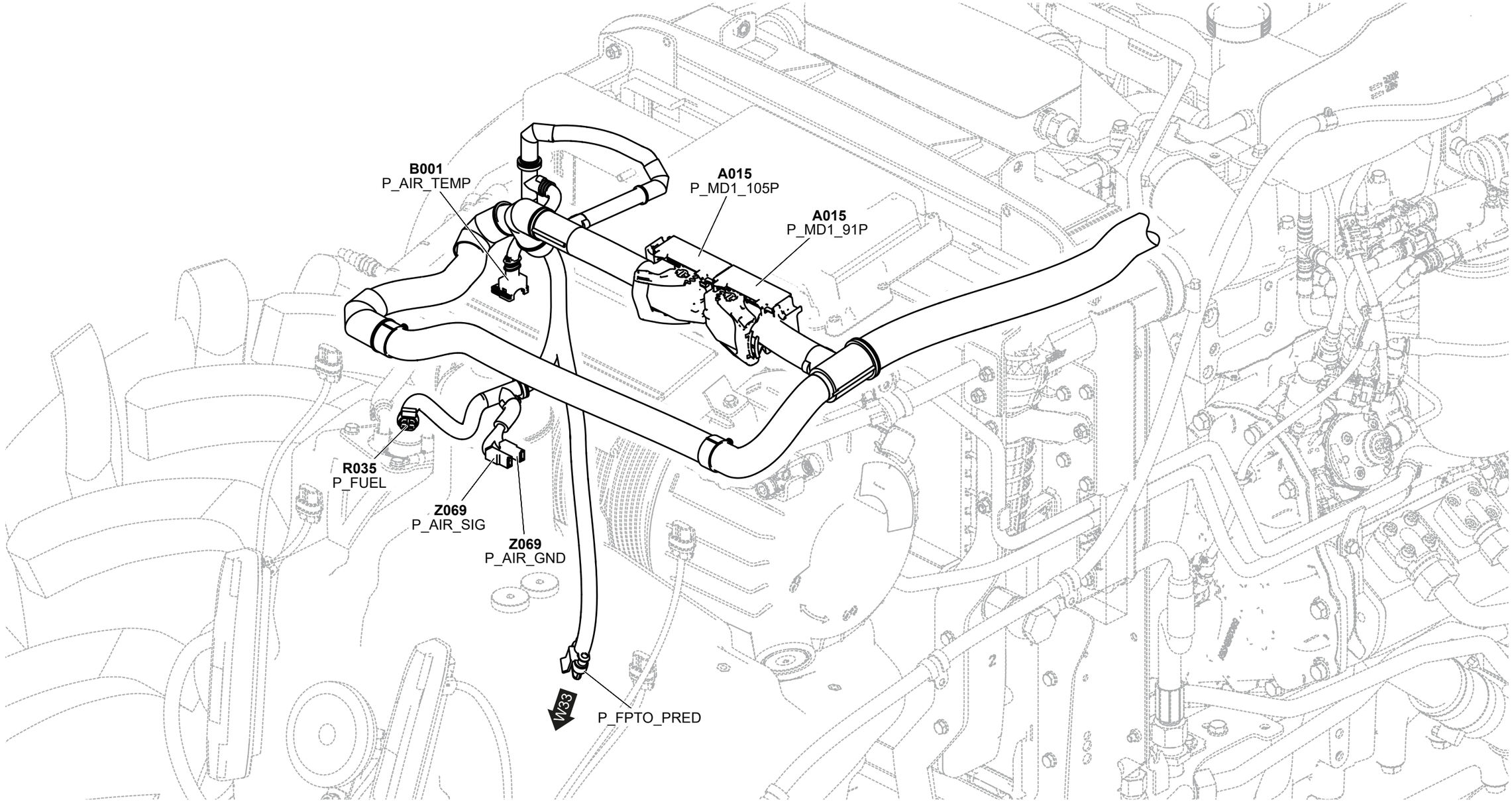
## 9.1.1.4.11 Schematic 11



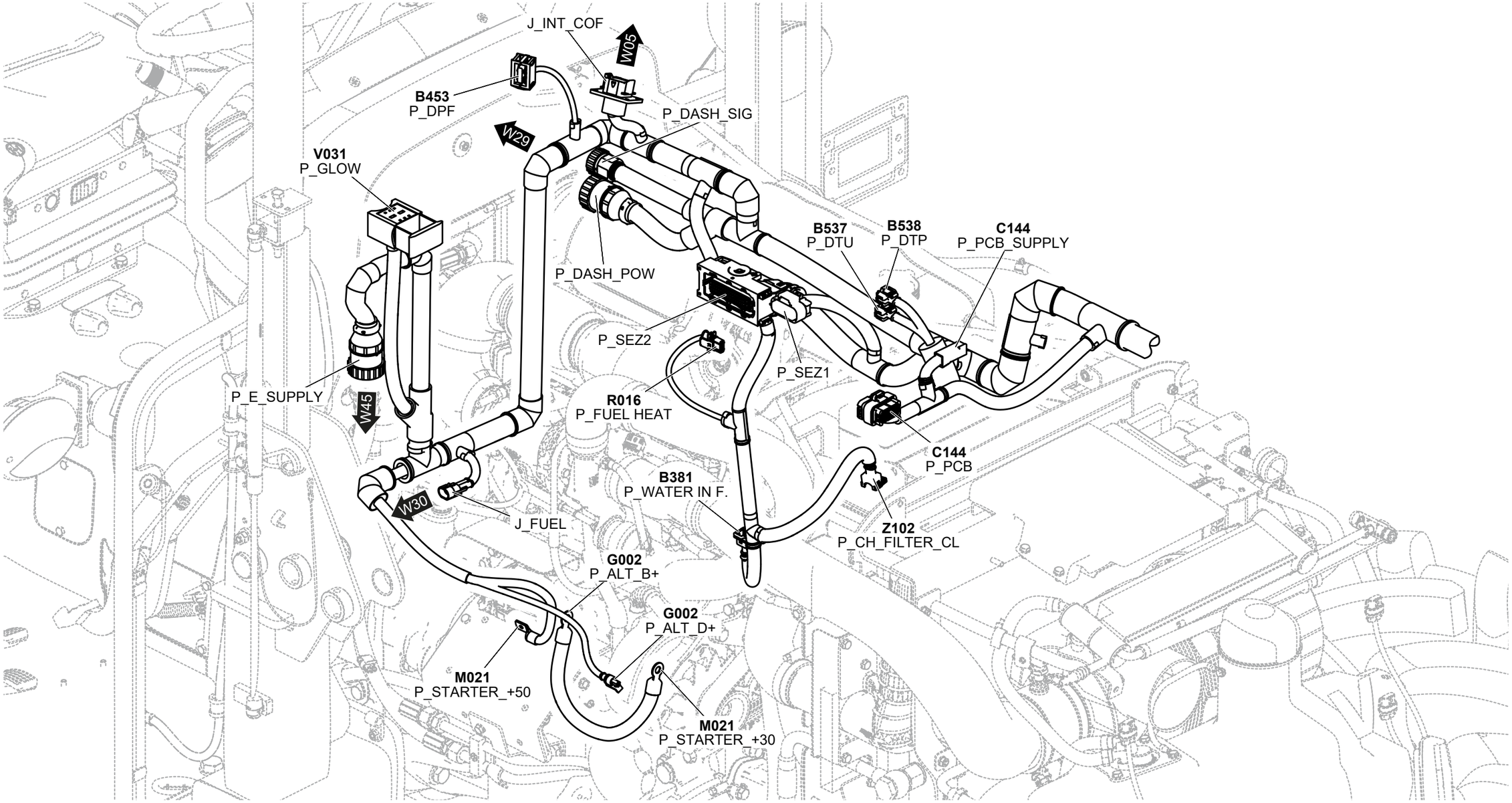
## 9.1.2. 3D Routings

### 9.1.2.1 OOS 75Hp Models

#### 9.1.2.1.1 W02 - ENGINE WIRING HARNESS_LH

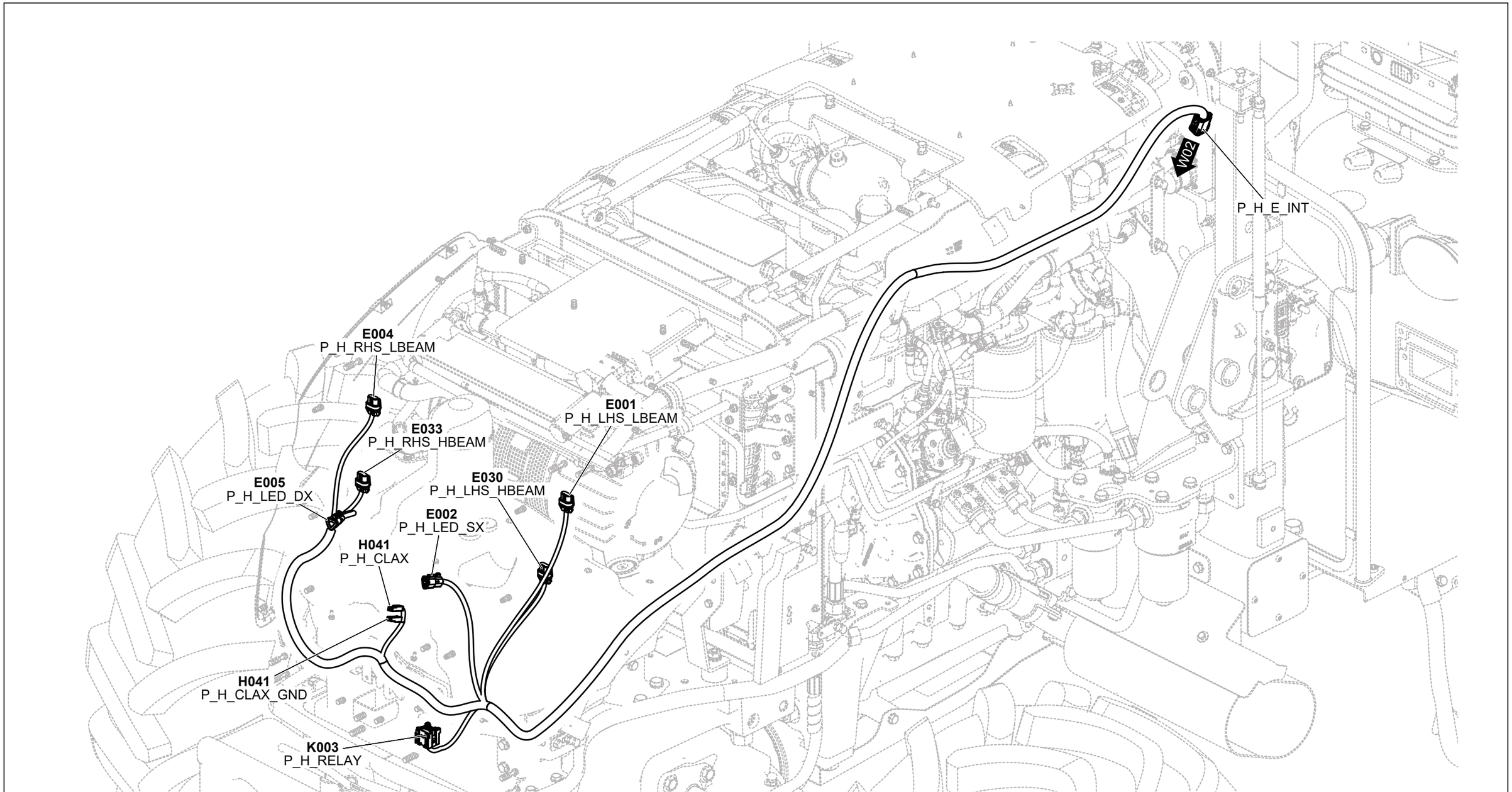



W02_VA_IN_567071_B_0_LH_20221121

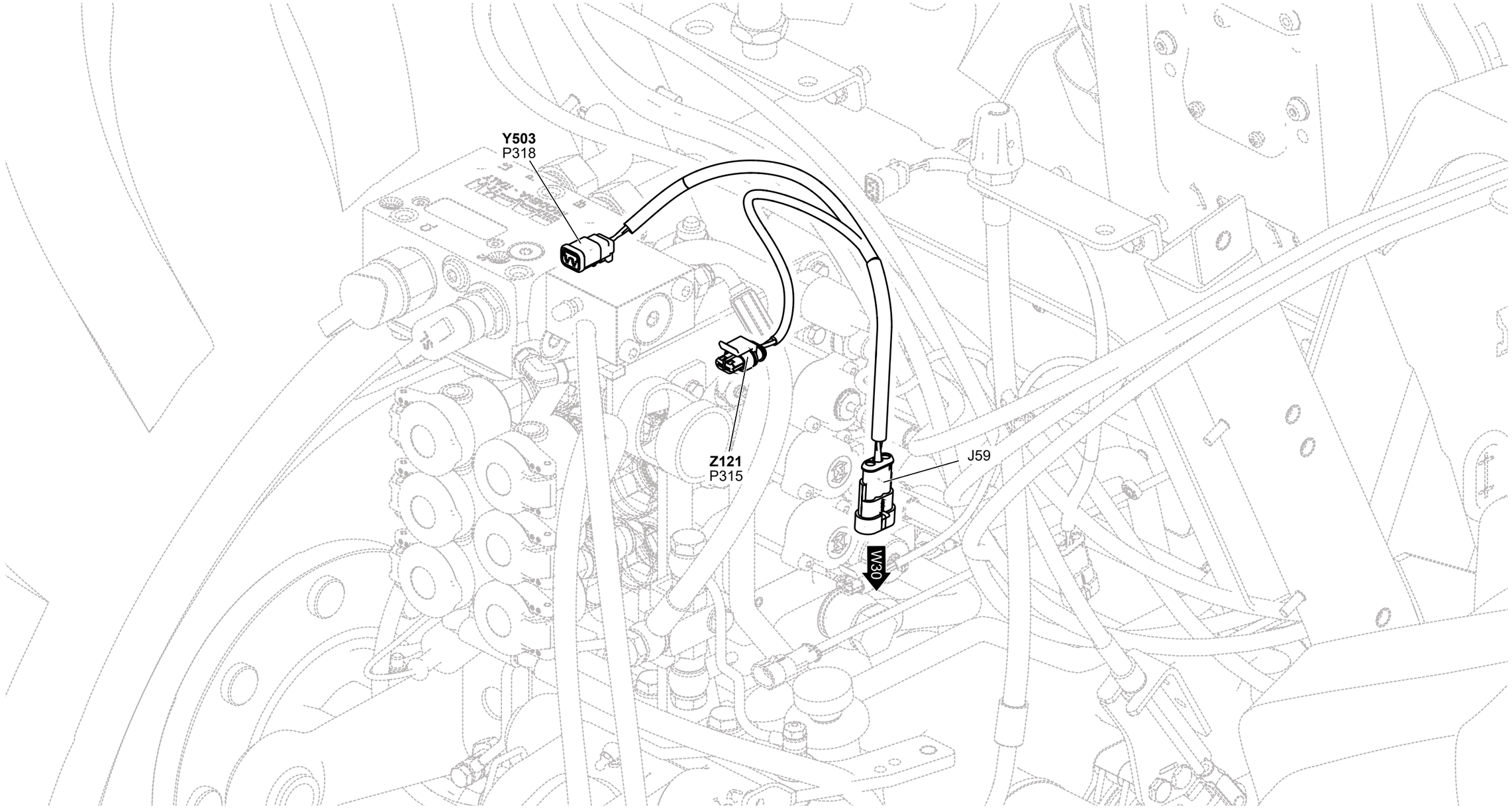



W02_VA_IN_567071_B_0_RH_20221121

### 9.1.2.1.3 W05 - HOOD WIRING HARNESS

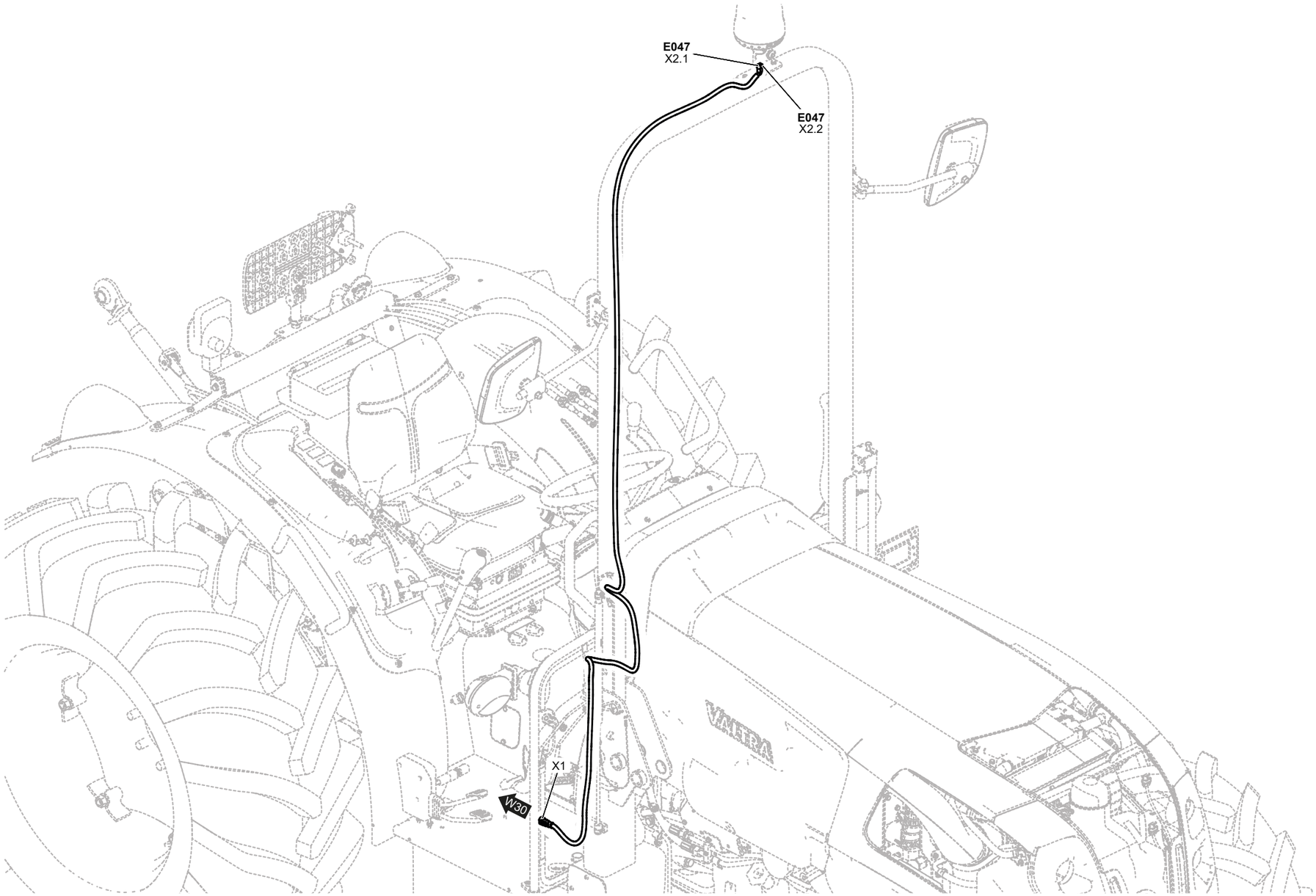



W05_VA_IN_581633_B_0_20221103



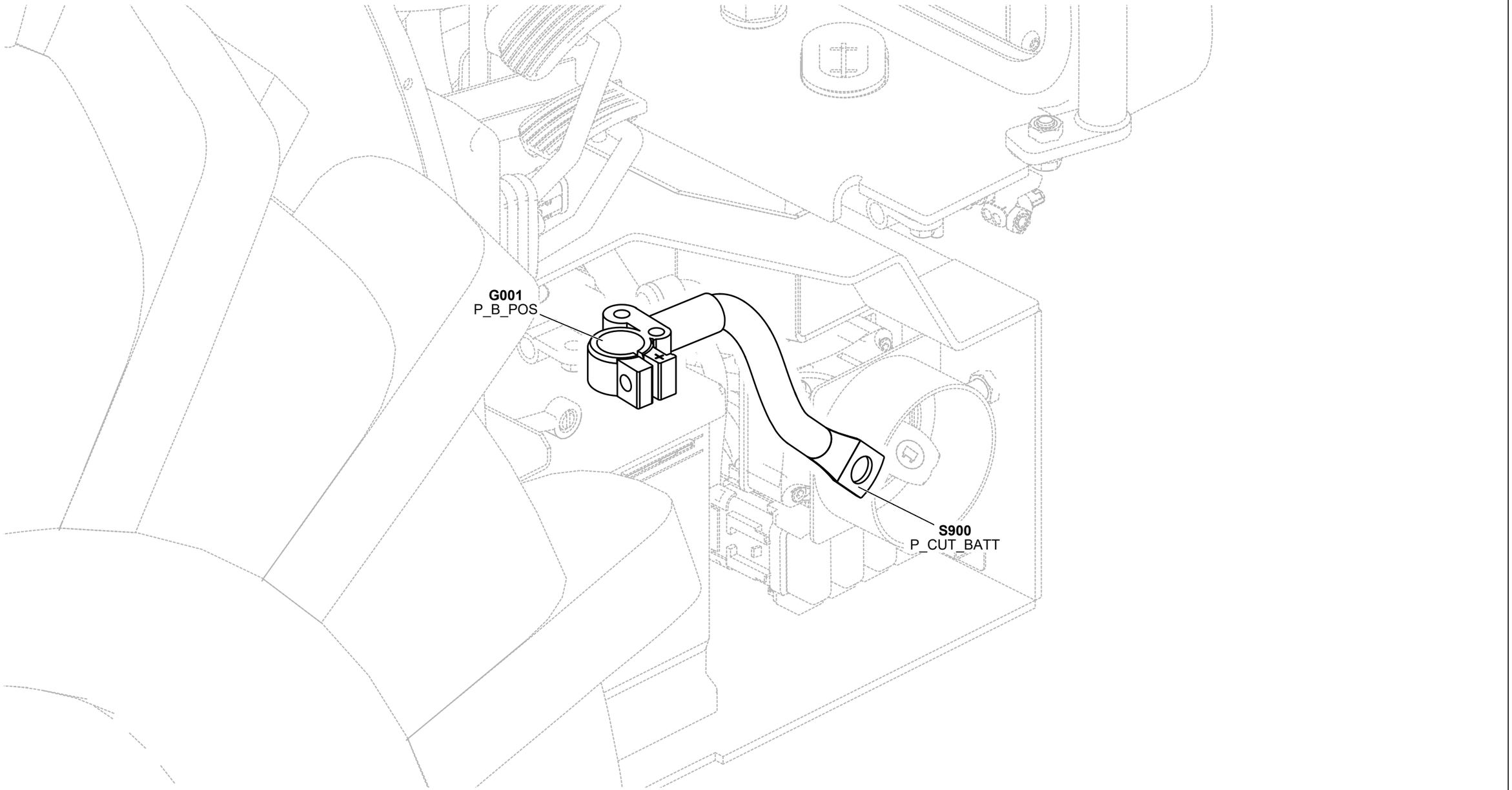

W06_VA_IN_522591_B_0_20221103

## 9.1.2.1.5 W17 - PLATFORM BEACON LIGHT WIRING HARNESS



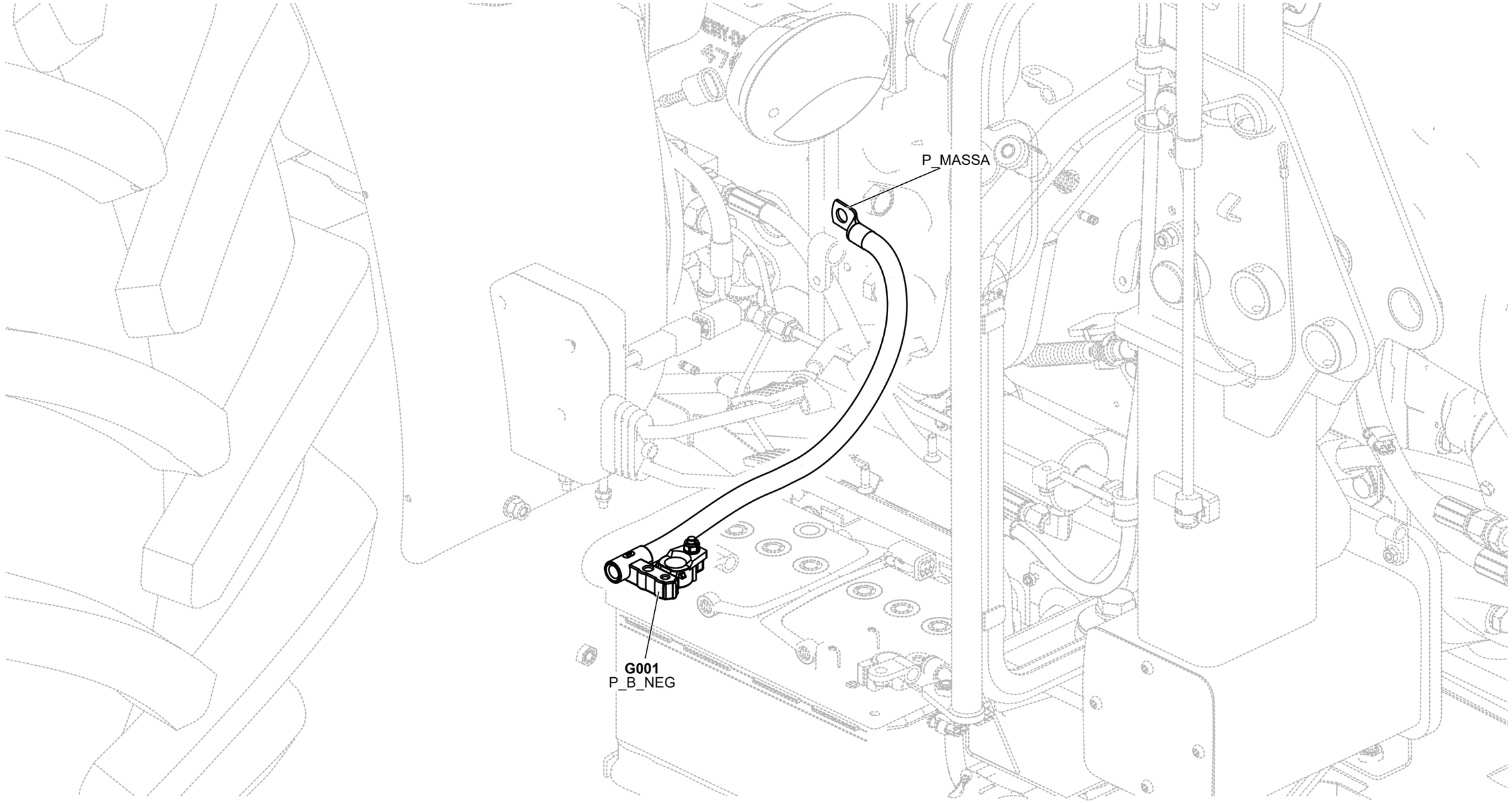

W17_VA_IN_496749_B_0_20221118

### 9.1.2.1.6 W21 - POSITIVE BATTERY CABLE



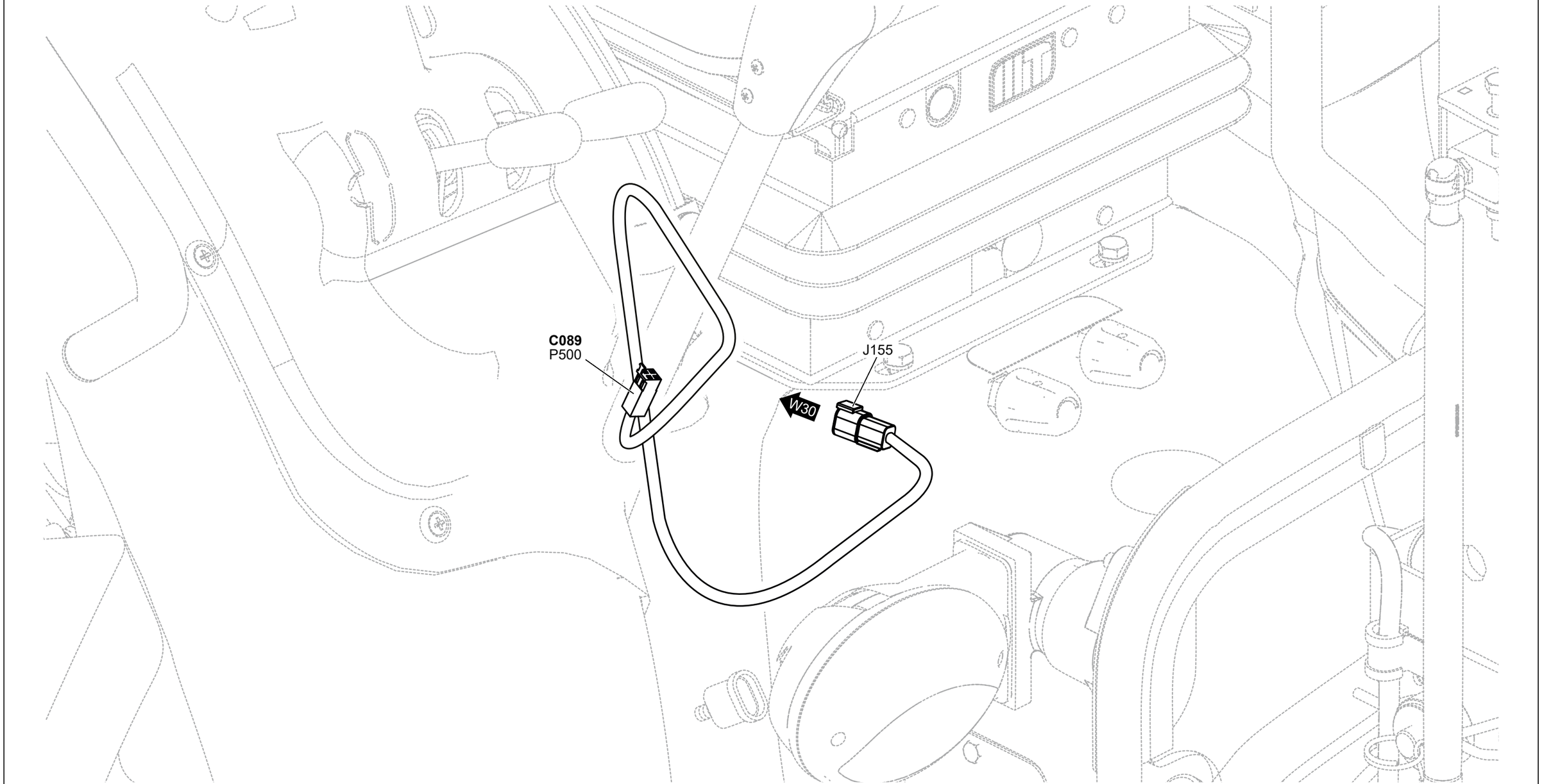

W21_VA_IN_583684_B_0_20221103

## 9.1.2.1.7 W22 - NEGATIVE BATTERY CABLE



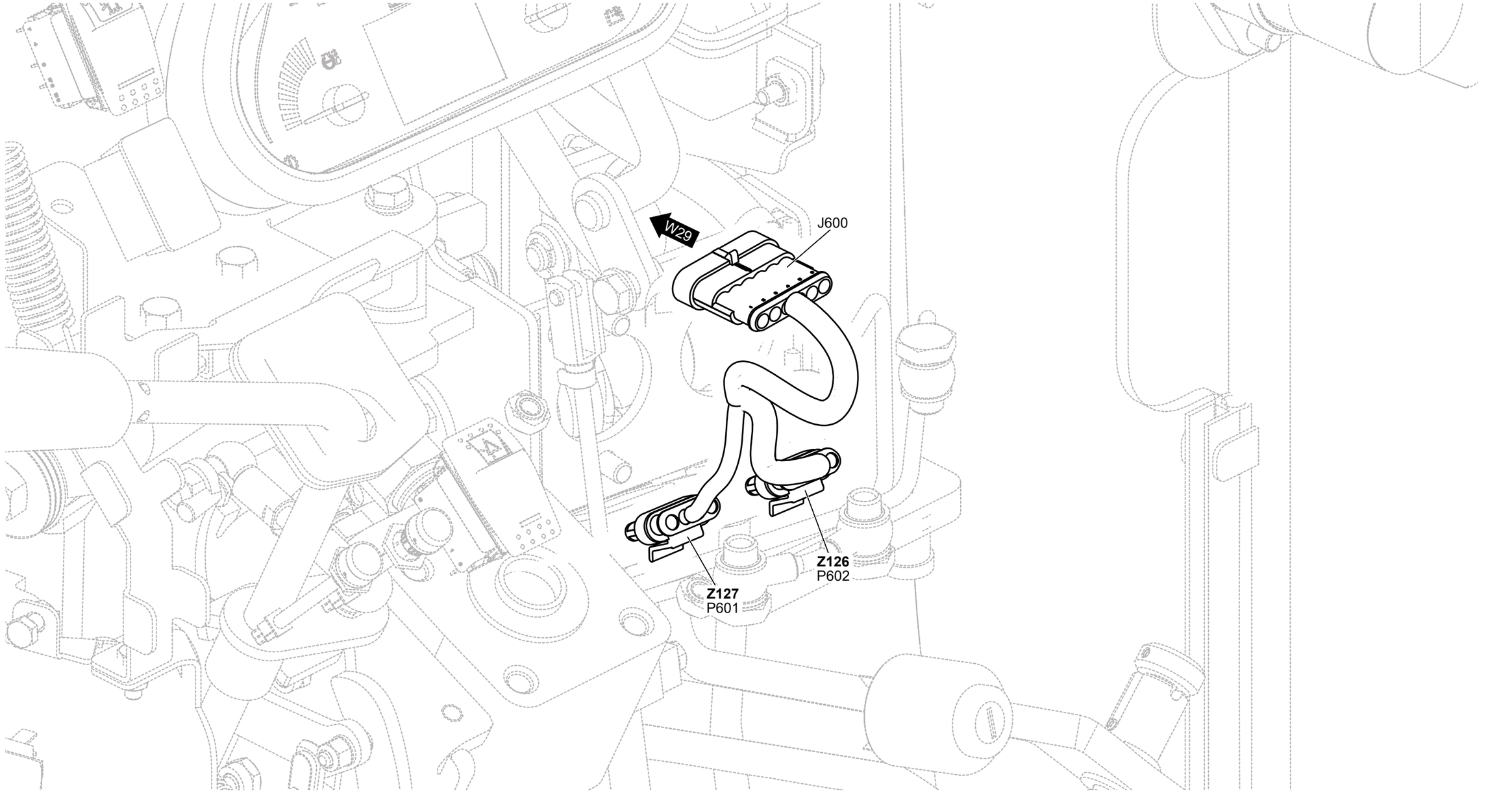

W22_VA_IN_588173_B_0_20221103

### 9.1.2.1.8 W25 - HI-LO ELECTRIC CABLE

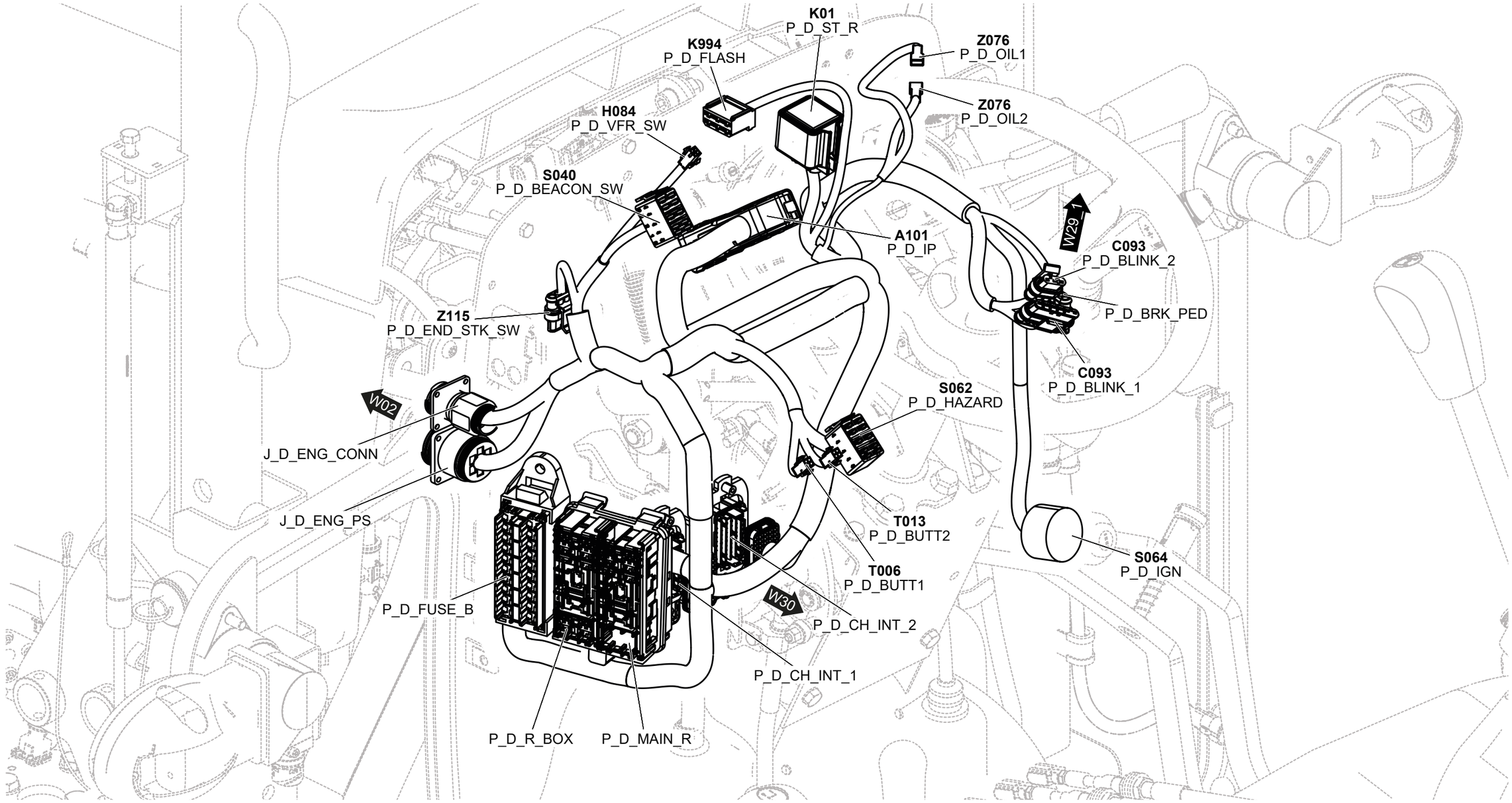



W25_VA_IN_473558_B_2_20221123

## 9.1.2.1.9 W29 - DASHBOARD CONTROLS WIRING HARNESS

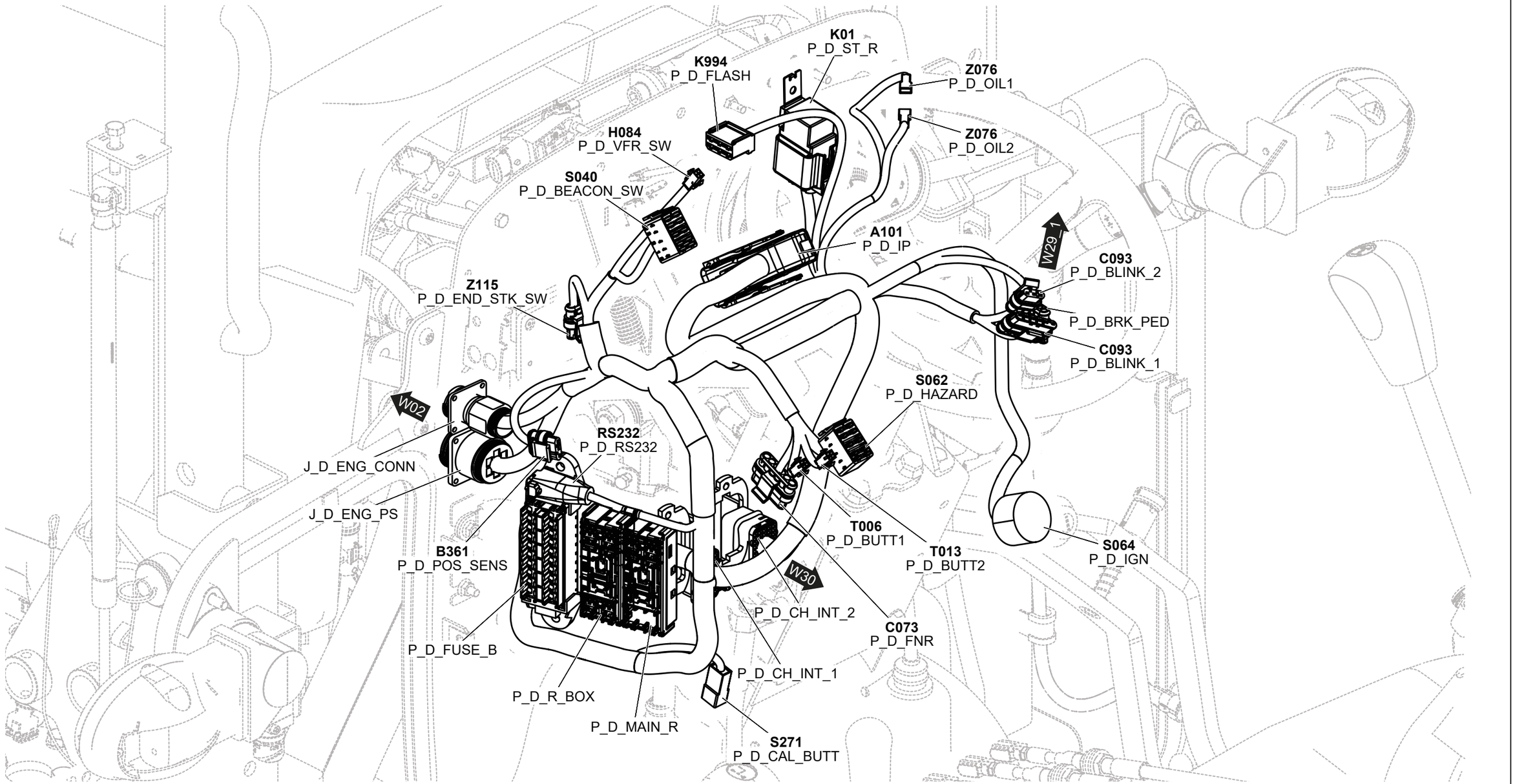



W29_1_VA_IN_464658_B_0_20221103



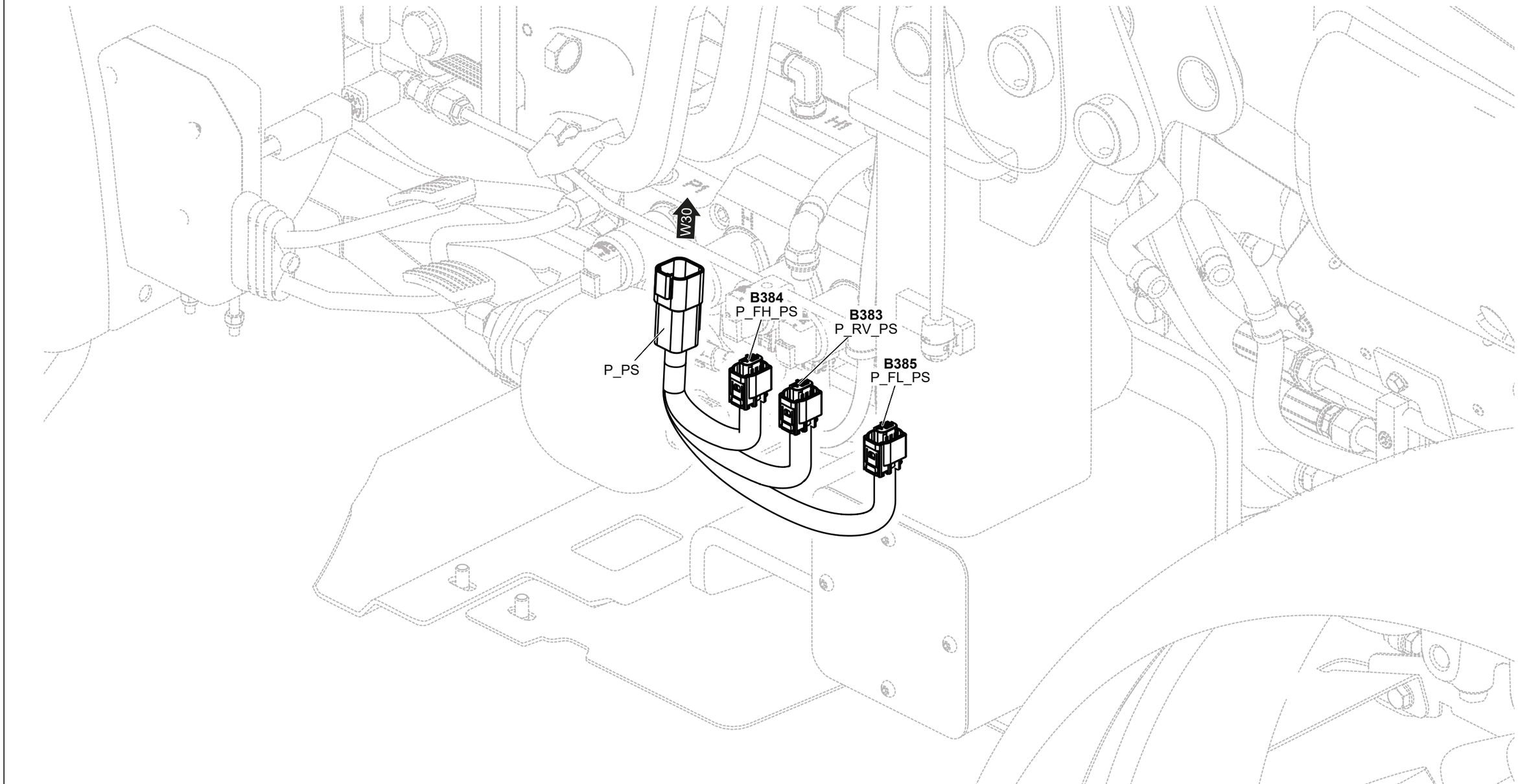

W29_VA_IN_581631_B_1_20221103

## 9.1.2.1.11 W29_1 - BRAKE SWITCHES WIRING HARNESS



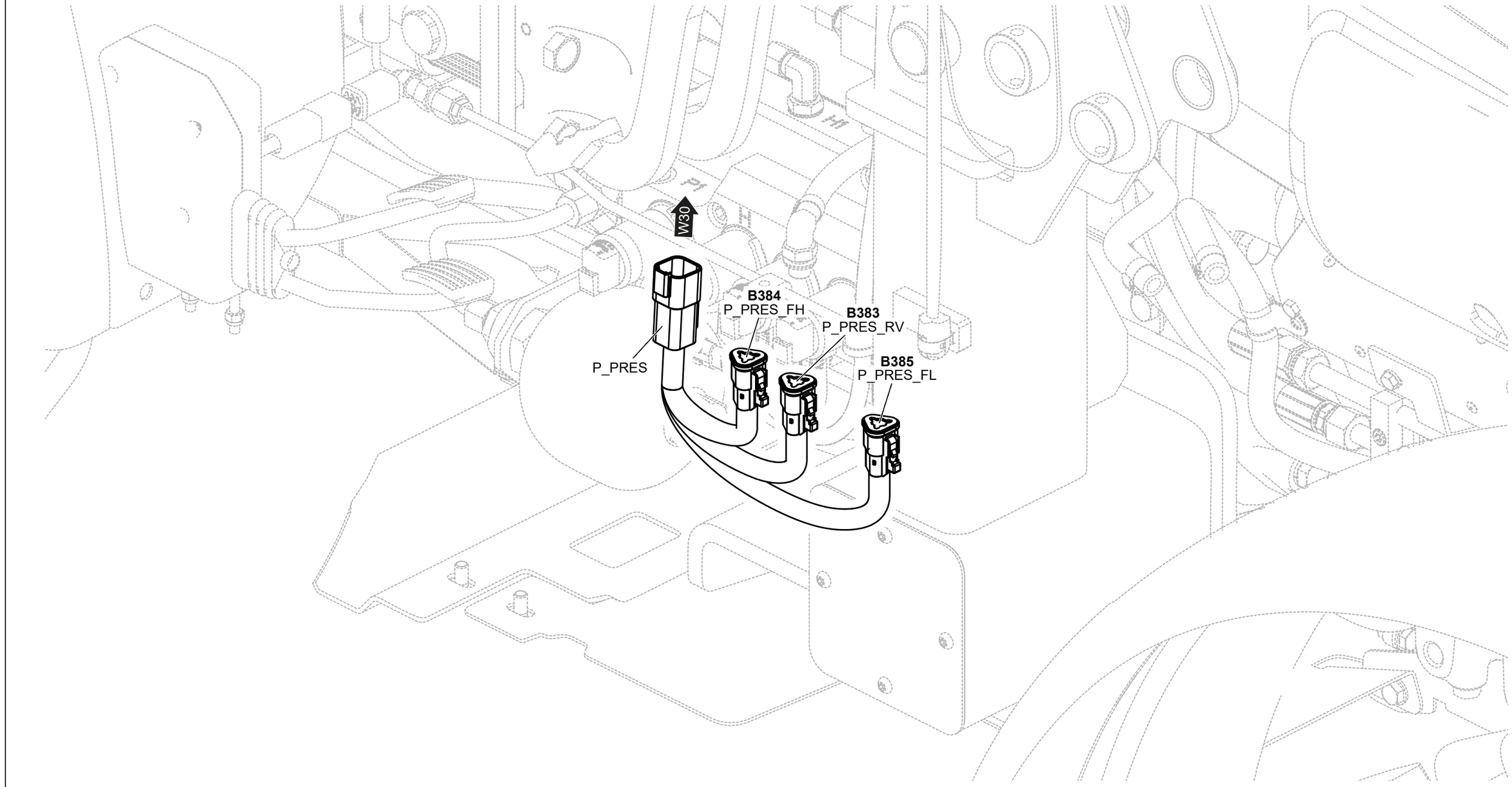

W29_VA_IN_581638_B_2_20221103

## 9.1.2.1.12 W30 - TRANSMISSION WIRING HARNESS_LH

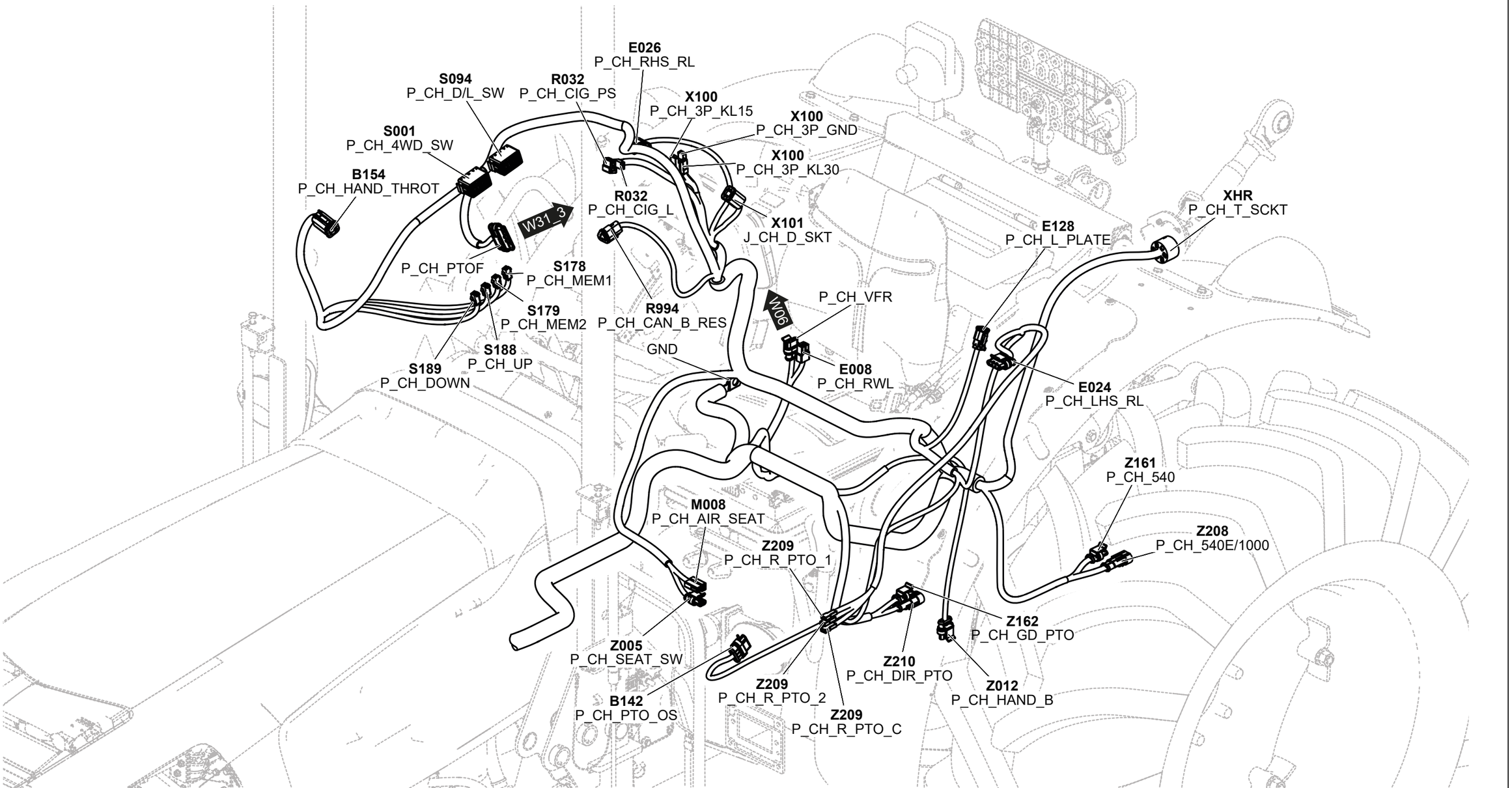



W30_3_VA_IN_585301_B_2_20221117

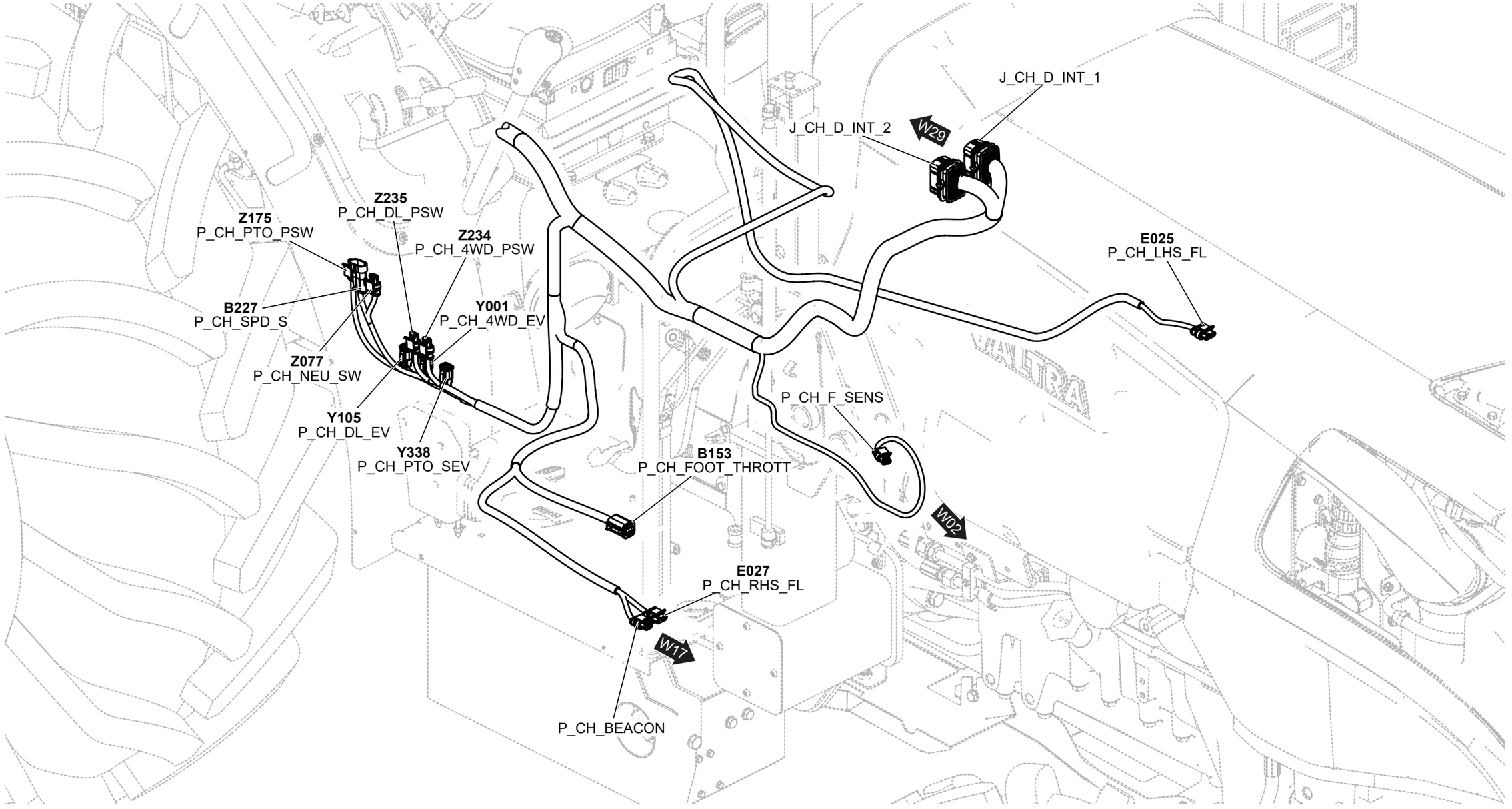
## 9.1.2.1.13 W30 - TRANSMISSION WIRING HARNESS_RH




W30_3_VA_IN_587108_B_2_20221117

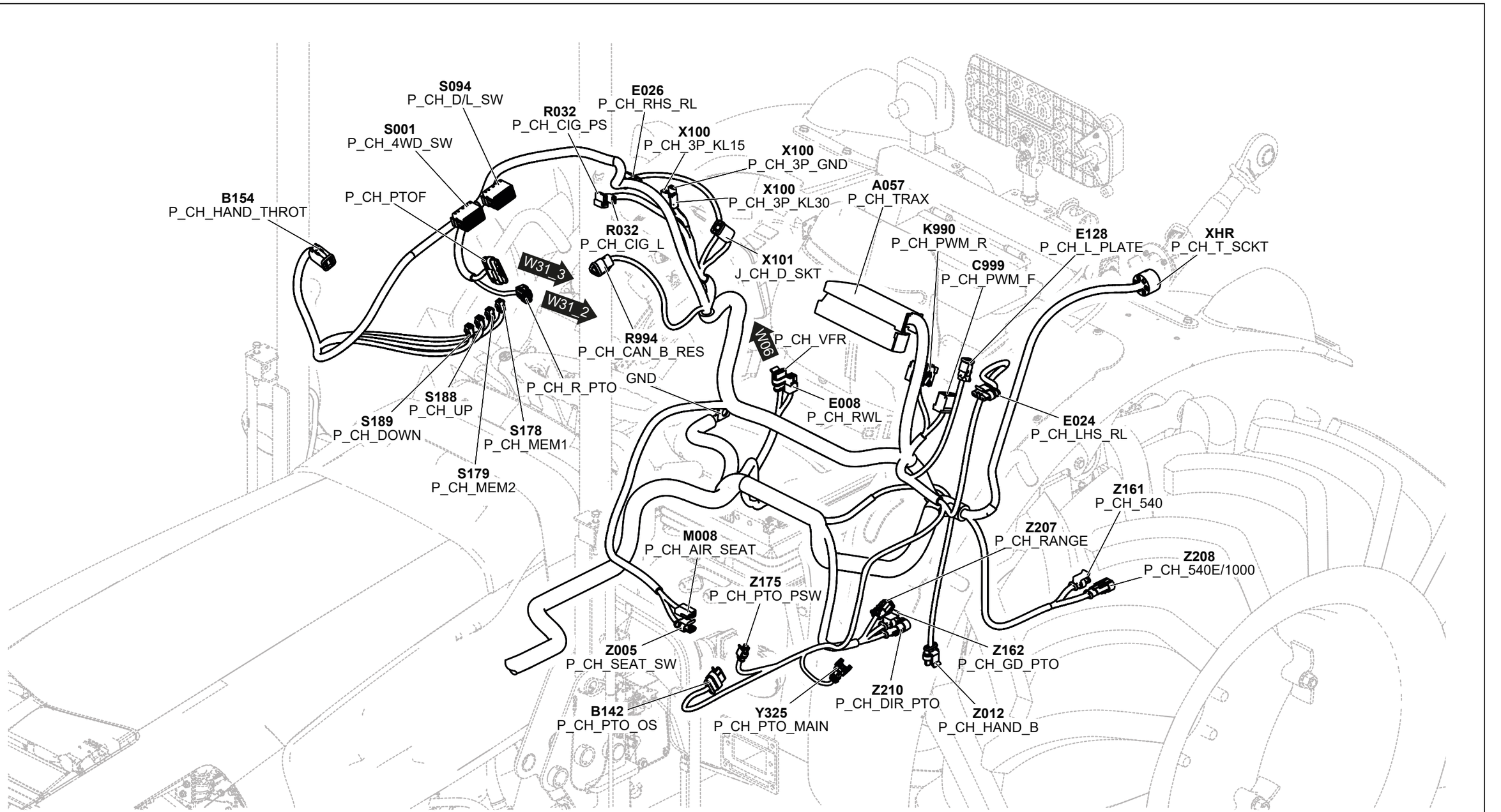



W30_VA_IN_581629_B_1_LH_20221121



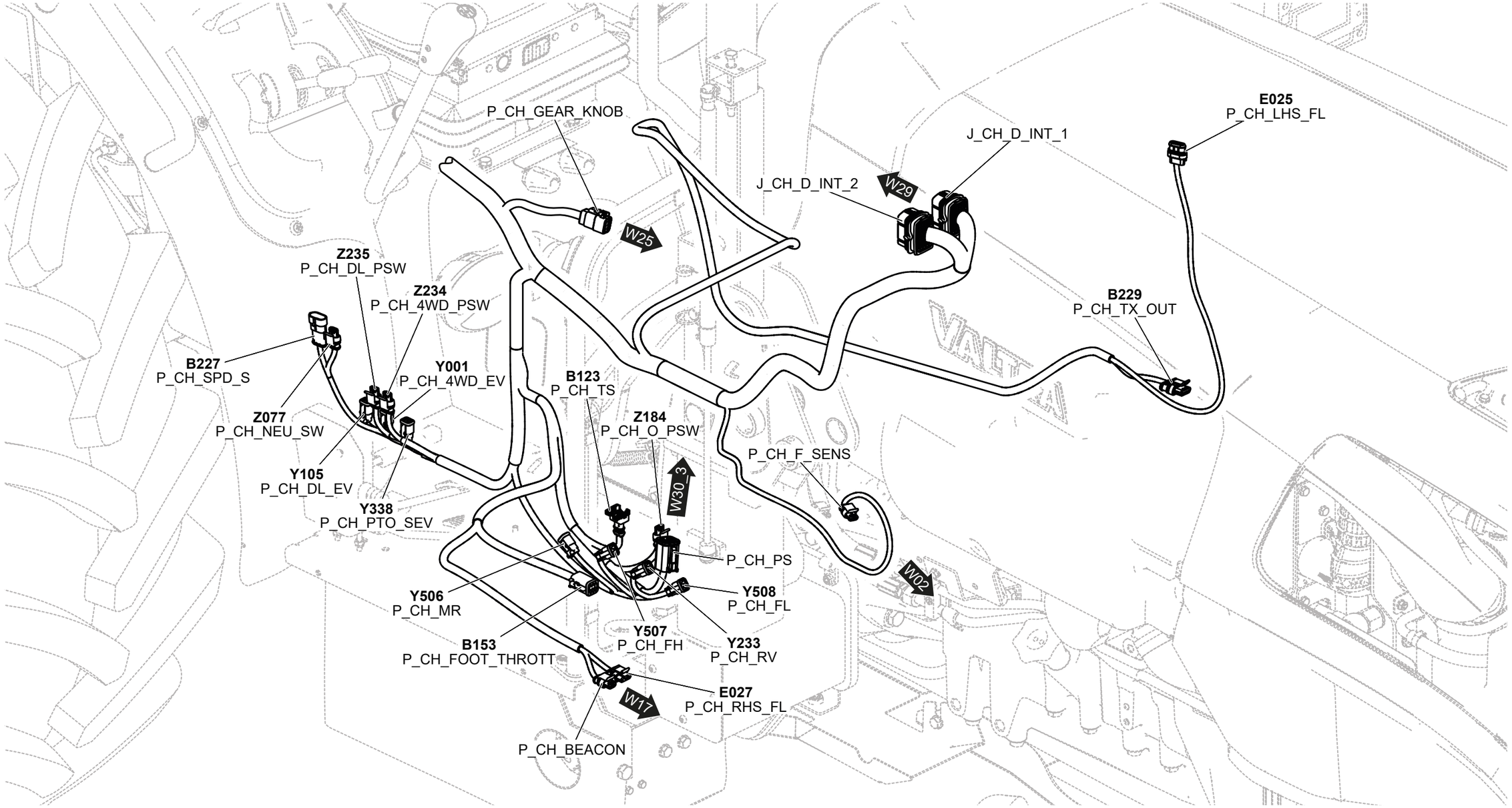

W30_VA_IN_581629_B_1_RH_20221121

### 9.1.2.1.16 W30_3 - TRANSMISSION PRESSURE SWITCHES WIRING HARNESS



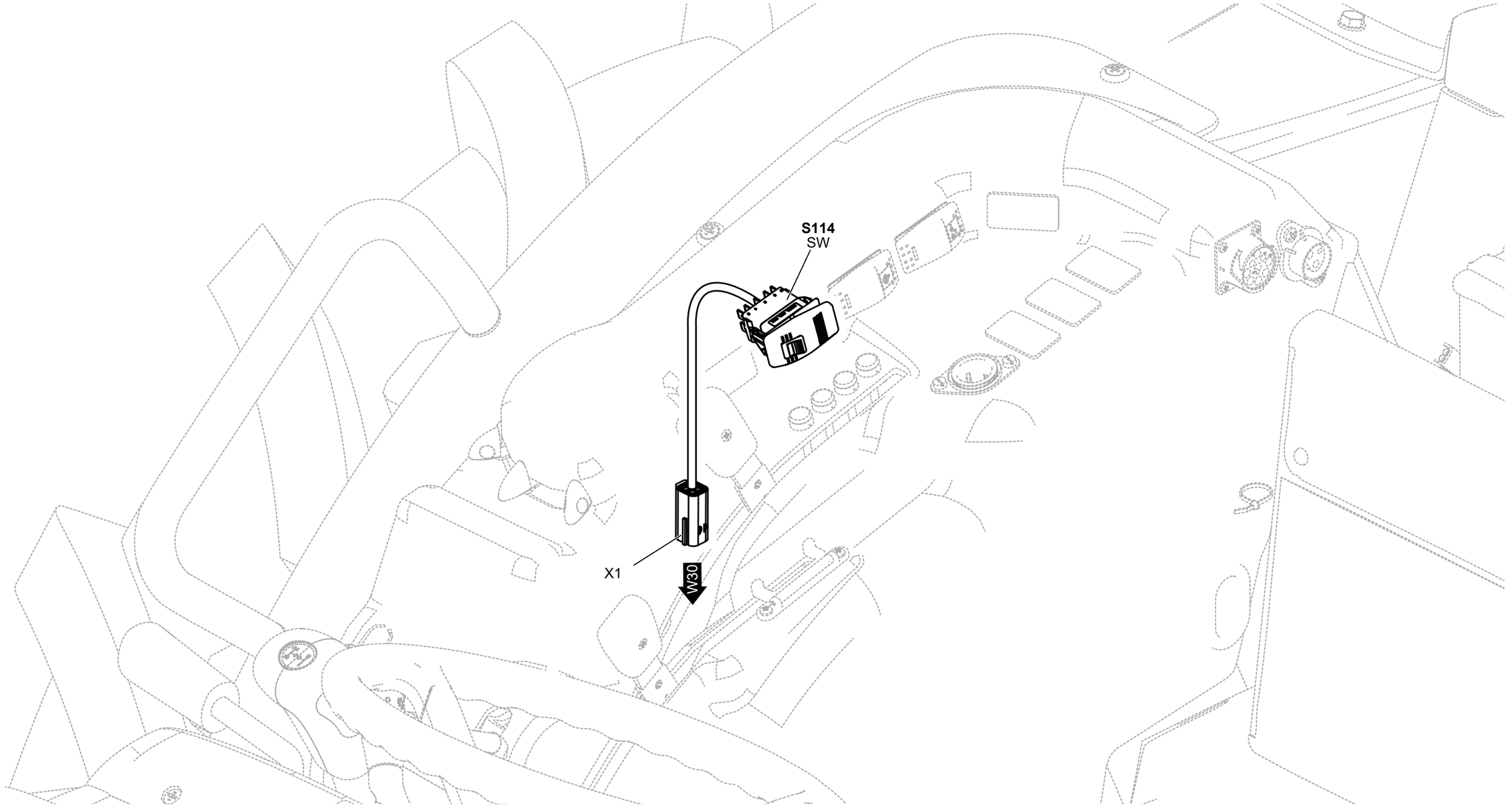

W30_VA_IN_581636_B_2_LH_20221122

## 9.1.2.1.17 W30_3 - TRANSMISSION PRESSURE SWITCHES WIRING HARNESS



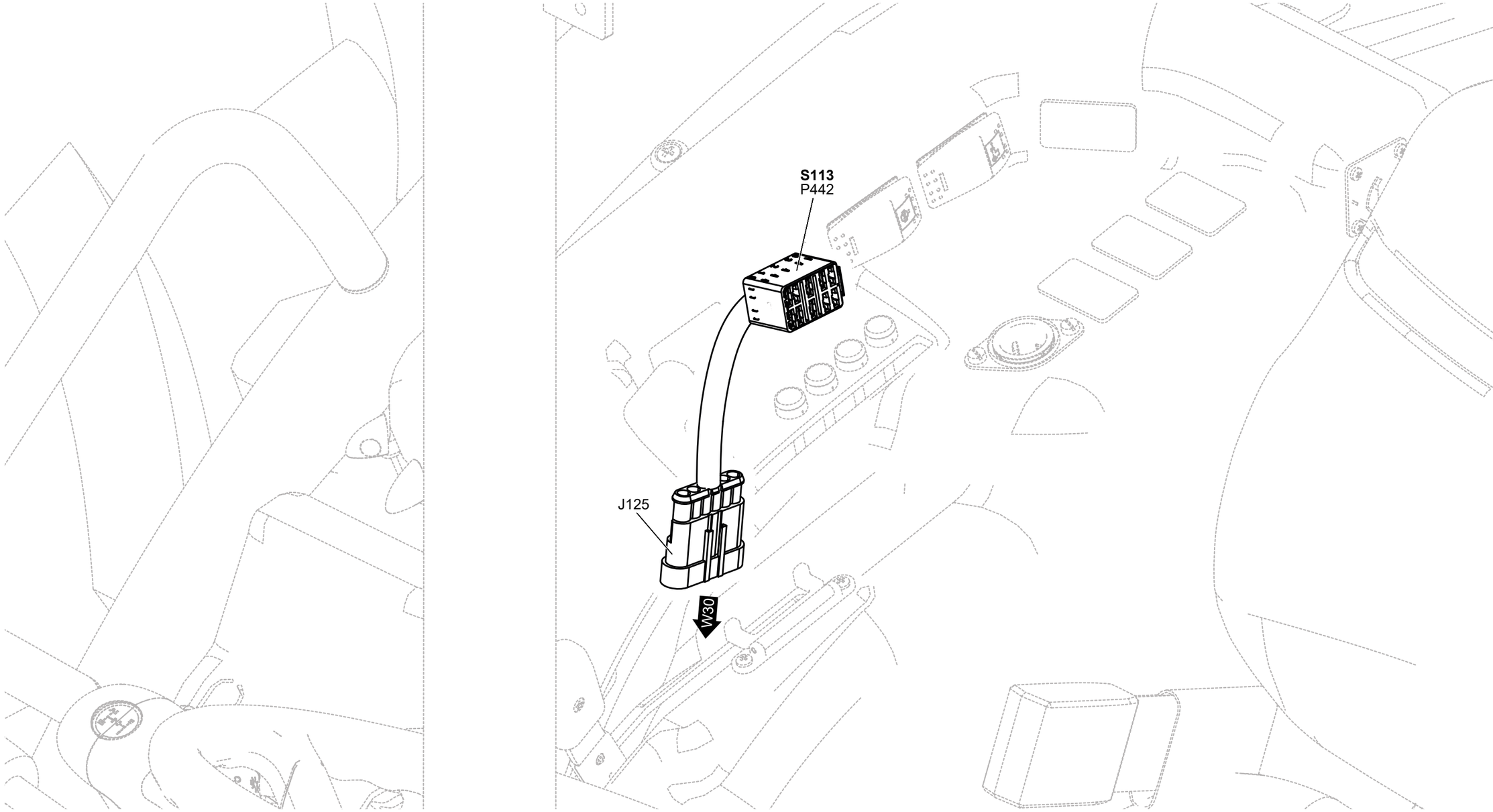

W30_VA_IN_581636_B_2_RH_20221122

## 9.1.2.1.18 W31_2 - REAR PTO SWITCH WIRING HARNESS



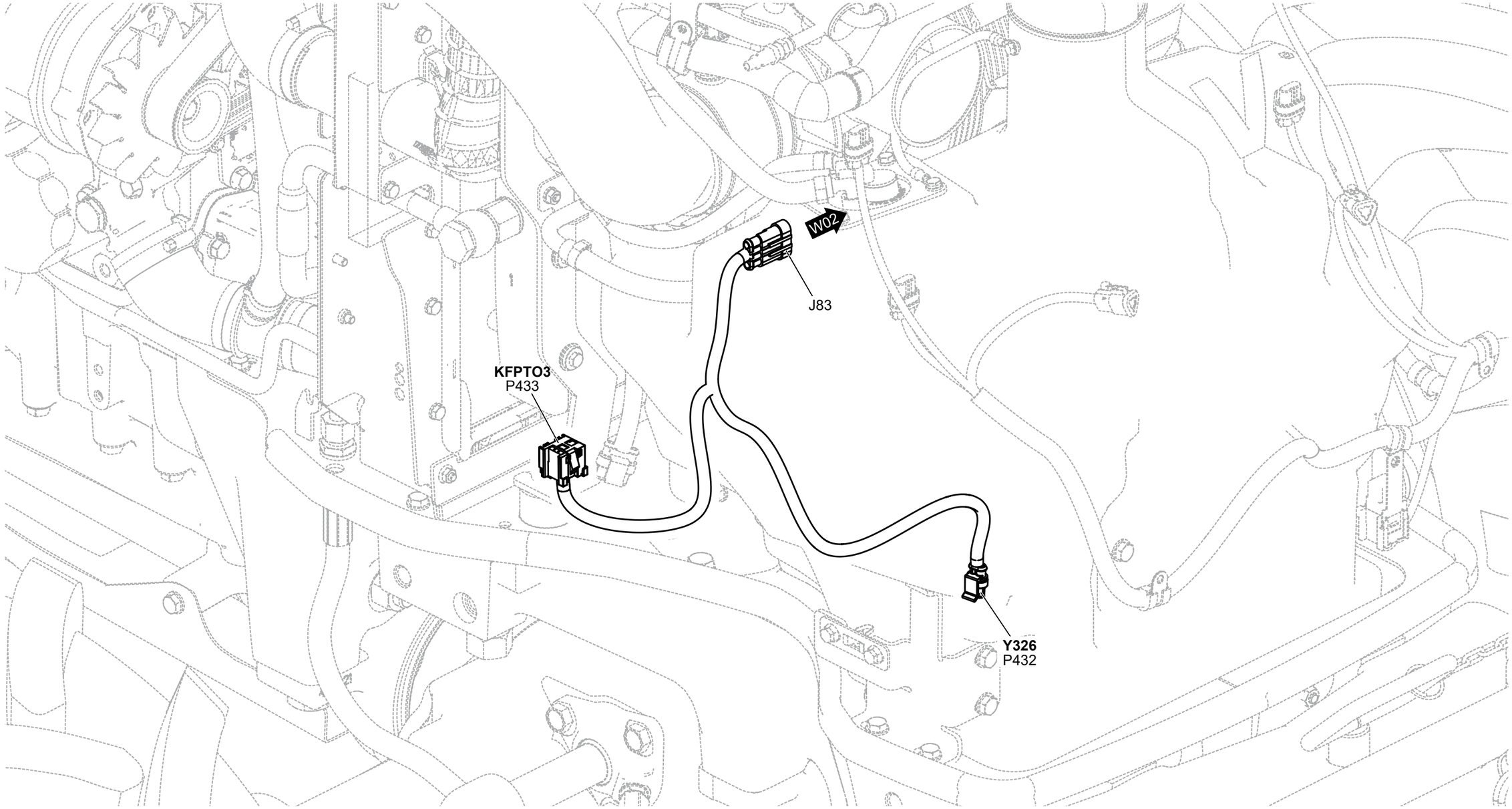

W31_2_VA_IN_397198_B_2_20221124

## 9.1.2.1.19 W31_3 - FRONT PTO SWITCH WIRING HARNESS



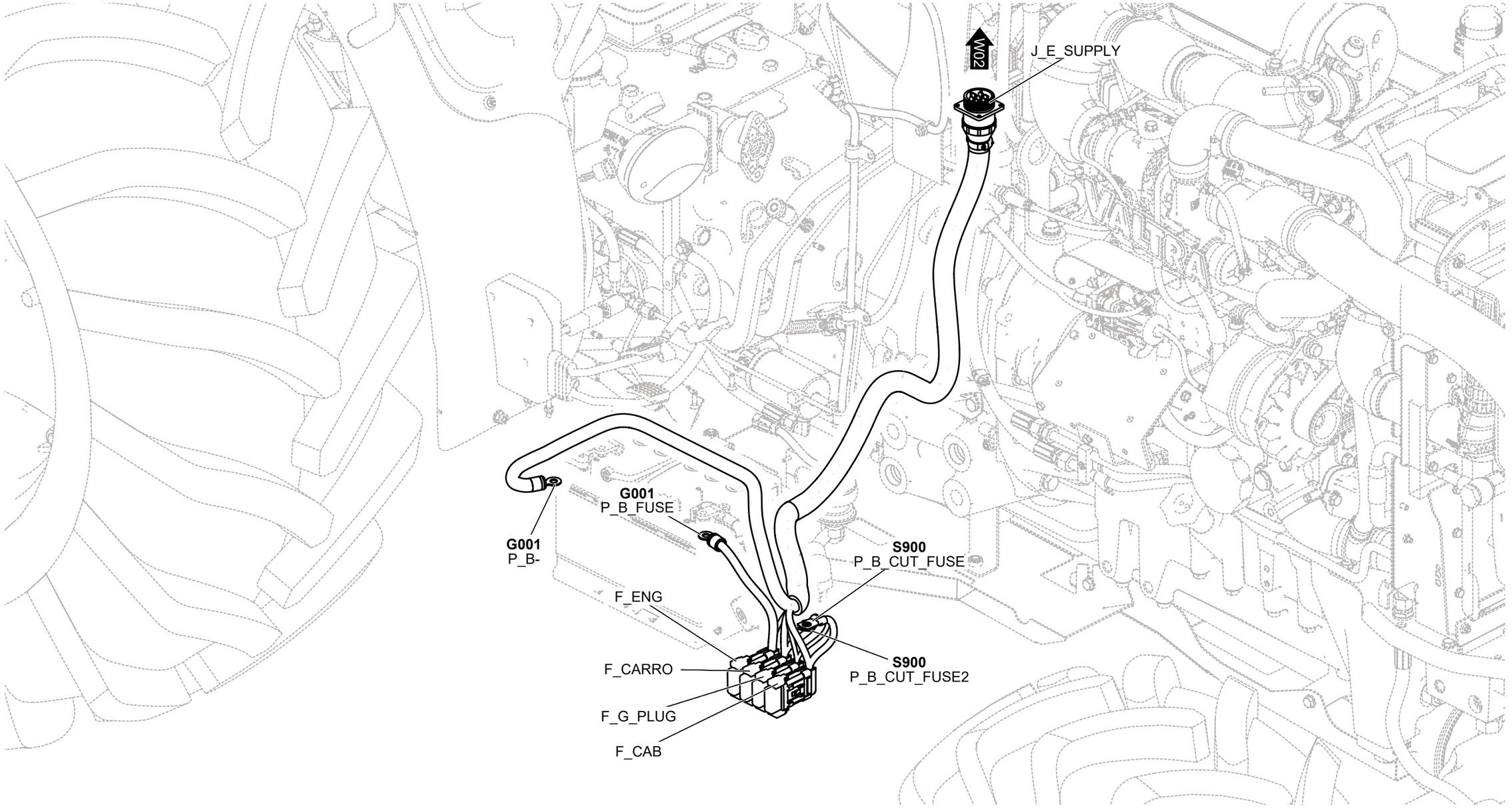

W31_3_VA_IN_569990_B_0_20221118

## 9.1.2.1.20 W33 - FRONT PTO MAIN WIRING HARNESS



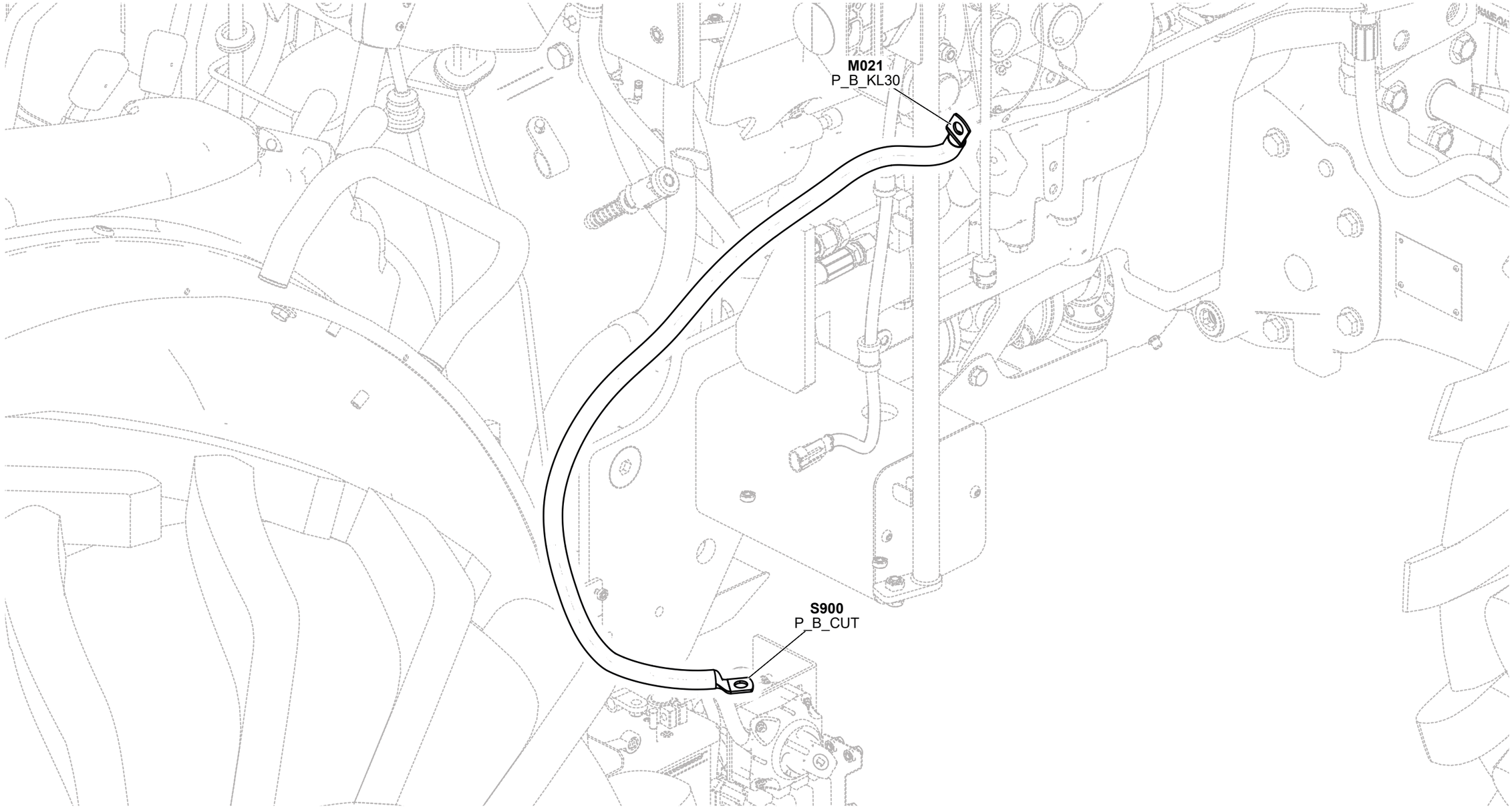

W33_VA_IN_448938_B_0_20221124

## 9.1.2.1.21 W45 - ENGINE POWER SUPPLY CABLES




W45_VA_IN_583683_B_0_20221103

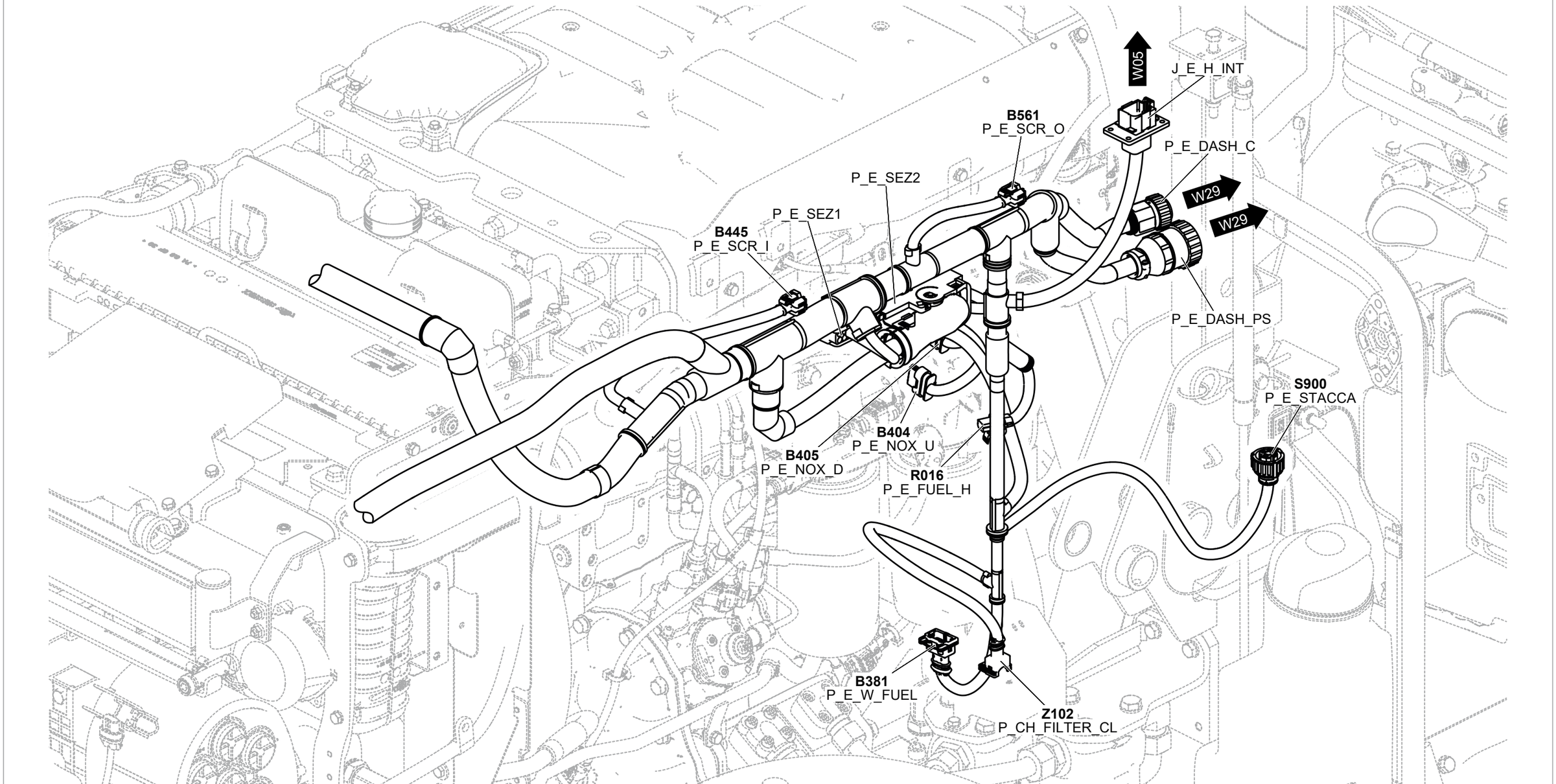
## 9.1.2.1.22 W45_1 - STARTER MOTOR ELECTRIC CABLES




W45_1_VA_IN_585321_B_0_20221103

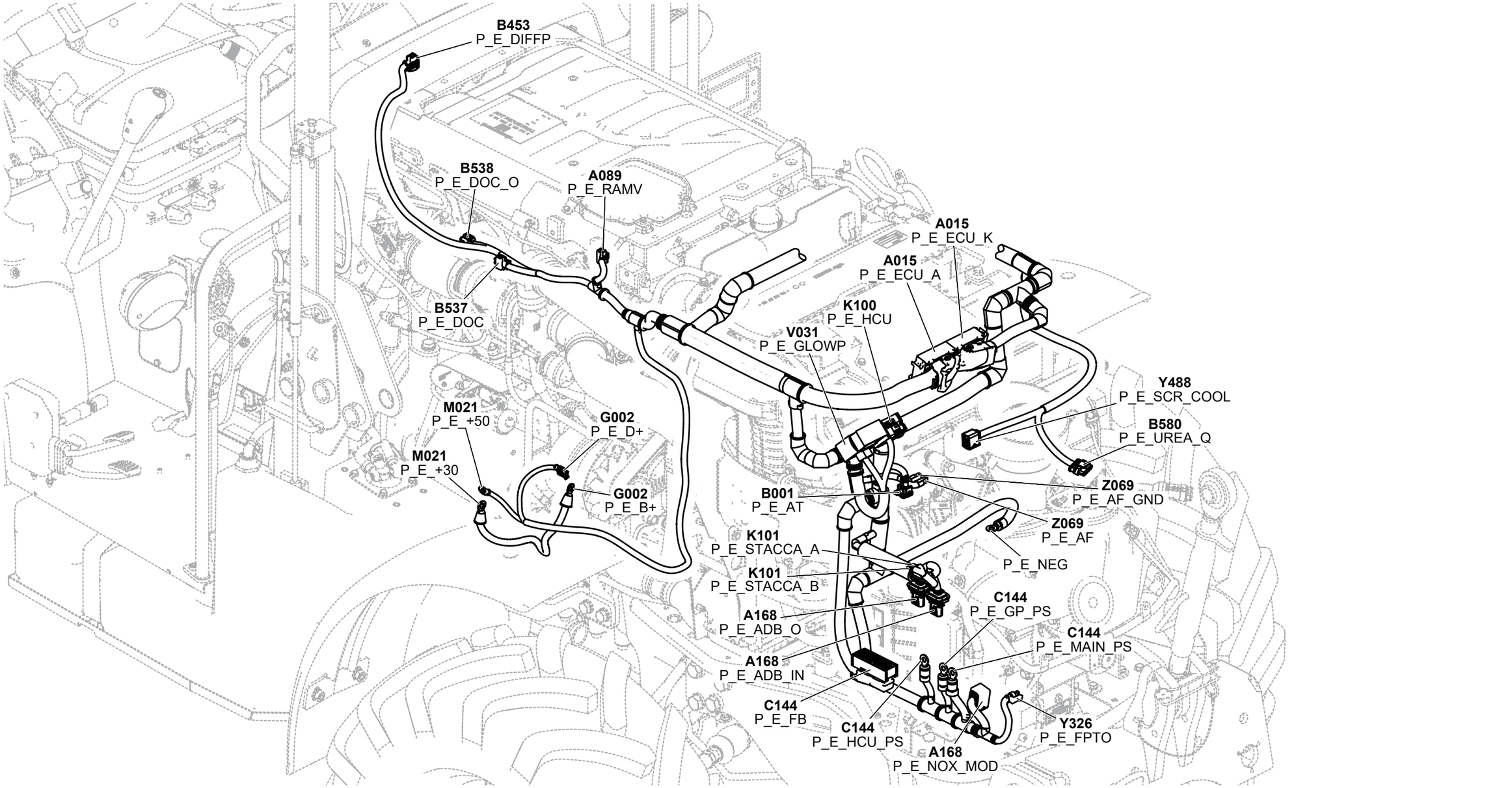
### 9.1.2.2 OOS 100Hp Models

#### 9.1.2.2.1 W02 - ENGINE WIRING HARNESS_LH



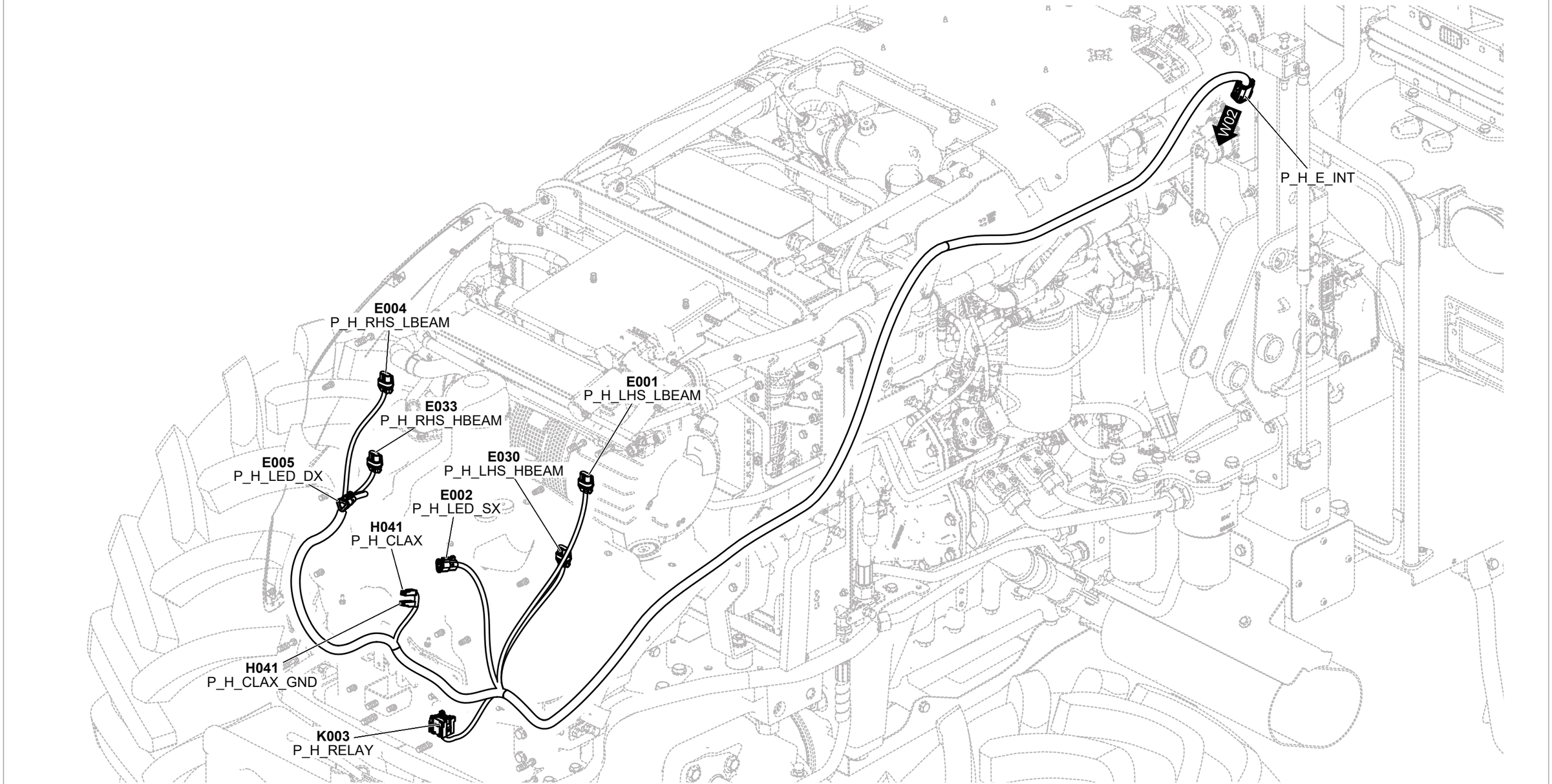

W02_VA_IN_582980_B_0_LH_20221122

### 9.1.2.2.2 W02 - ENGINE WIRING HARNESS_RH



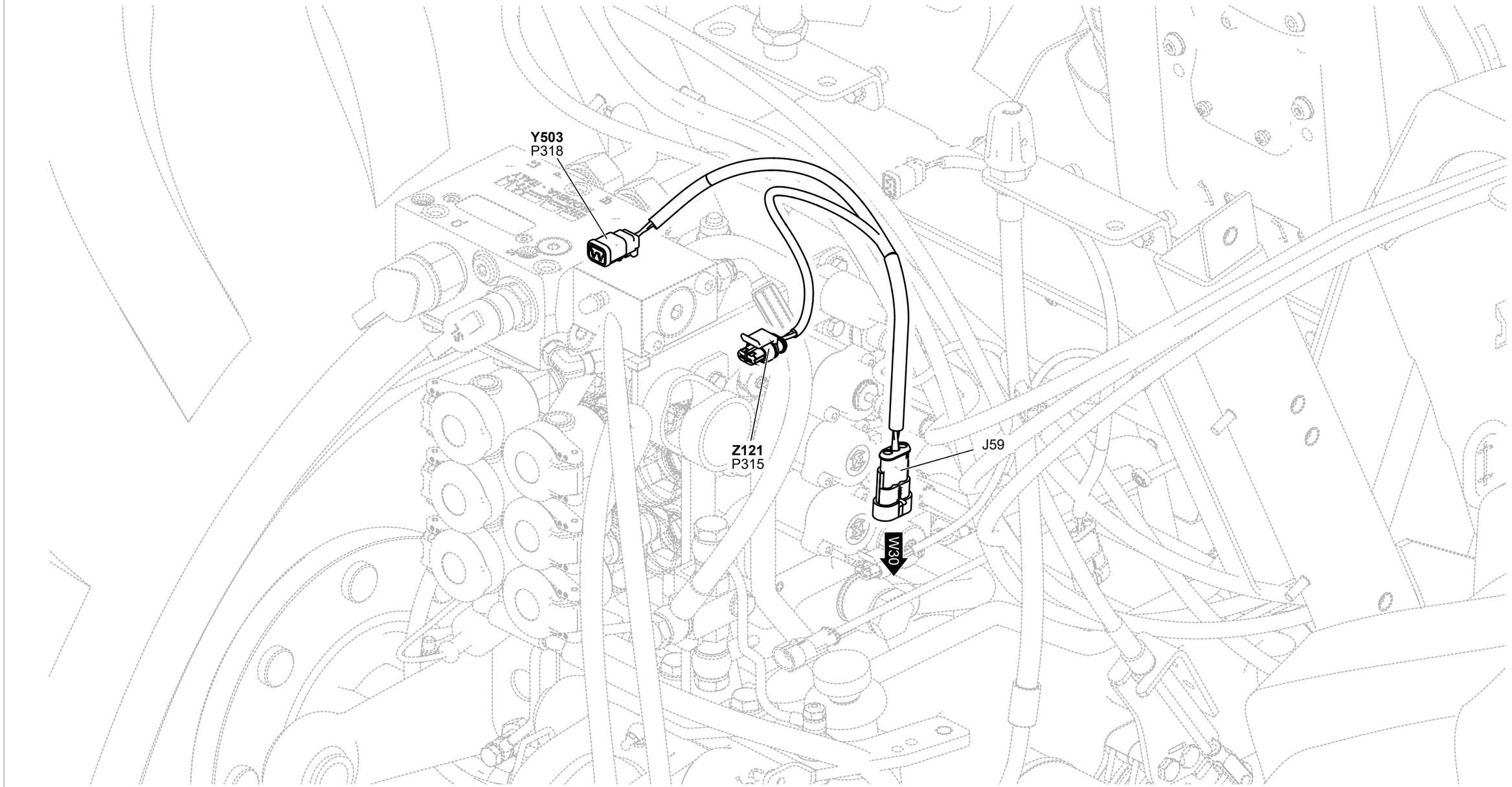

W02_VA_IN_582980_B_0_RH_20221122

### 9.1.2.2.3 W05 - HOOD WIRING HARNESS



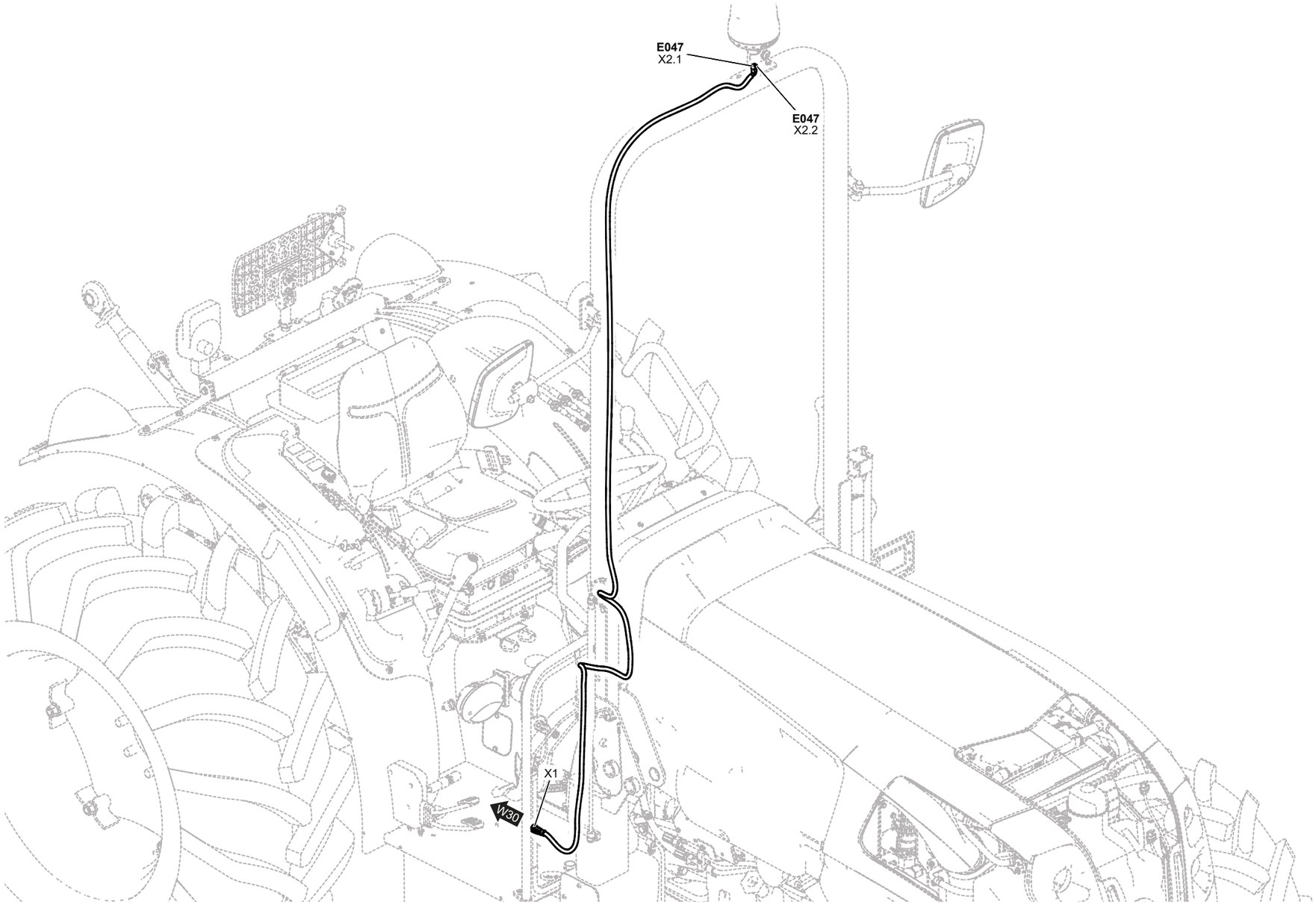

W05_VA_IN_581633_B_0_20221103

## 9.1.2.2.4 W06 - TRAILER BRAKE VALVE WIRING HARNESS



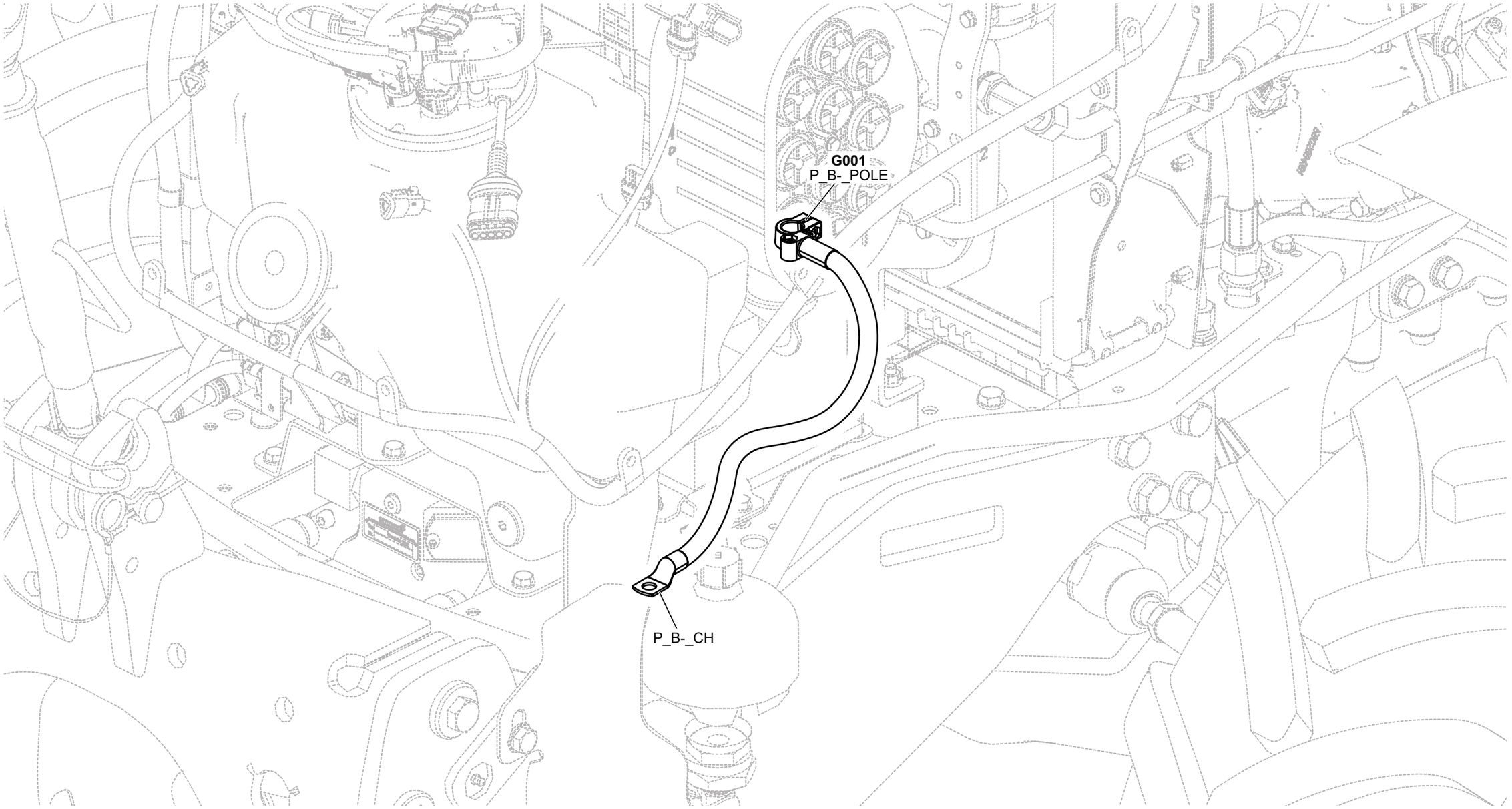

W06_VA_IN_522591_B_0_20221103

## 9.1.2.2.5 W17 - PLATFORM BEACON LIGHT WIRING HARNESS



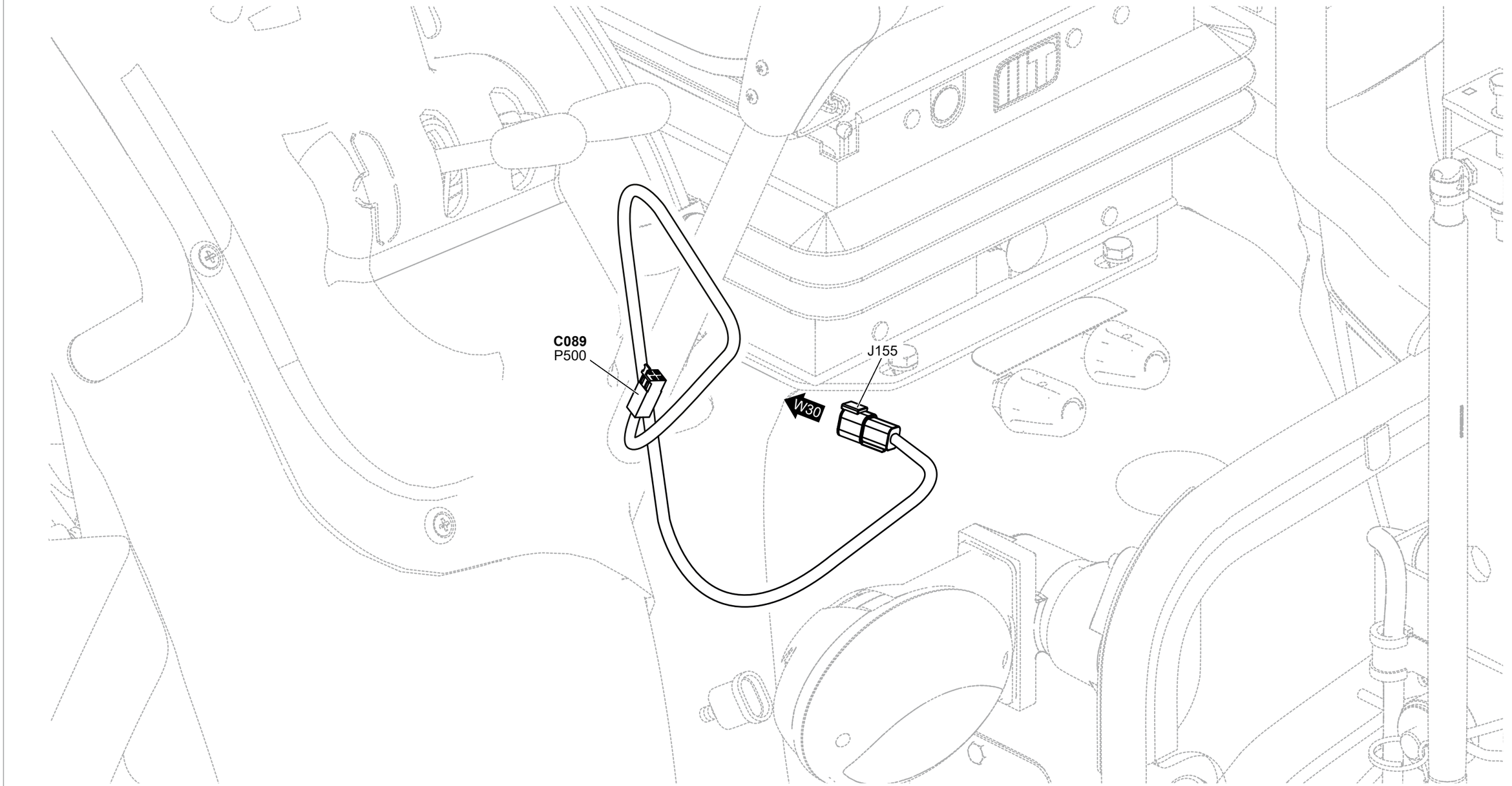

W17_VA_IN_496749_B_0_20221118

### 9.1.2.2.6 W22 - NEGATIVE BATTERY CABLE



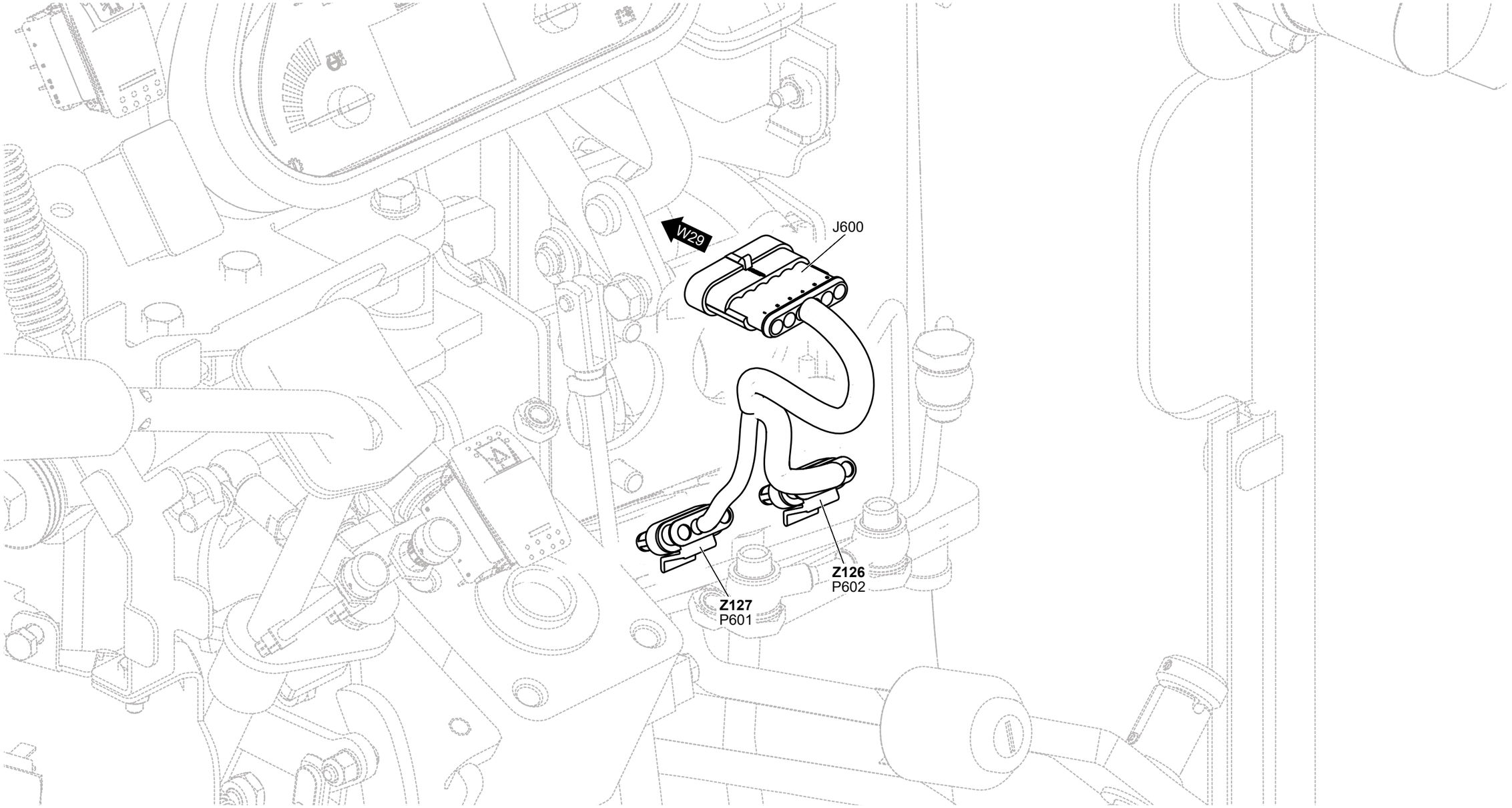

W22_VA_IN_527502_B_0_20221117

### 9.1.2.2.7 W25 - HI-LO ELECTRIC CABLE



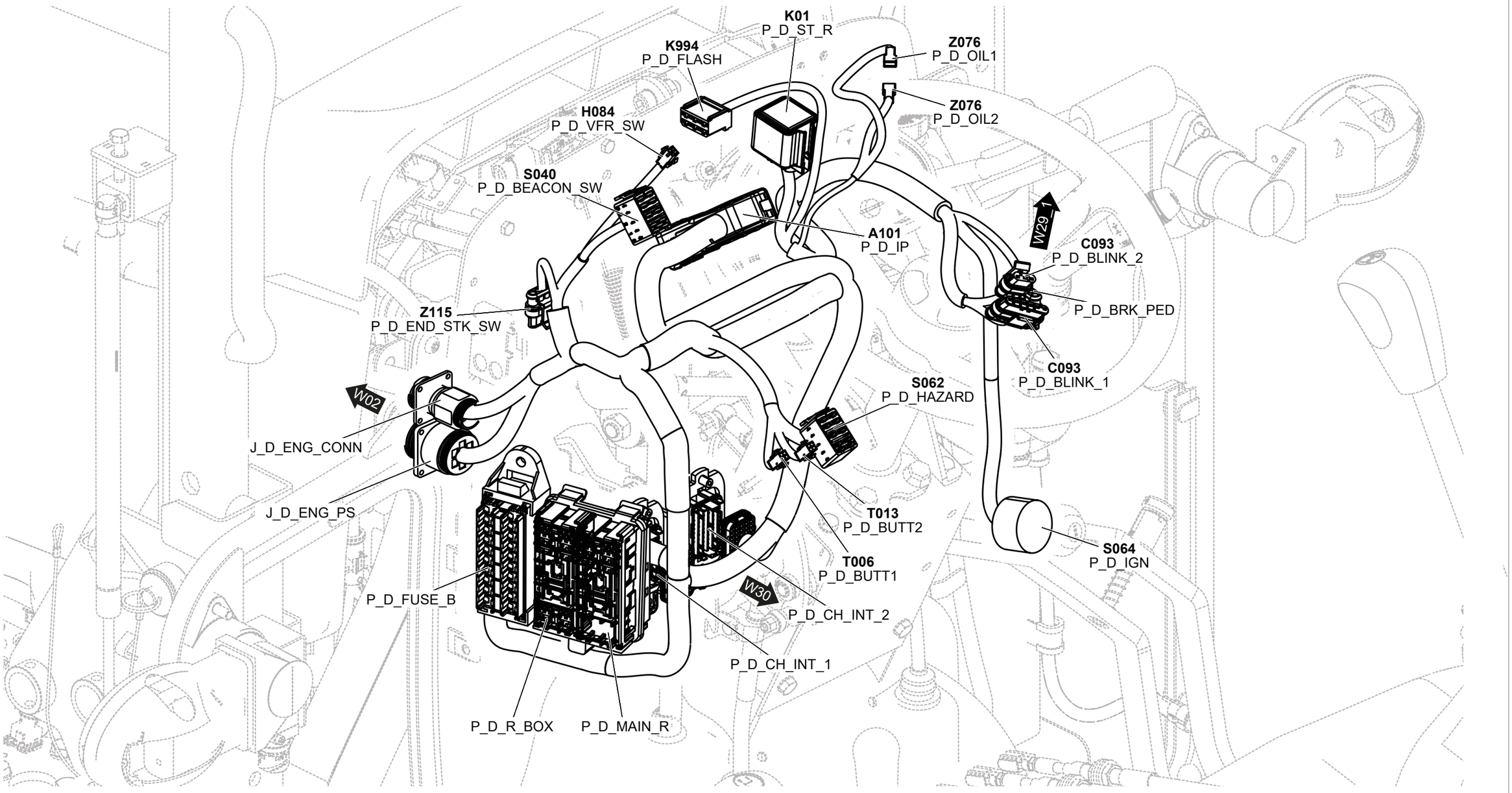

W25_VA_IN_473558_B_2_20221123

## 9.1.2.2.8 W29 - DASHBOARD CONTROLS WIRING HARNESS



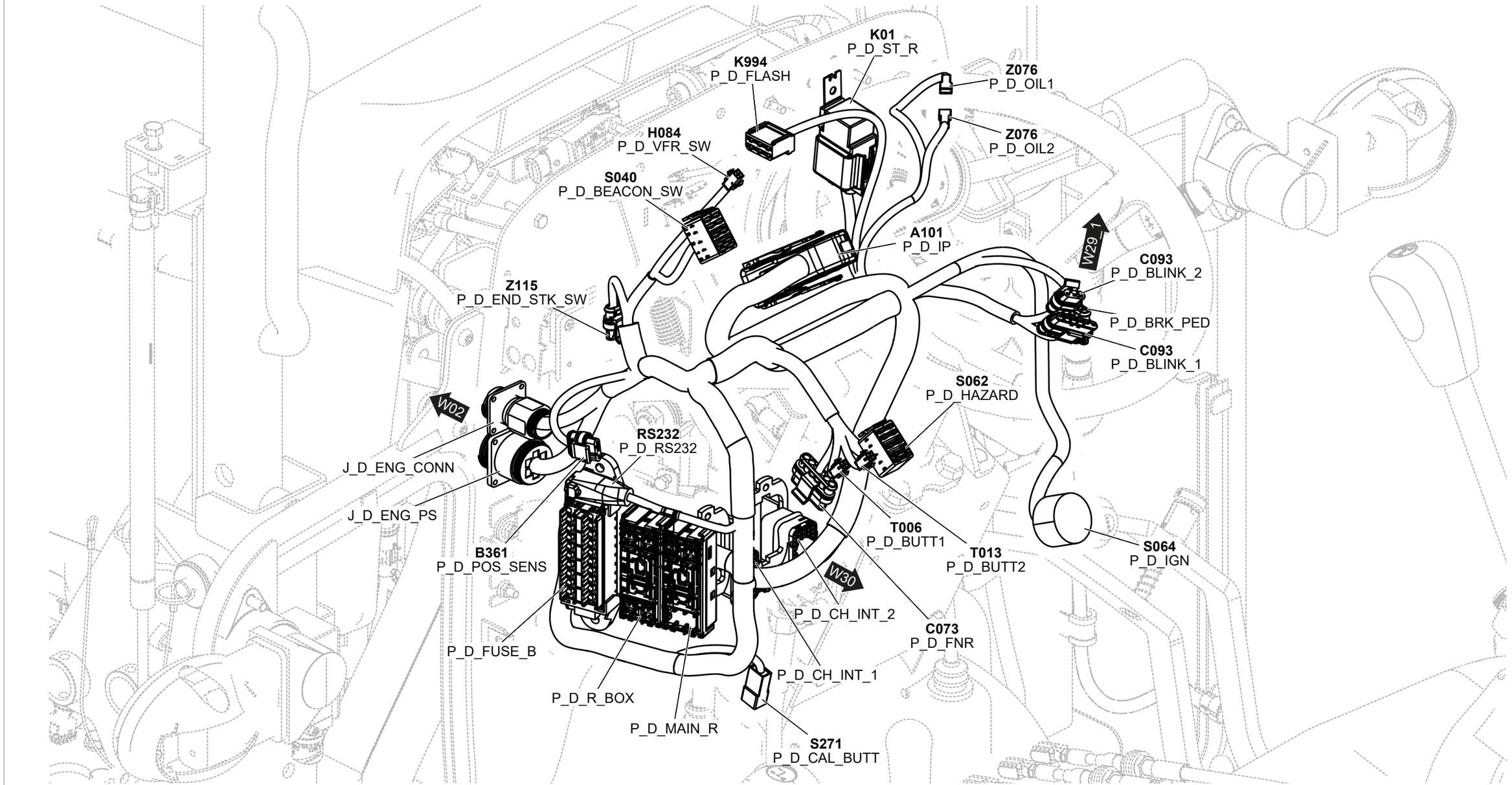

W29_1_VA_IN_464658_B_0_20221103

### 9.1.2.2.9 W29 - DASHBOARD CONTROLS WIRING HARNESS



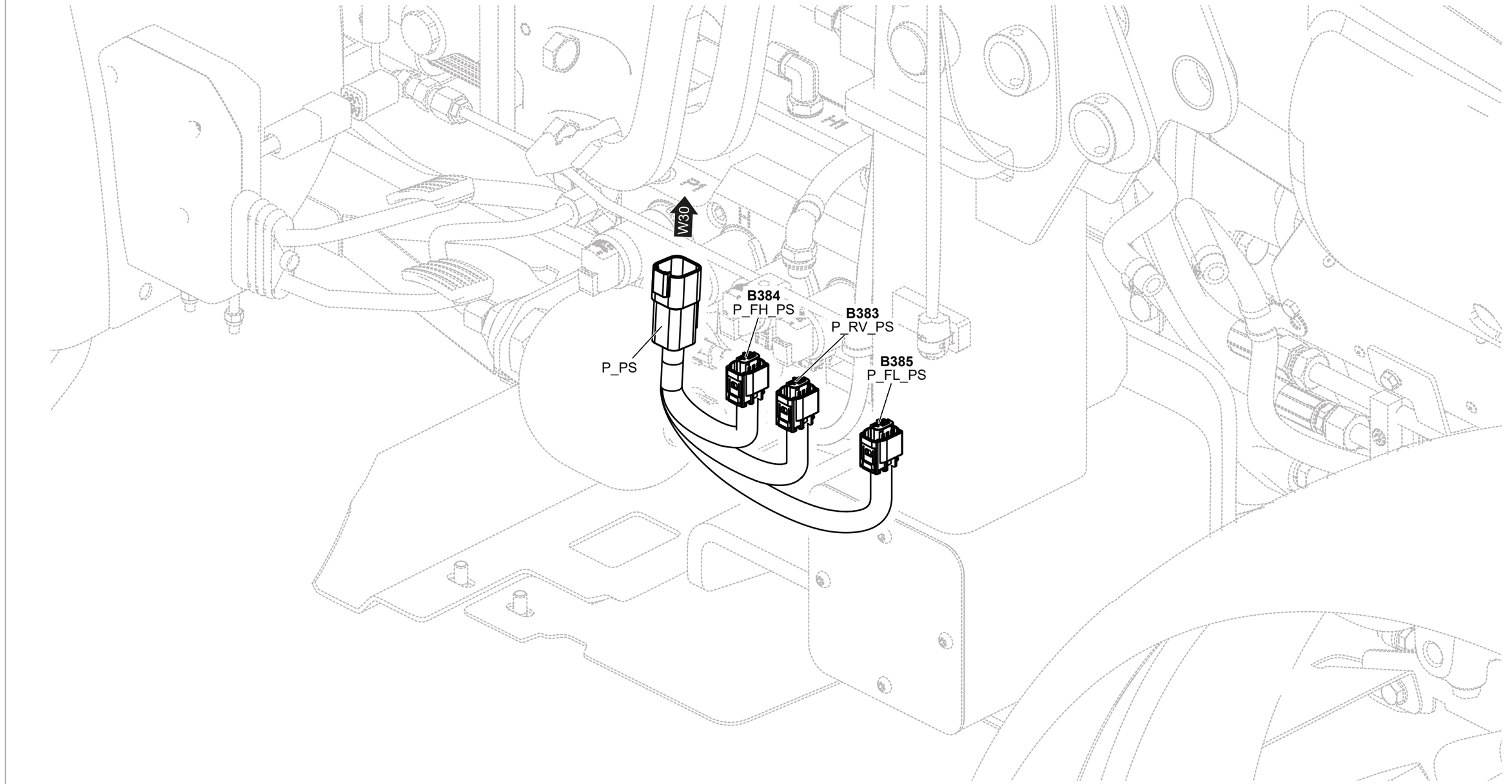

W29_VA_IN_581631_B_1_20221103

### 9.1.2.2.10 W29_1 - BRAKE SWITCHES WIRING HARNESS

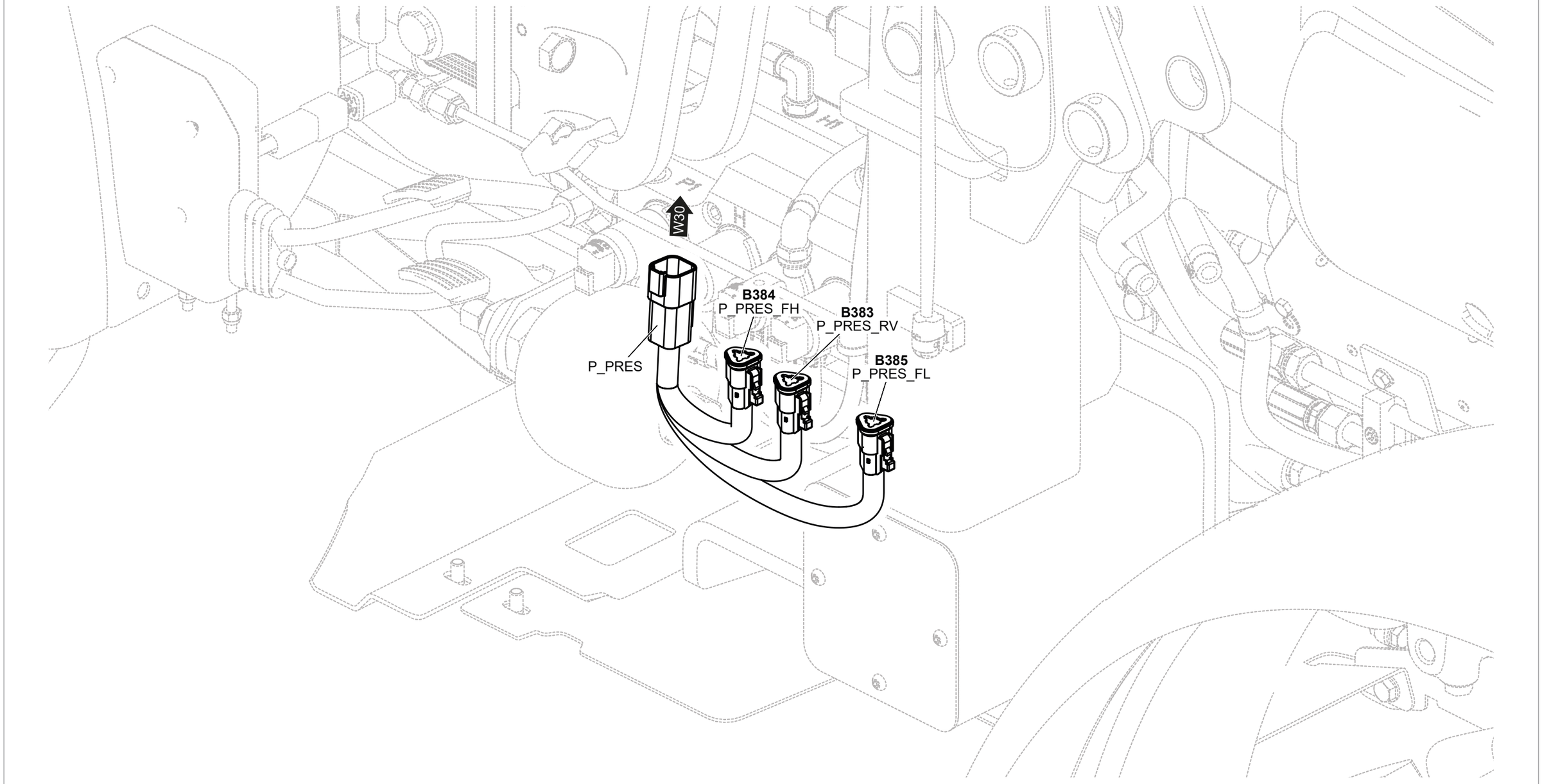



W29_VA_IN_581638_B_2_20221103

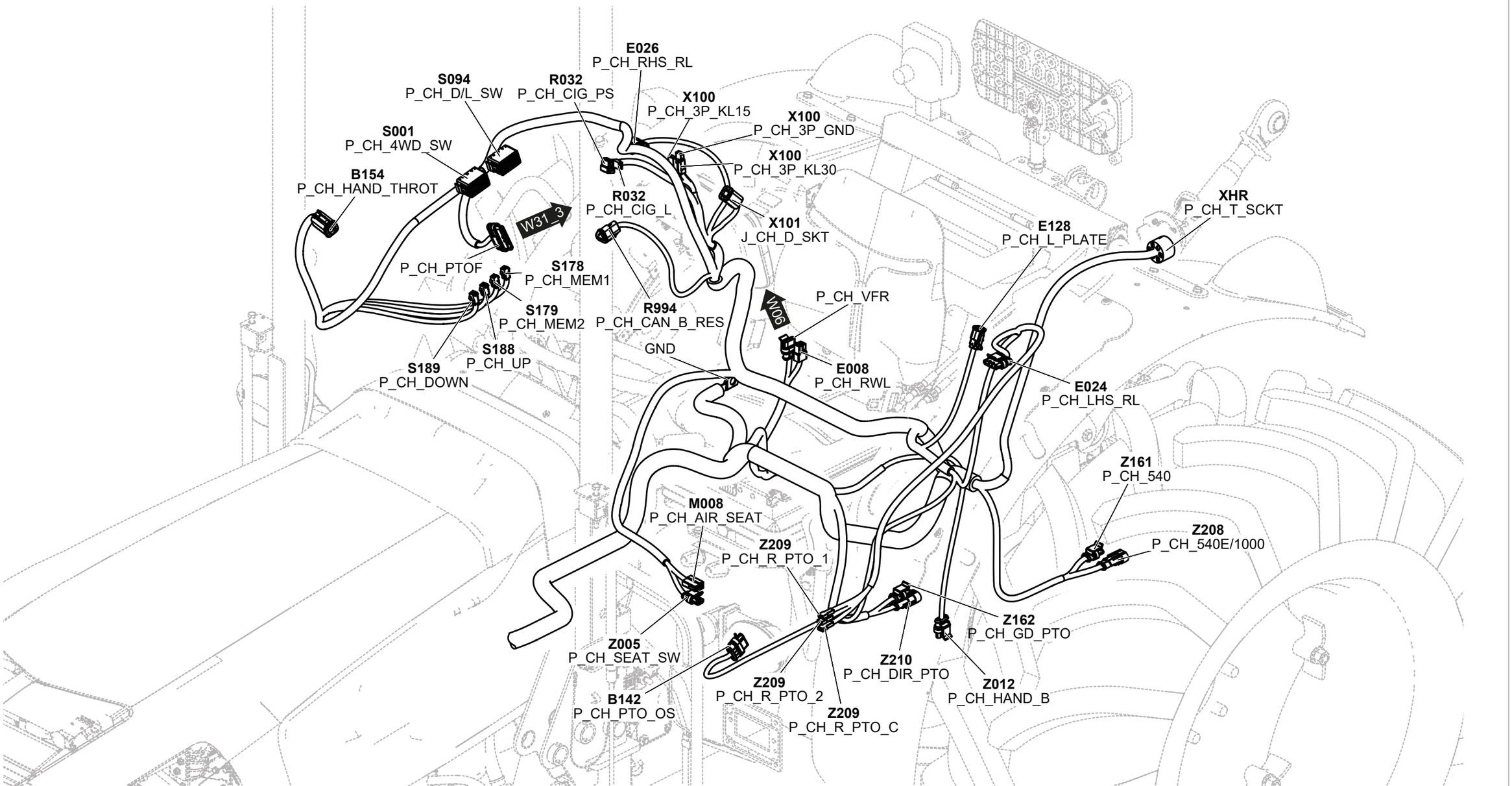
## 9.1.2.2.11 W30 - TRANSMISSION WIRING HARNESS_LH



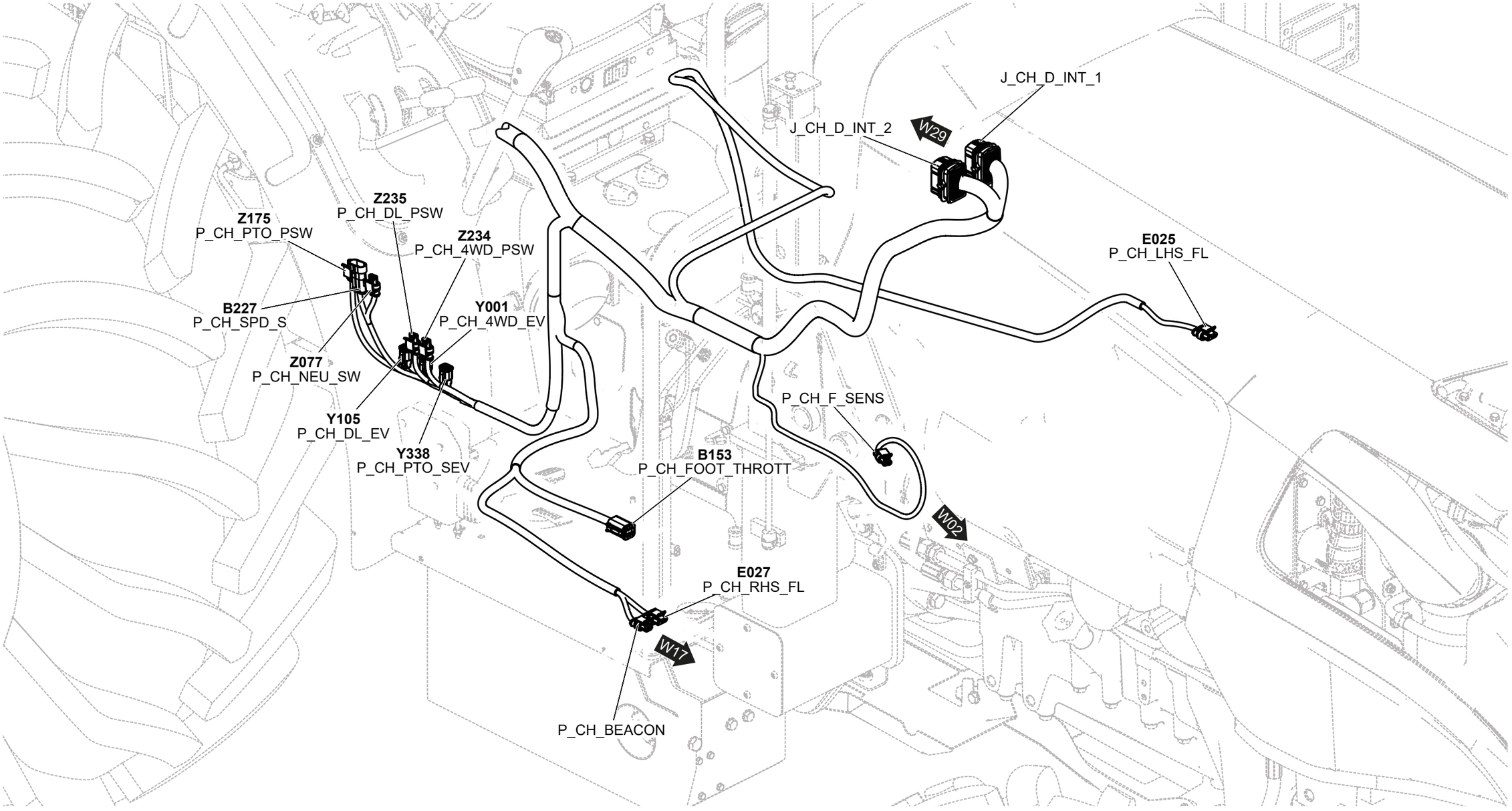

W30_3_VA_IN_585301_B_2_20221117




W30_3_VA_IN_587108_B_2_20221117

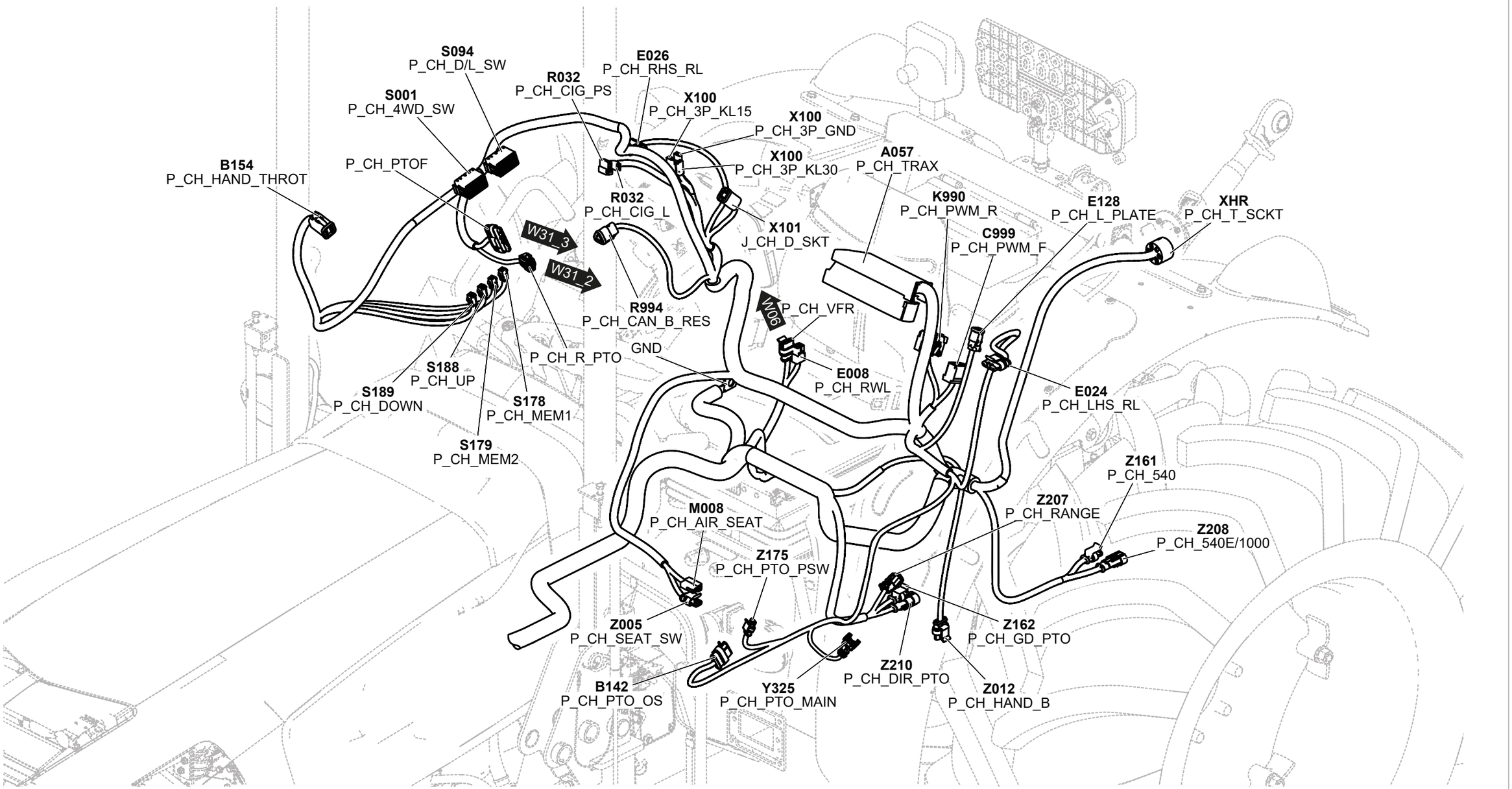



W30_VA_IN_581629_B_1_LH_20221121

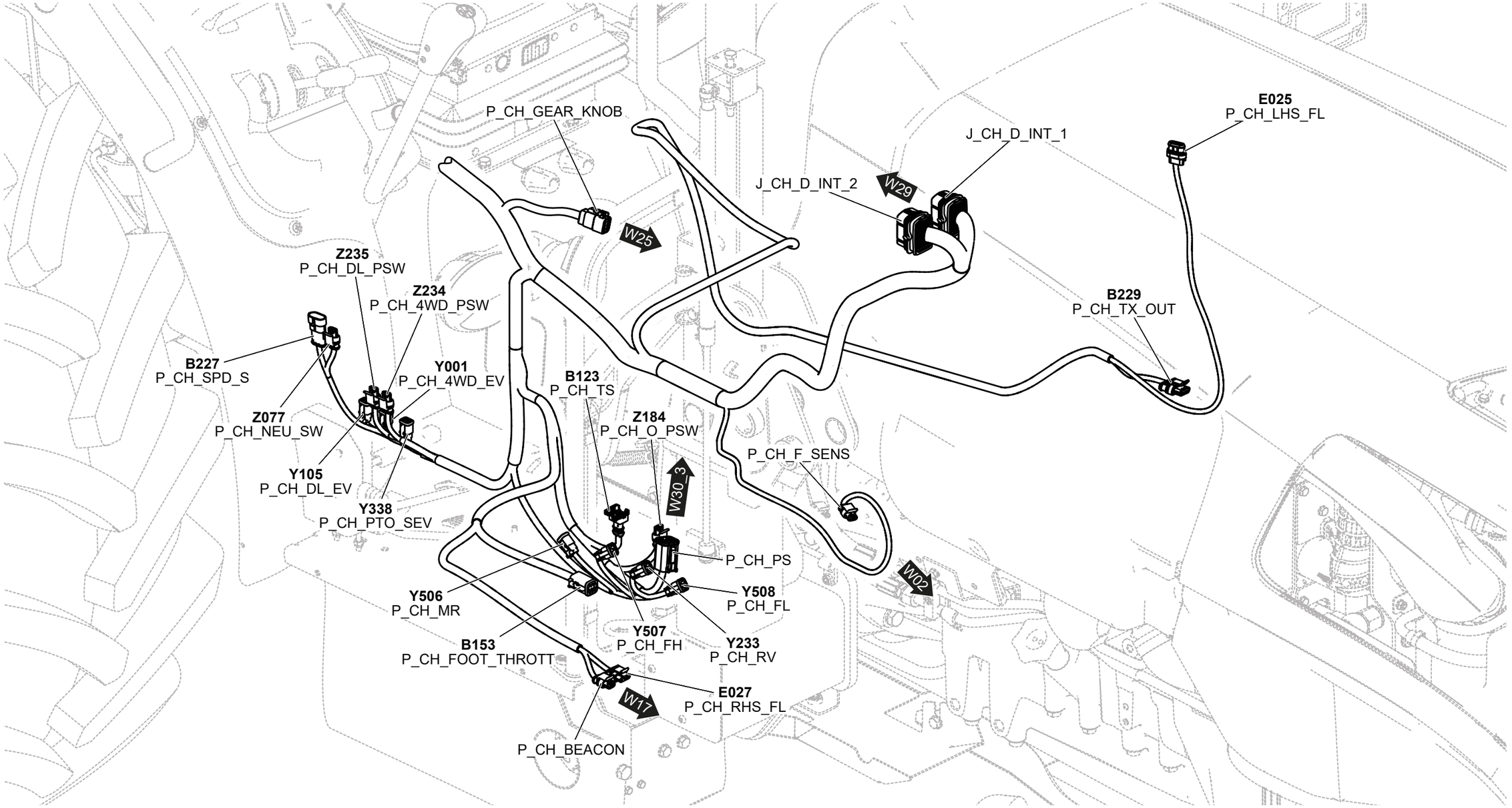



W30_VA_IN_581629_B_1_RH_20221121

### 9.1.2.2.15 W30_3 - TRANSMISSION PRESSURE SWITCHES WIRING HARNESS

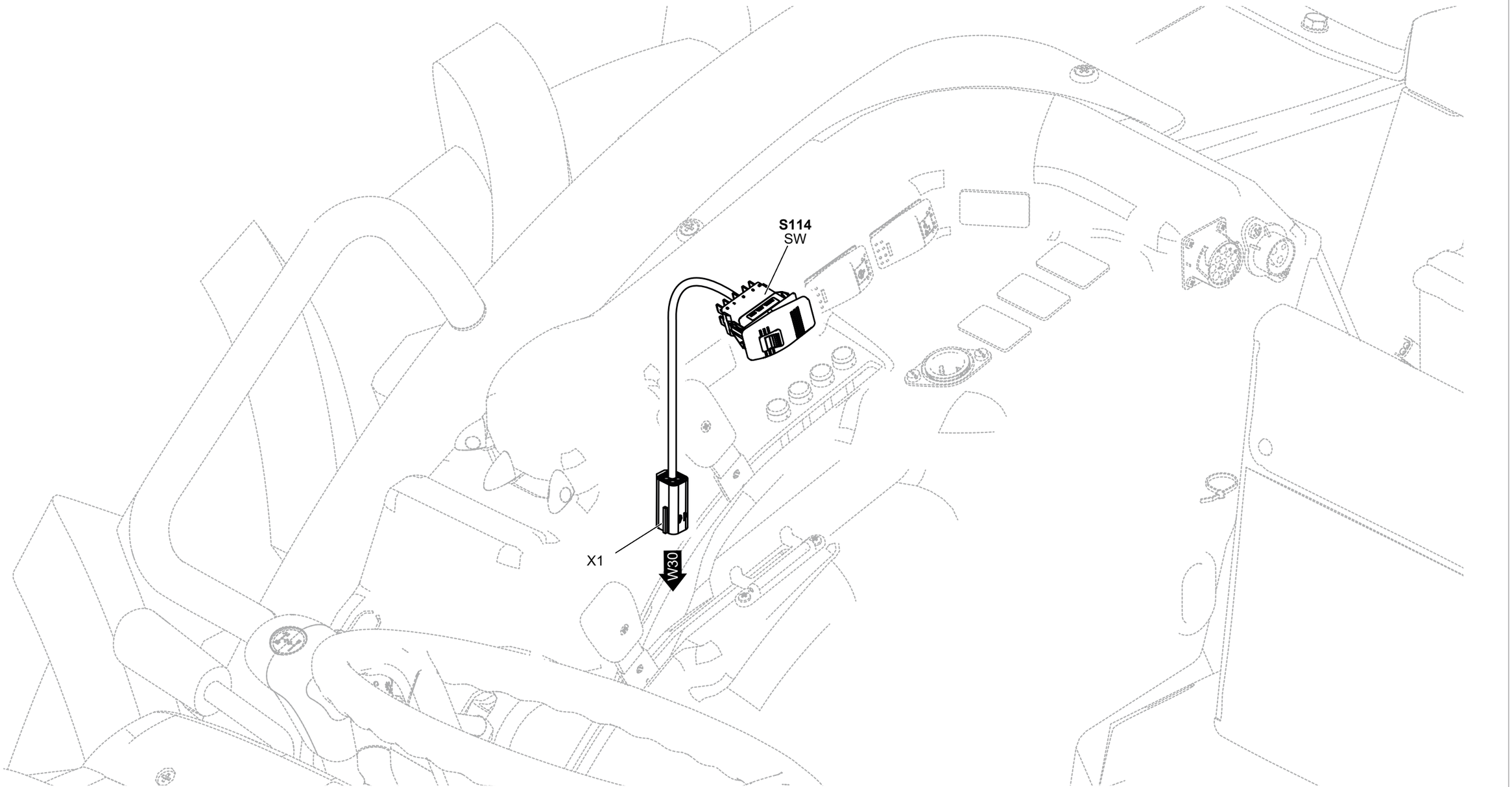



W30_VA_IN_581636_B_2_LH_20221122

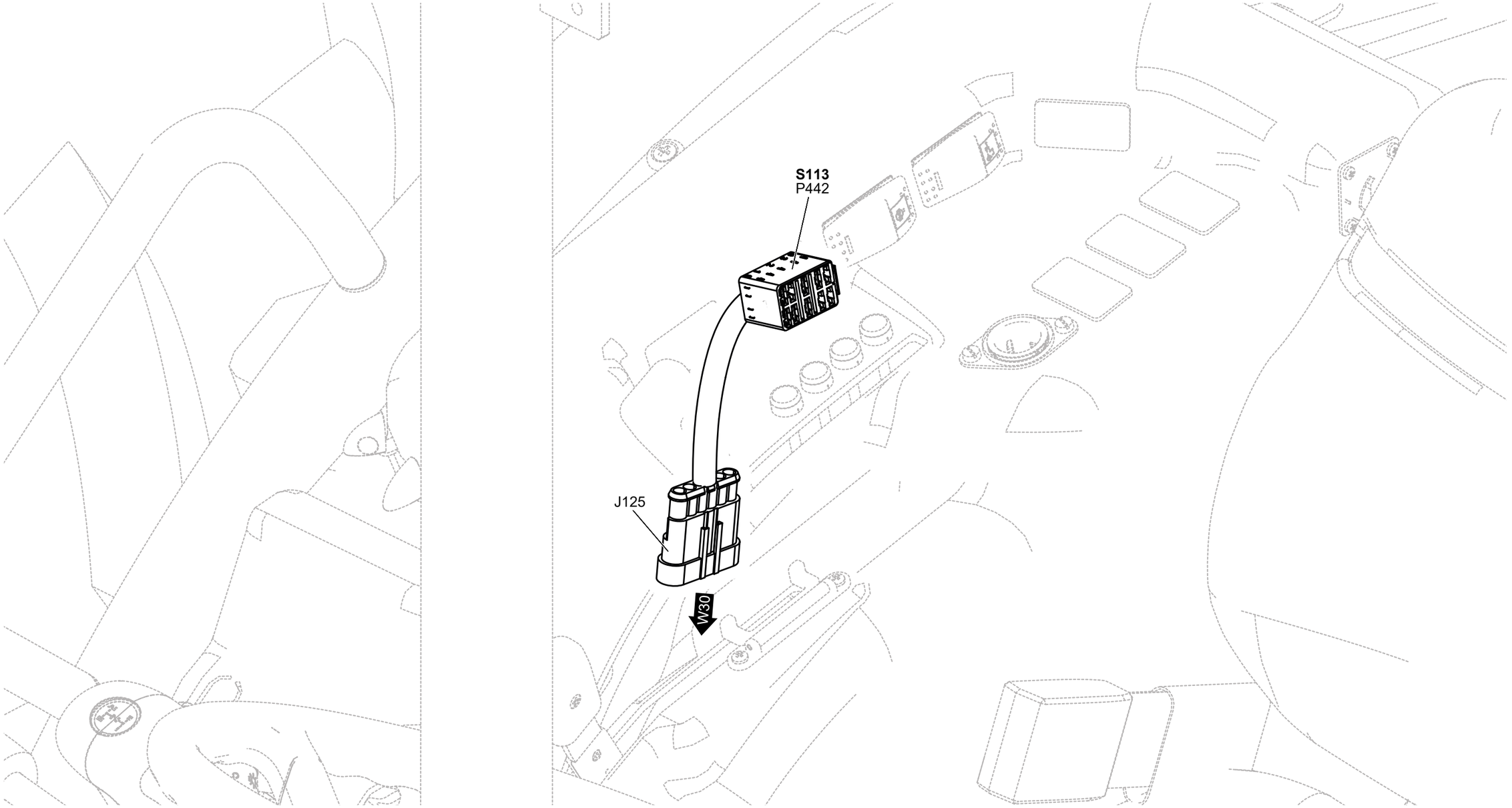



W30_VA_IN_581636_B_2_RH_20221122

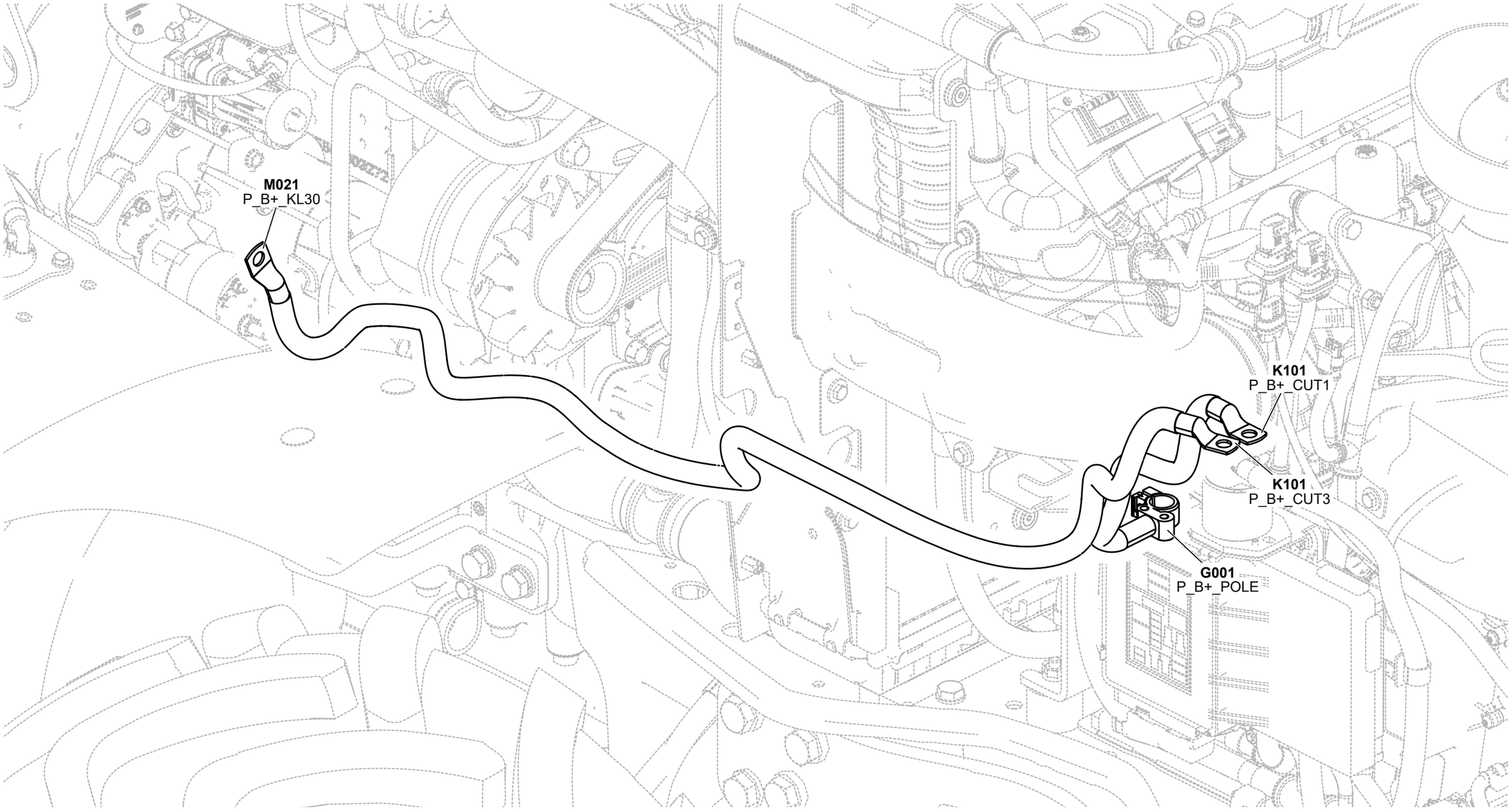
## 9.1.2.2.17 W31_2 - REAR PTO SWITCH WIRING HARNESS



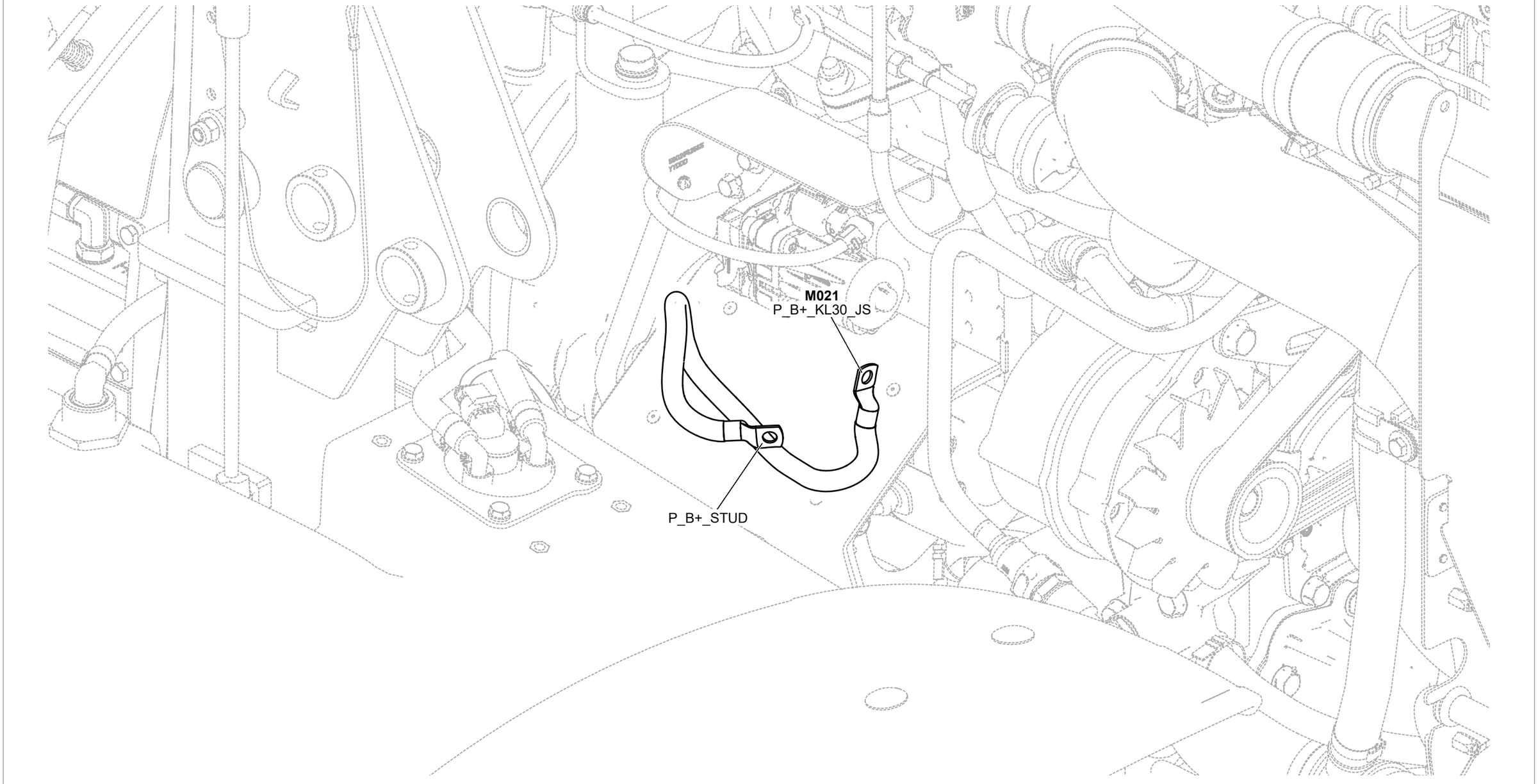

W31_2_VA_IN_397198_B_2_20221124




W31_3_VA_IN_569990_B_0_20221118

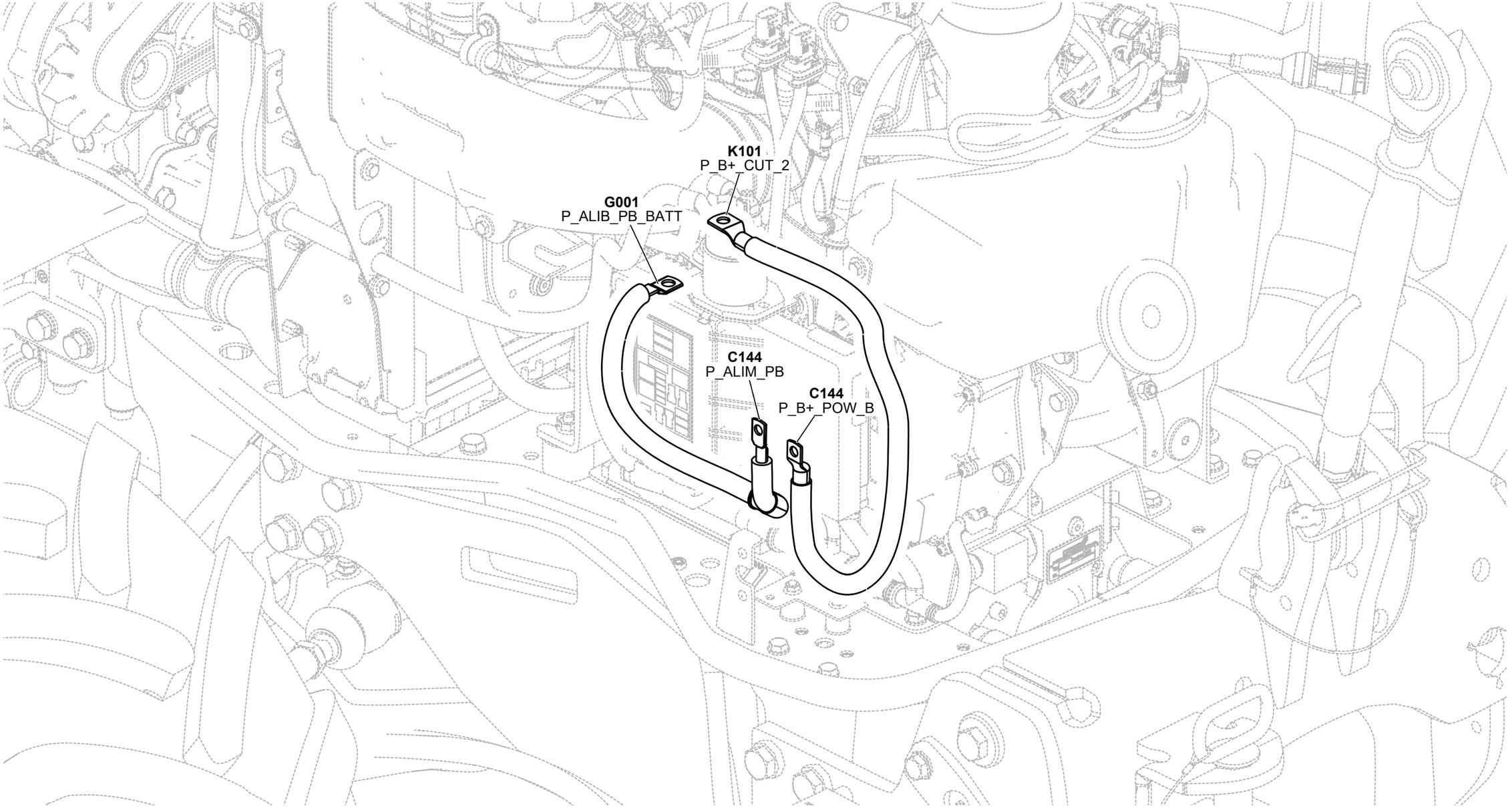



W45_1_VA_IN_565325_B_0_20221117




W45_2_VA_IN_552957_B_0_20221123

### 9.1.2.2.21 W45_2 - START ELECTRIC CABLES

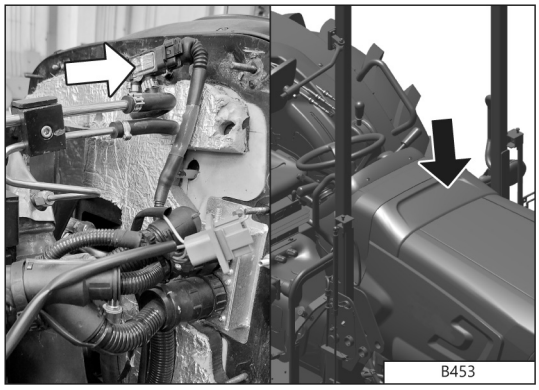



W45_VA_IN_565326_B_0_20221118

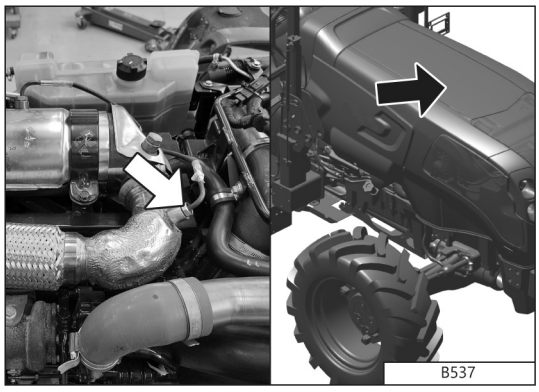
## 9.1.3. Component Locations

### 9.1.3.1 75Hp models

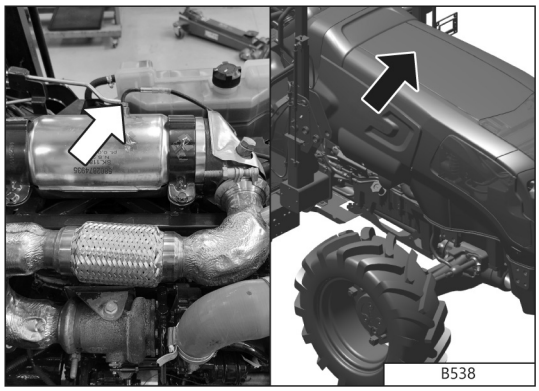
#### 9.1.3.1.1 B453 - Delta pressure sensor (Under75cv)



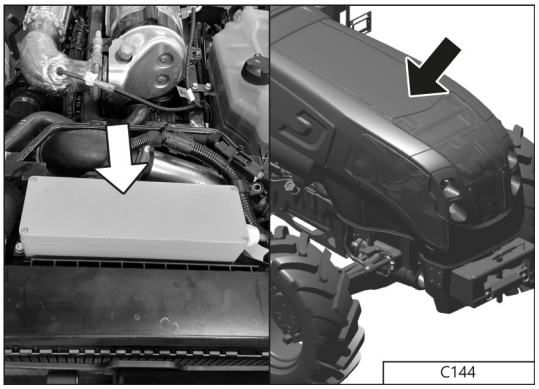

#### 9.1.3.1.2 B537 - DOC catalyser inlet temperature sensor (Under75cv)



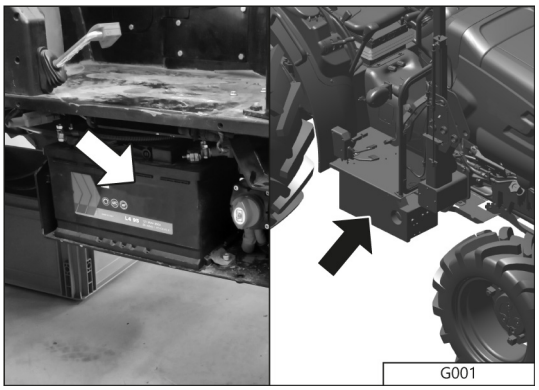

#### 9.1.3.1.3 B538 - DOC catalytic outlet temperature sensor (Under75cv)



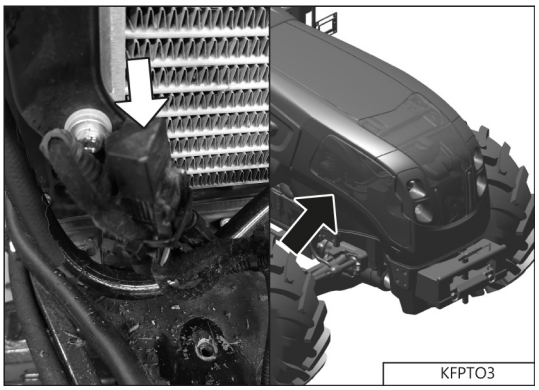

#### 9.1.3.1.4 C144 - Main fuse box (Under75cv)



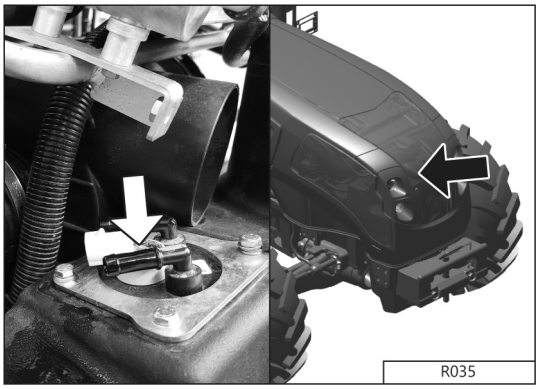

#### 9.1.3.1.5 G001 - Battery (Under 75cv) (Under-75cv)



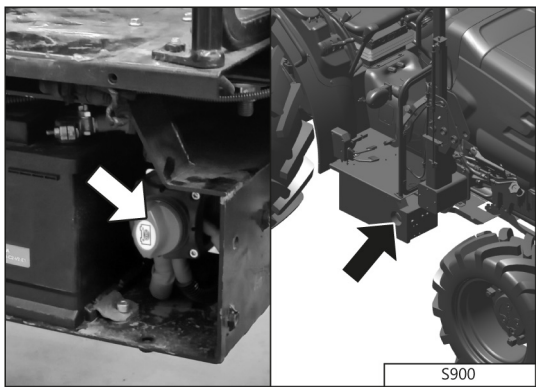

#### 9.1.3.1.6 KFPTO3 - Front PTO interlock relay (Under75cv)



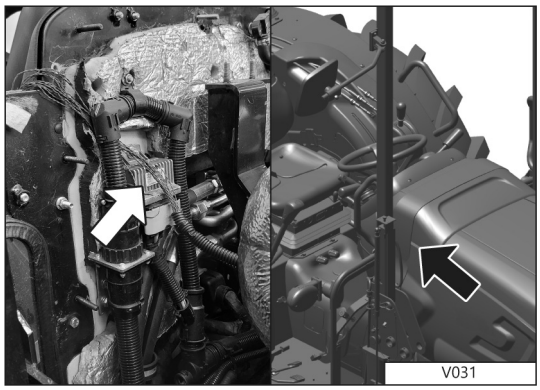

#### 9.1.3.1.7 R035 - Fuel level sensor (Under75cv)



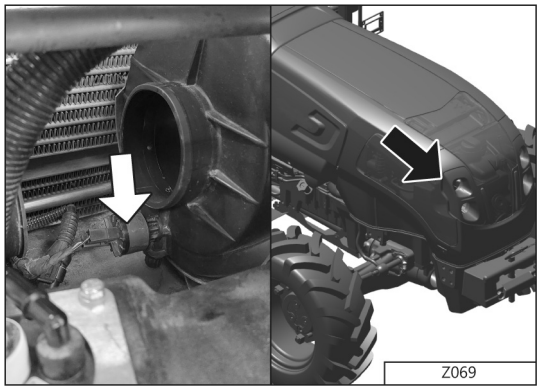
### 9.1.3.1.8 S900 - Battery cut-off switch (Under 75cv)




### 9.1.3.1.9 V031 - Glow plug ECU (Under 75cv)

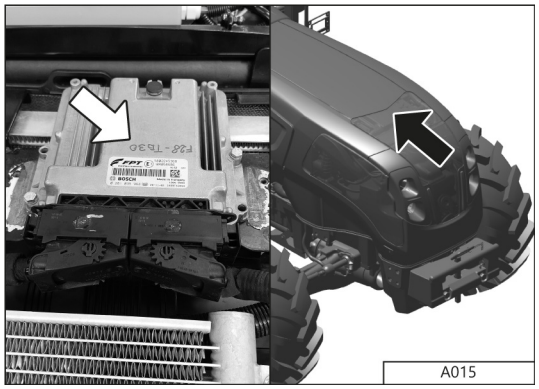



### 9.1.3.1.10 Z069 - Air filter switch (Under75cv)

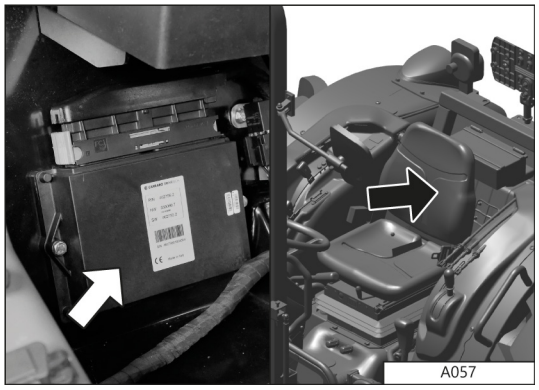


## 9.1.3.2 75Hp and 100Hp models

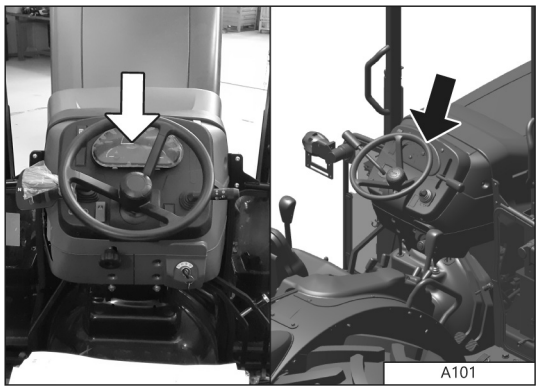
### 9.1.3.2.1 A015 - Engine control unit



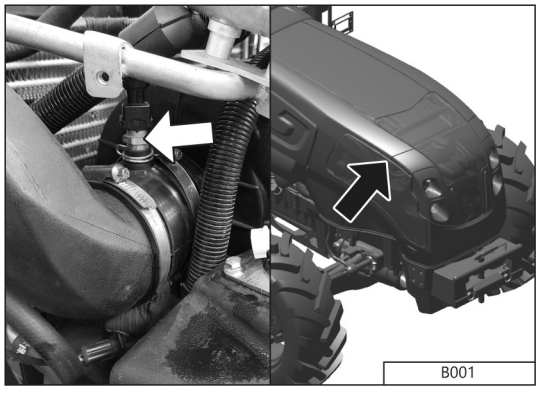

### 9.1.3.2.2 A057 - Transmission control unit



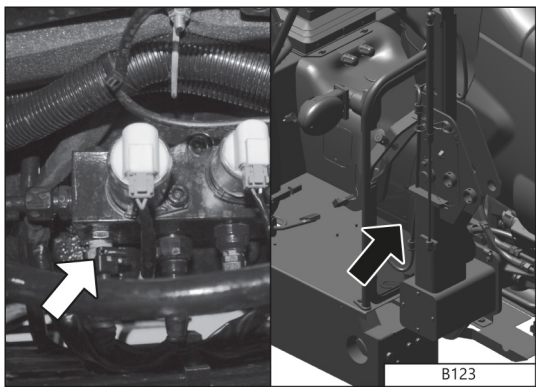

### 9.1.3.2.3 A101 - Instrument panel



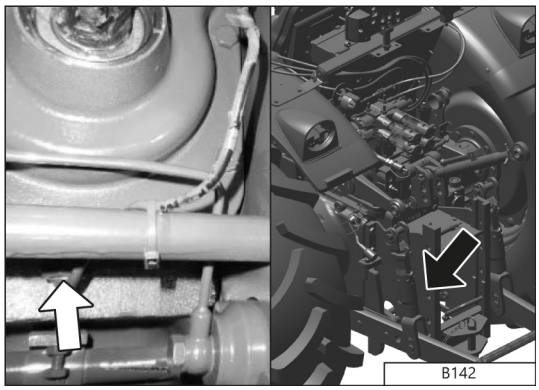

### 9.1.3.2.4 B001 - Air temperature sensor



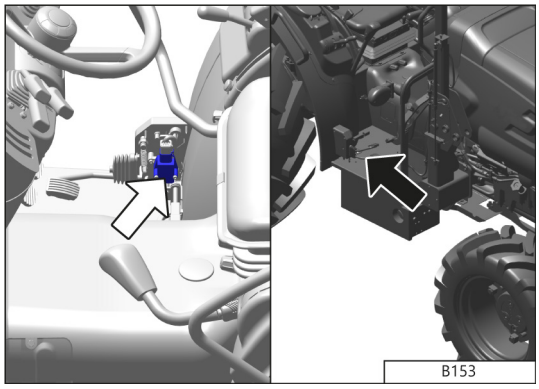

### 9.1.3.2.5 B123 - Transmission oil temperature sensor



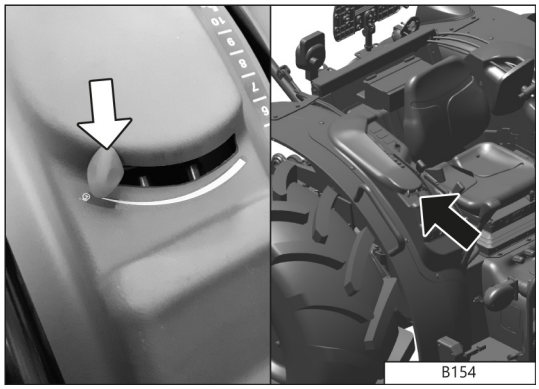

### 9.1.3.2.6 B142 - PTO shaft output sensor



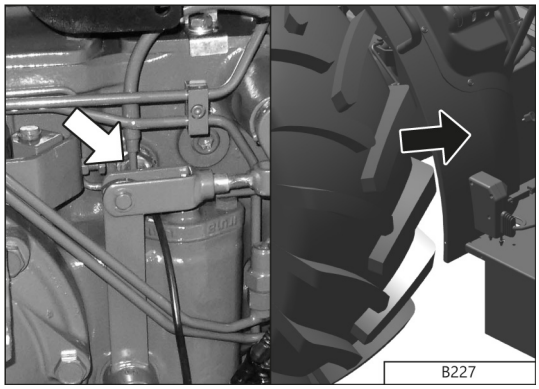

### 9.1.3.2.7 B153 - Foot throttle sensor



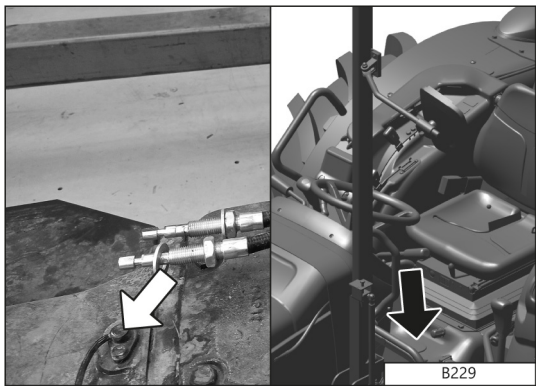

### 9.1.3.2.8 B154 - Hand throttle sensor



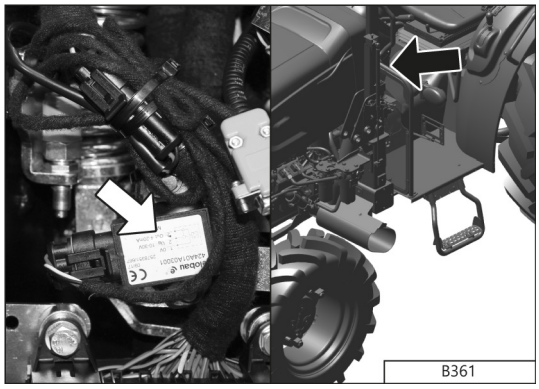
### 9.1.3.2.9 B227 - Speed Sensor



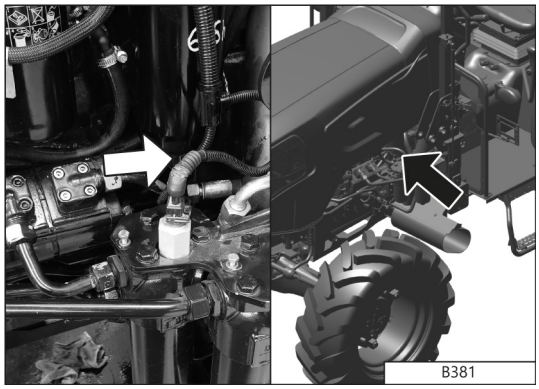

### 9.1.3.2.10 B229 - Transmission out speed signal



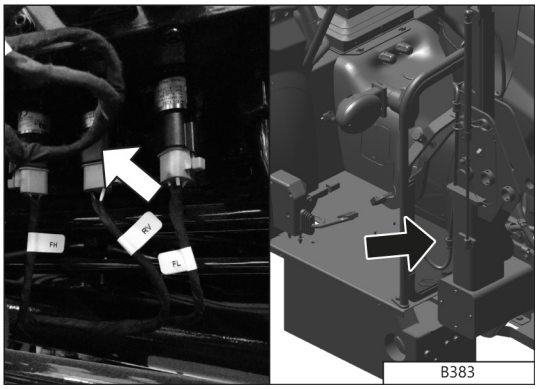

### 9.1.3.2.11 B361 - Clutch pedal position sensor



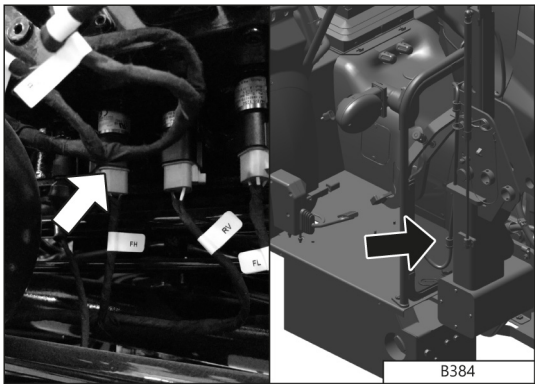

### 9.1.3.2.12 B381 - Water in fuel switch



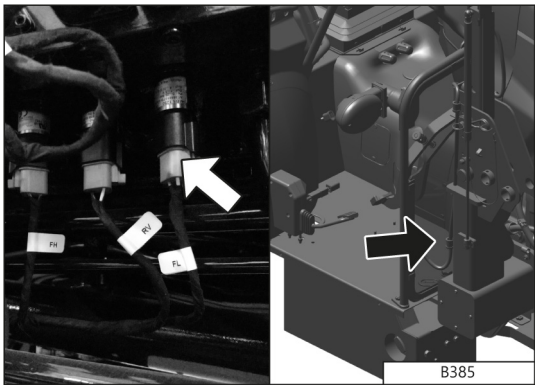

### 9.1.3.2.13 B383 - RV pressure sensor



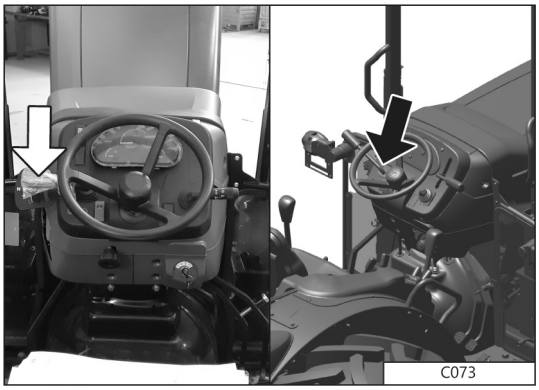

### 9.1.3.2.14 B384 - HI pressure sensor



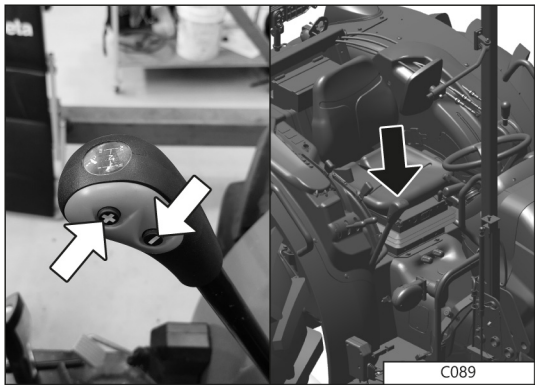

### 9.1.3.2.15 B385 - LO pressure sensor



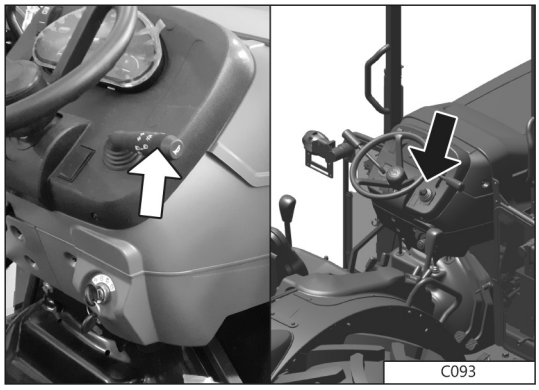

### 9.1.3.2.16 C073 - FNR lever (Power Reverser only)



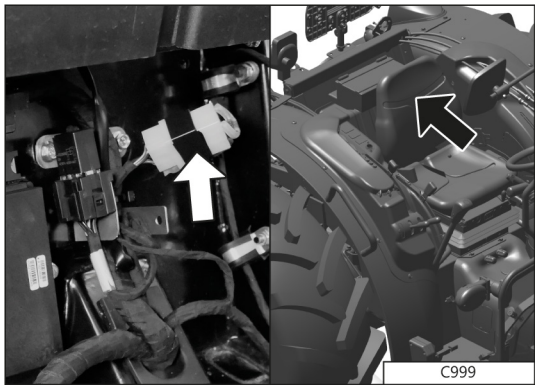
### 9.1.3.2.17 C089 - HI-LO switch



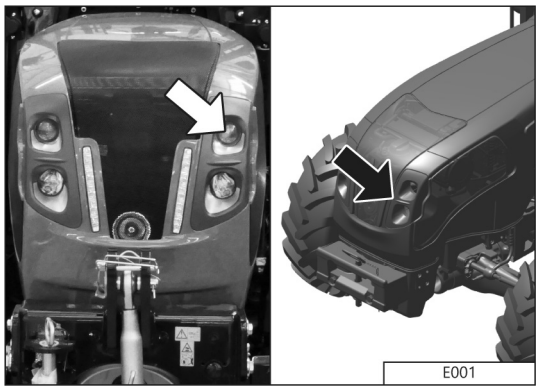

### 9.1.3.2.18 C093 - Blinker lever



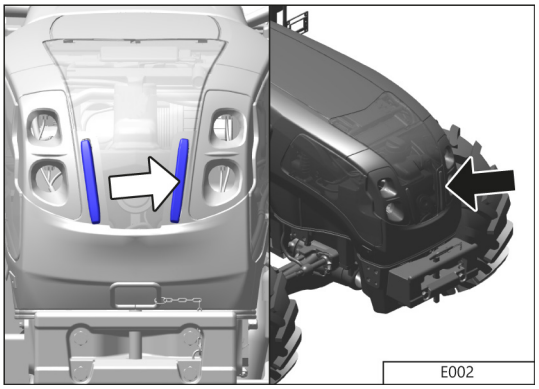

### 9.1.3.2.19 C999 - Filter LP



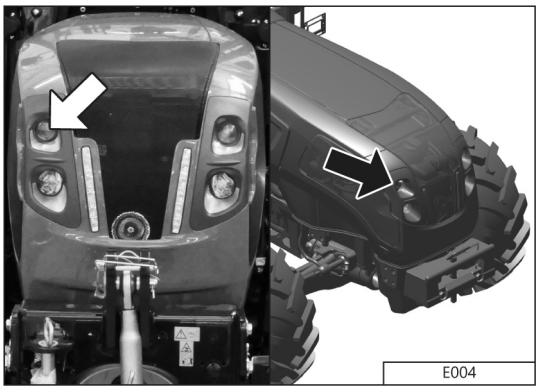

### 9.1.3.2.20 E001 - Front LH road light - Low beam



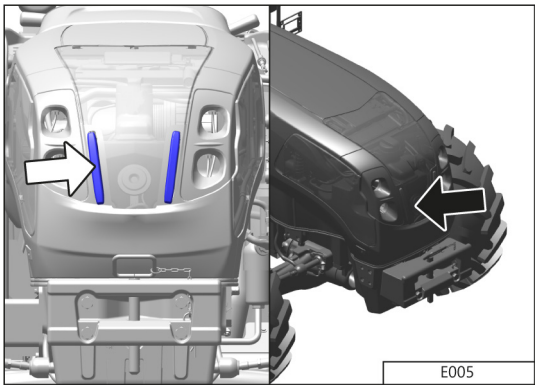

### 9.1.3.2.21 E002 - Front LH LED light



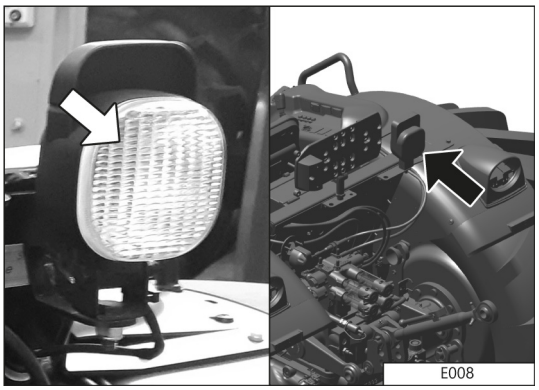

### 9.1.3.2.22 E004 - Front RH road light - Low beam



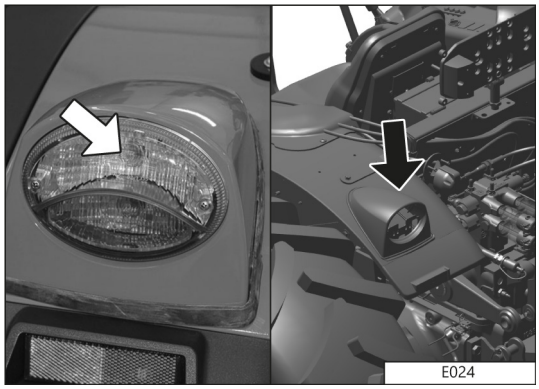

### 9.1.3.2.23 E005 - Front RH LED light



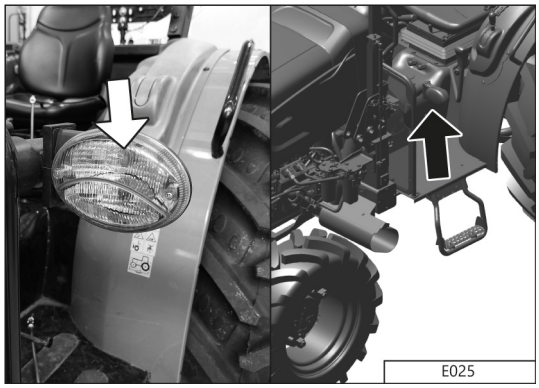

### 9.1.3.2.24 E008 - Rear work light



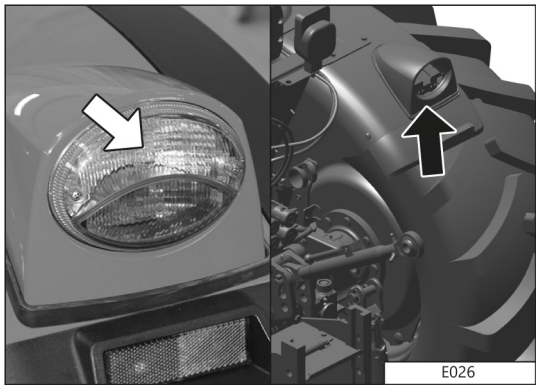
### 9.1.3.2.25 E024 - Rear LH road light



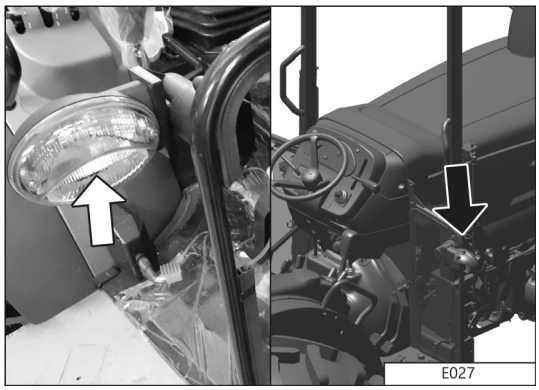

### 9.1.3.2.26 E025 - LH grabrail light



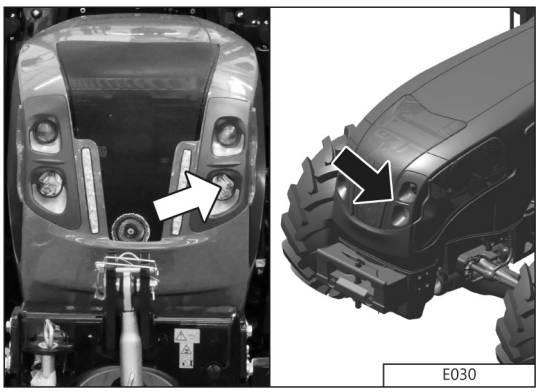

### 9.1.3.2.27 E026 - Rear RH road light



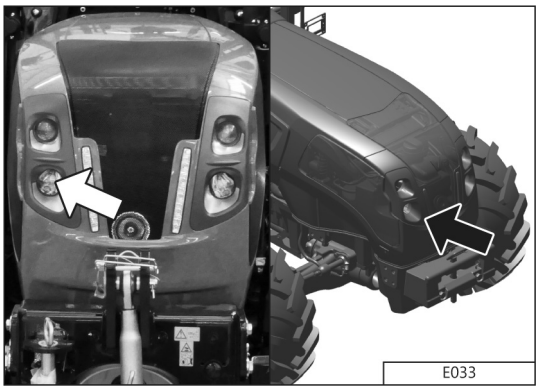

### 9.1.3.2.28 E027 - RH grabrail light




### 9.1.3.2.29 E030 - Front LH road light - High beam



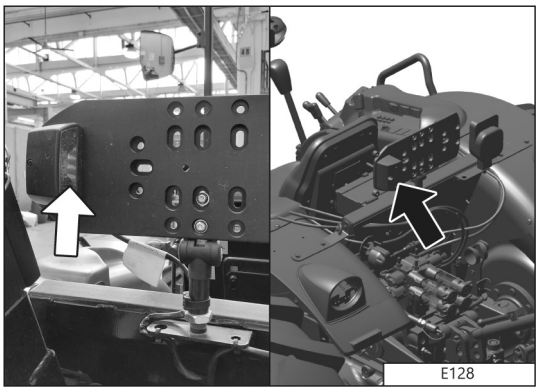

### 9.1.3.2.30 E033 - Front RH road light - High beam



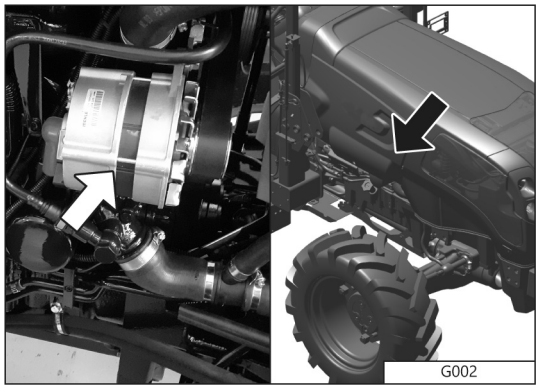

### 9.1.3.2.31 E047 - Beacon light



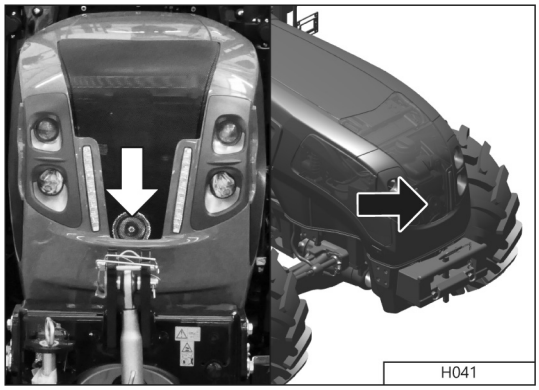

### 9.1.3.2.32 E128 - Licence plate light



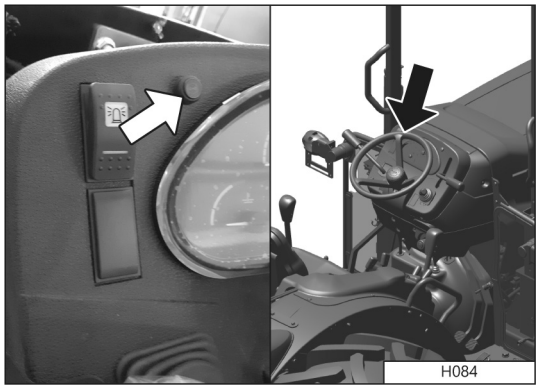
### 9.1.3.2.33 G002 - Alternator



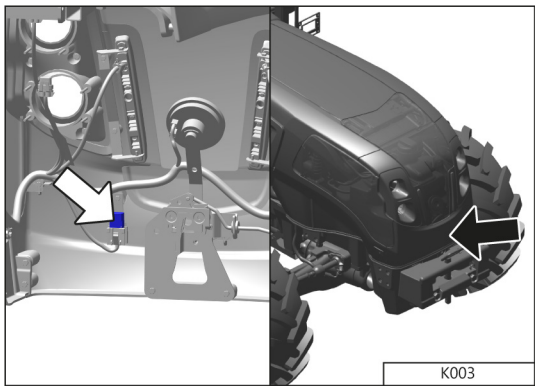

### 9.1.3.2.34 H041 - Claxon



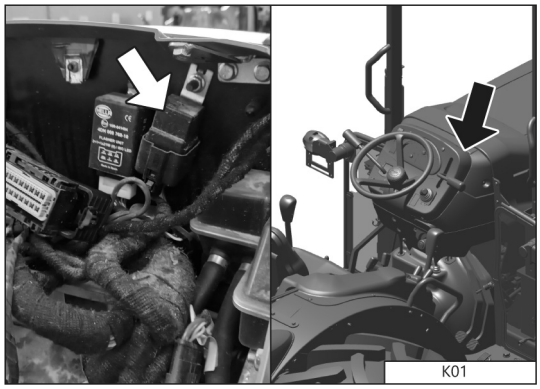

### 9.1.3.2.35 H084 - Trailer brake warning light



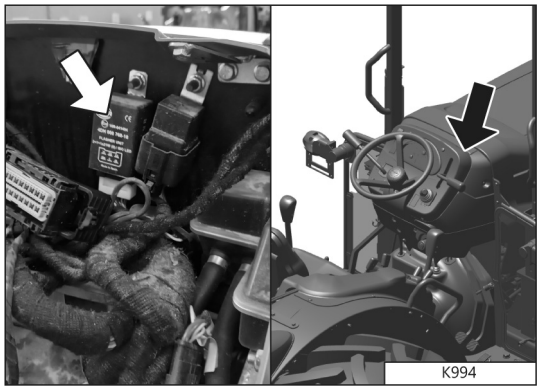

### 9.1.3.2.36 K003 - LED lights relay



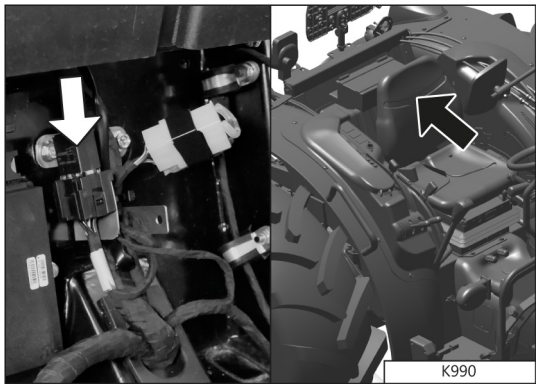

### 9.1.3.2.37 K01 - Starter relay



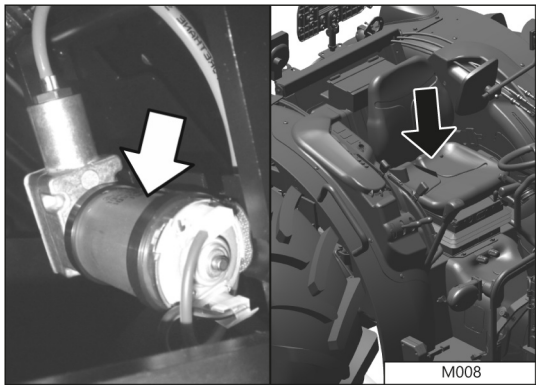

### 9.1.3.2.38 K994 - Flasher unit



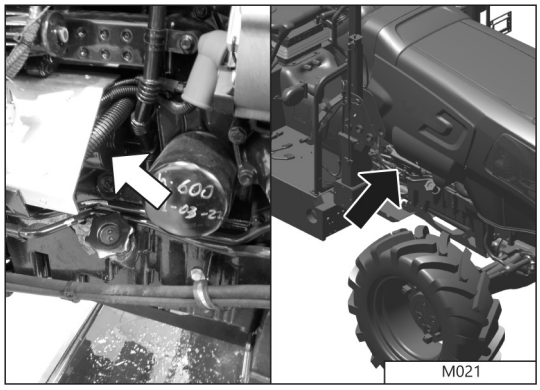

### 9.1.3.2.39 K990 - PWM enabler



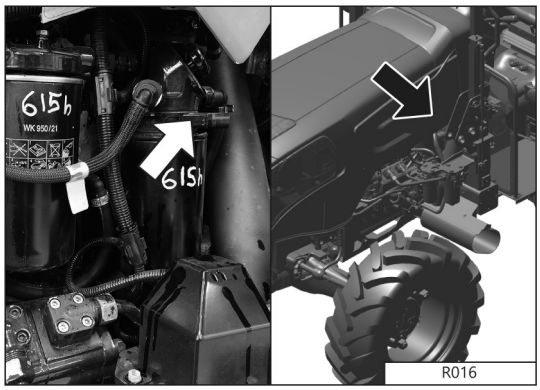

### 9.1.3.2.40 M008 - Air seat



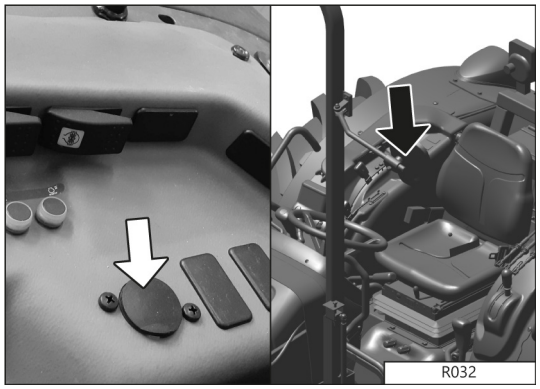
### 9.1.3.2.41 M021 - Starter motor



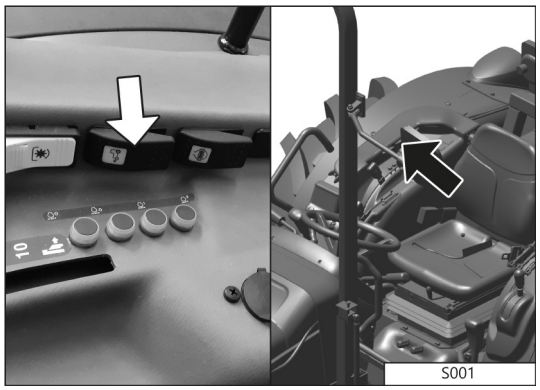

### 9.1.3.2.42 R016 - Fuel filter heating



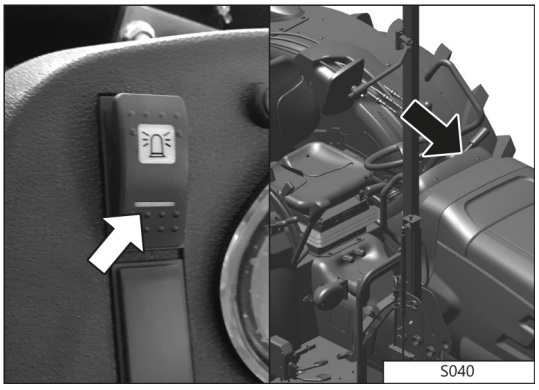

### 9.1.3.2.43 R032 - Cigarette lighter



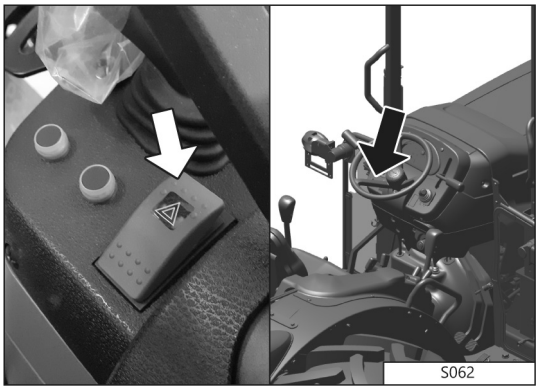

### 9.1.3.2.44 S001 - 4WD switch



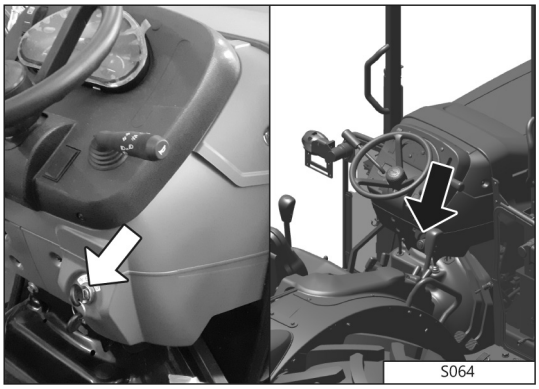

### 9.1.3.2.45 S040 - Beacon switch



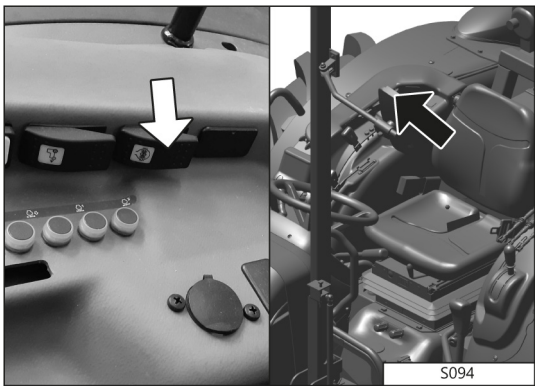

### 9.1.3.2.46 S062 - Hazard switch



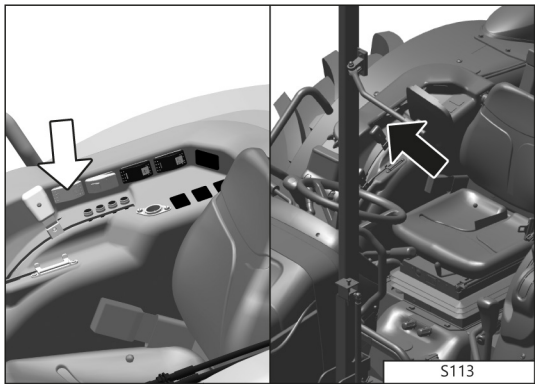

### 9.1.3.2.47 S064 - Ignition key switch



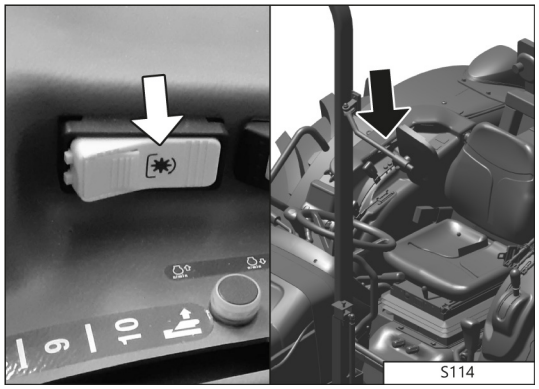

### 9.1.3.2.48 S094 - Diff-lock switch



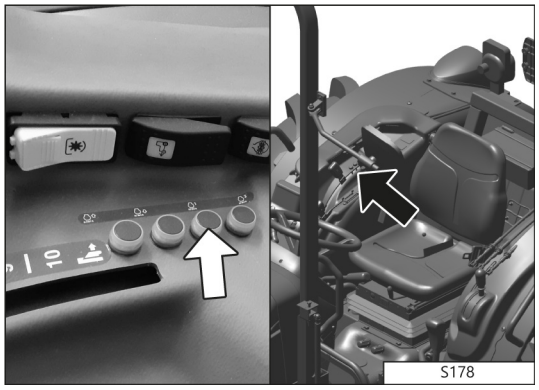
### 9.1.3.2.49 S113 - Front PTO switch



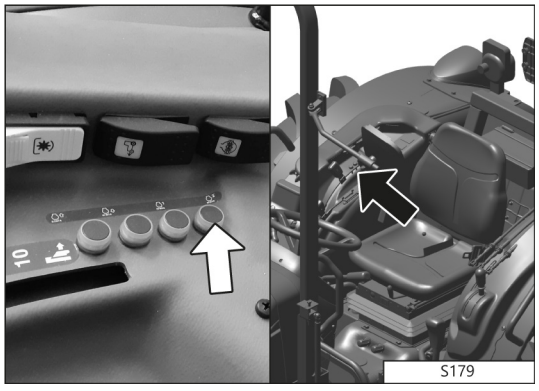

### 9.1.3.2.50 S114 - Rear PTO switch



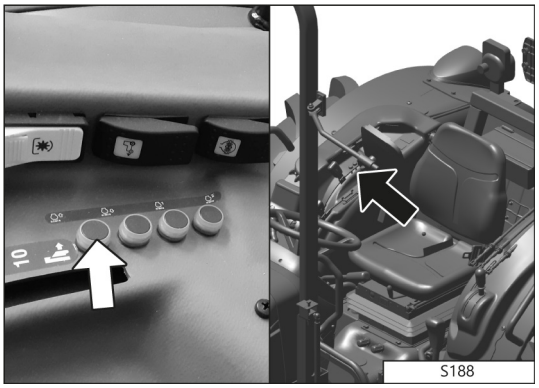

### 9.1.3.2.51 S178 - Cruise control MEM1



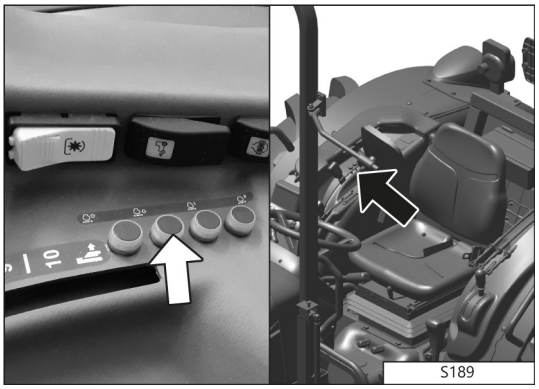

### 9.1.3.2.52 S179 - Cruise control MEM2



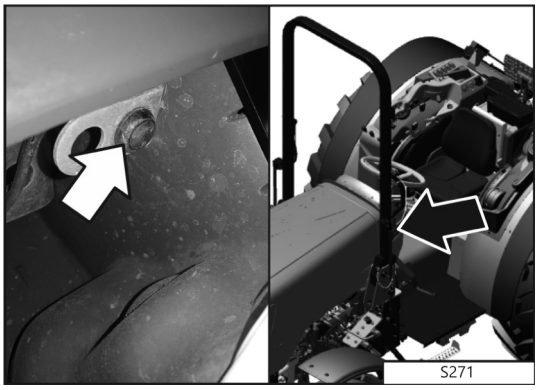

### 9.1.3.2.53 S188 - Cruise control UP



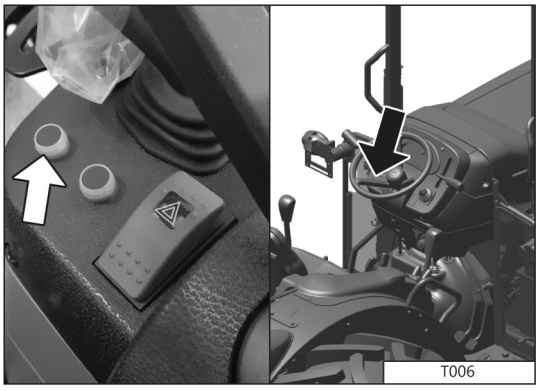

### 9.1.3.2.54 S189 - Cruise control DW



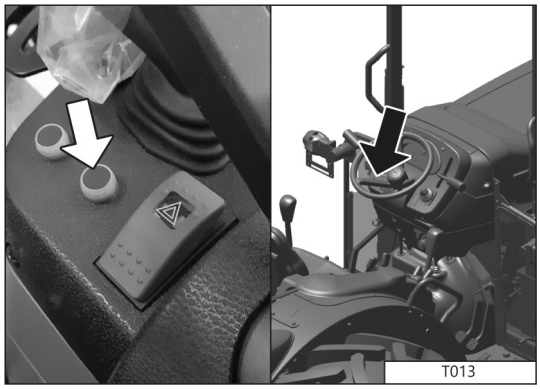

### 9.1.3.2.55 S271 - Calibration hidden button



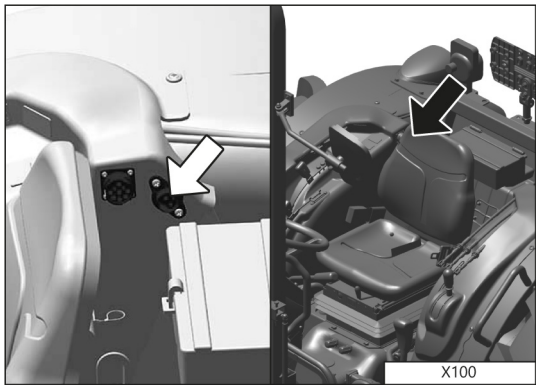

### 9.1.3.2.56 T006 - Button set



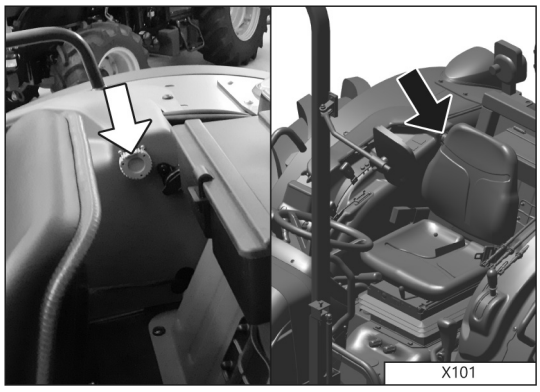
### 9.1.3.2.57 T013 - Button menu



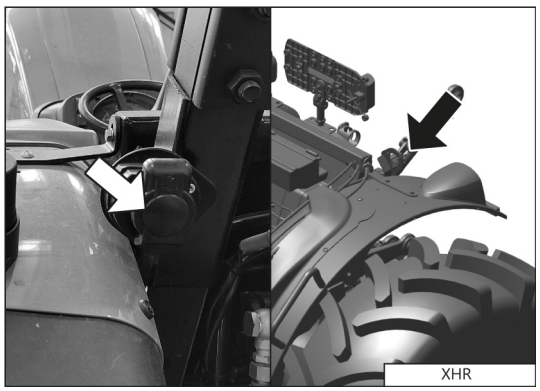

### 9.1.3.2.58 X100 - 3 pole socket



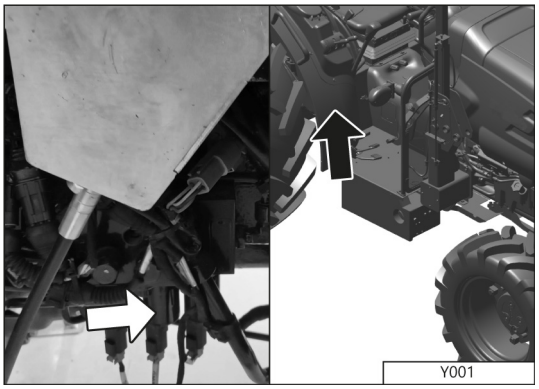

### 9.1.3.2.59 X101 - Diagnostic socket



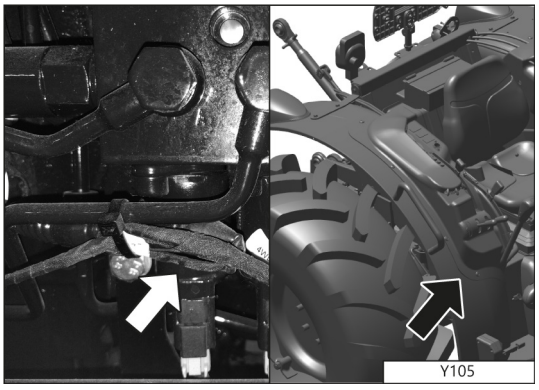

### 9.1.3.2.60 XHR - Rear trailer socket



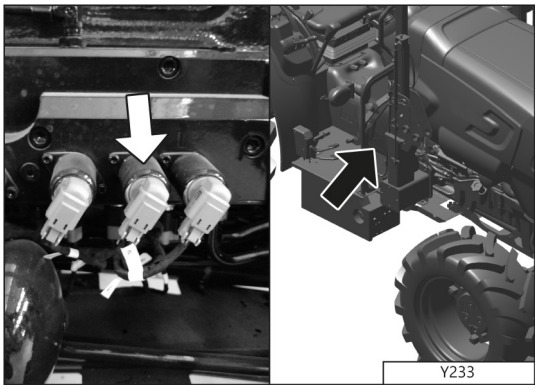

### 9.1.3.2.61 Y001 - 4WD solenoid valve



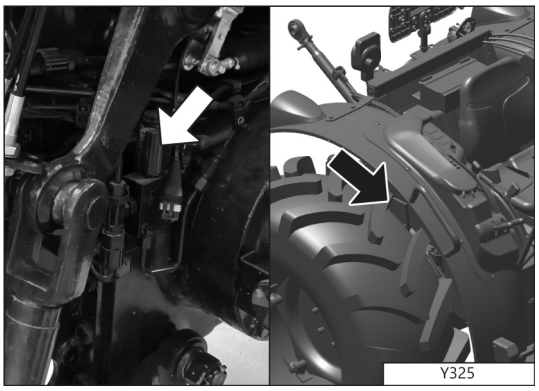

### 9.1.3.2.62 Y105 - Diff-lock solenoid valve



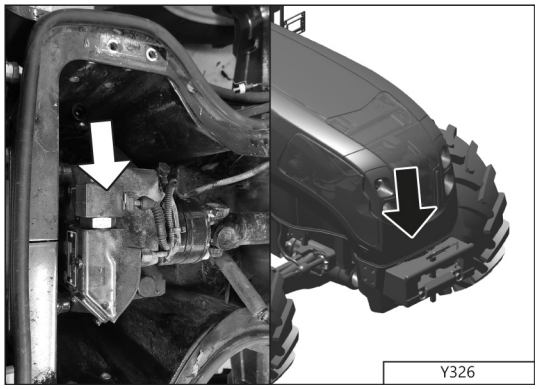

### 9.1.3.2.63 Y233 - RV solenoid valve



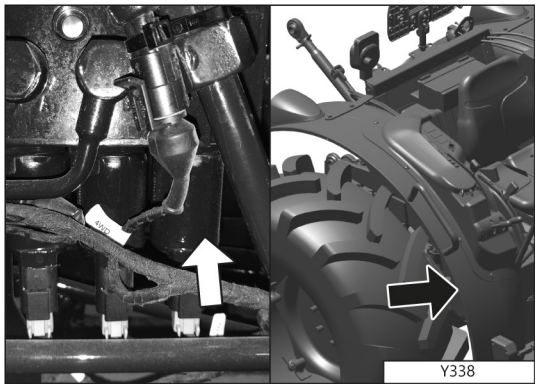

### 9.1.3.2.64 Y325 - PTO main valve connection



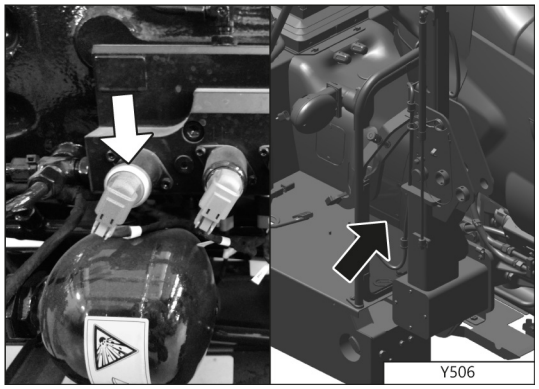
### 9.1.3.2.65 Y326 - Front PTO solenoid valve



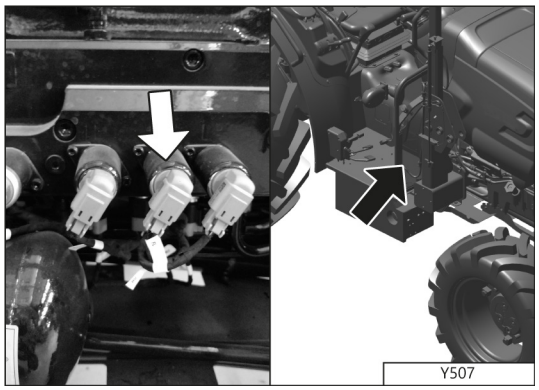

### 9.1.3.2.66 Y338 - PTO priority solenoid valve



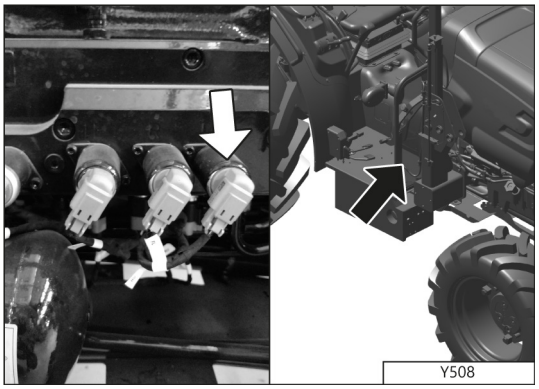

### 9.1.3.2.67 Y506 - Main ring solenoid valve



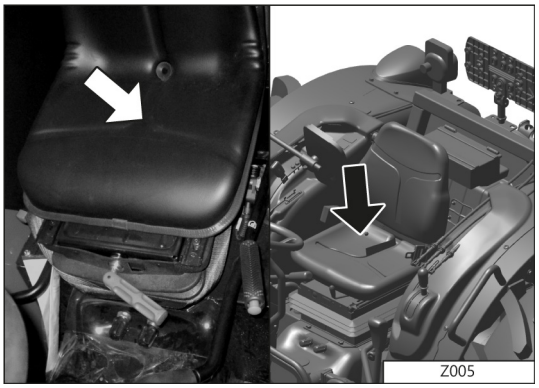

### 9.1.3.2.68 Y507 - FH solenoid valve



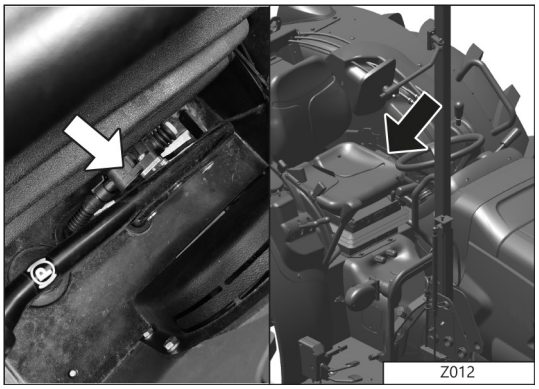

### 9.1.3.2.69 Y508 - FL solenoid valve



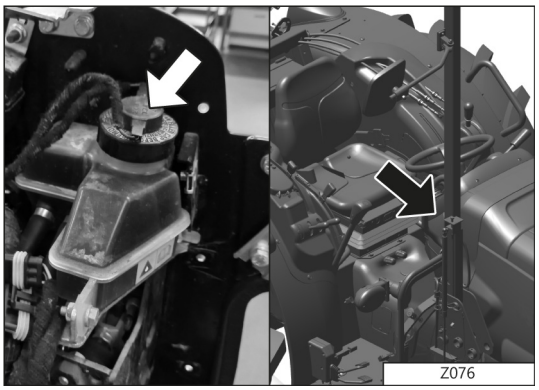

### 9.1.3.2.70 Z005 - Seat switch



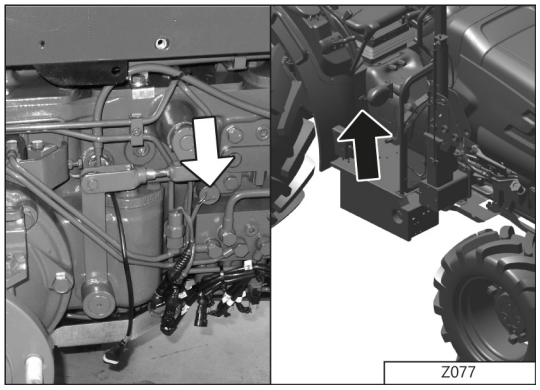

### 9.1.3.2.71 Z012 - Hand brake switch



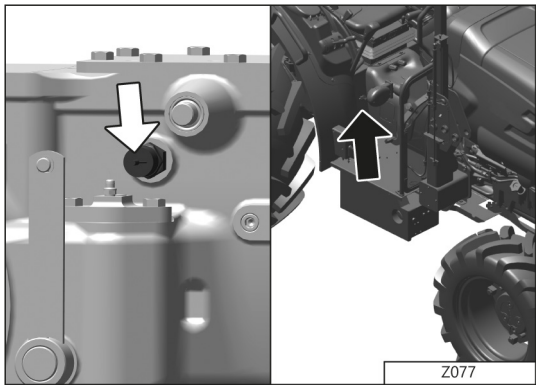

### 9.1.3.2.72 Z076 - Brakes oil level switch



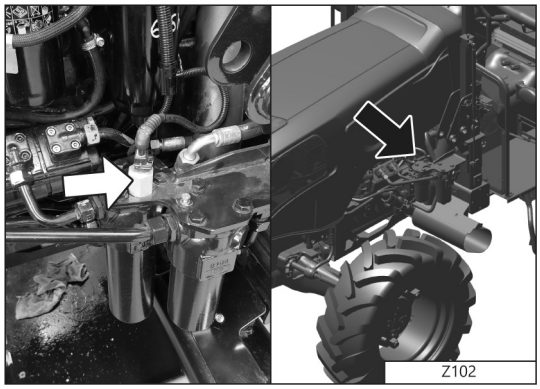
### 9.1.3.2.73 Z077 - Neutral start switch (Mechanical Reverse)



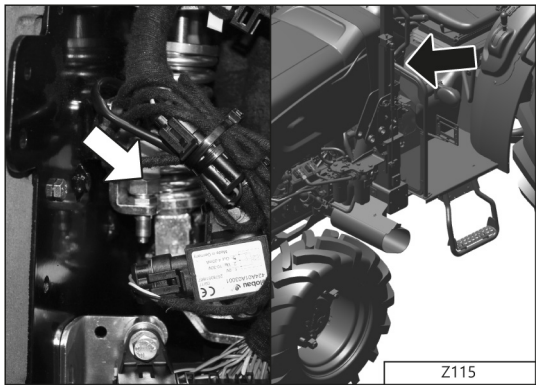

### 9.1.3.2.74 Z077 - Neutral start switch (Power Reverse)



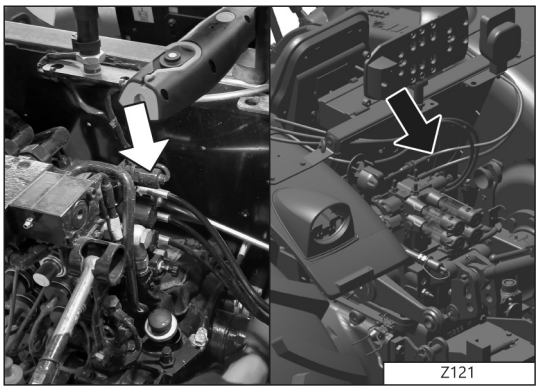

### 9.1.3.2.75 Z102 - Transmission oil filter clogged switch



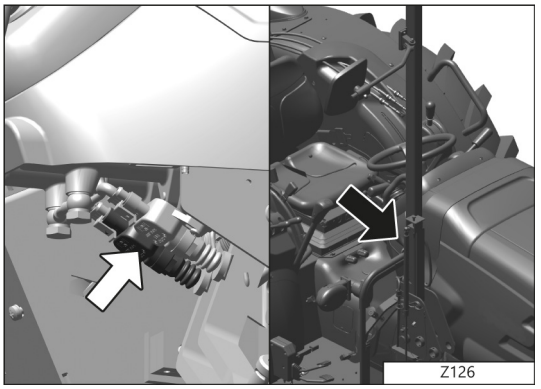

### 9.1.3.2.76 Z115 - End stroke switch



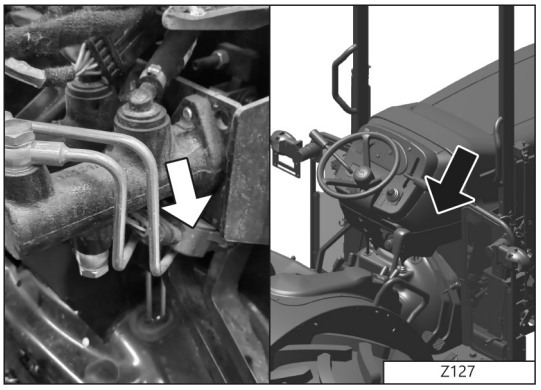

### 9.1.3.2.77 Z121 - Trailer brake pressure sensor



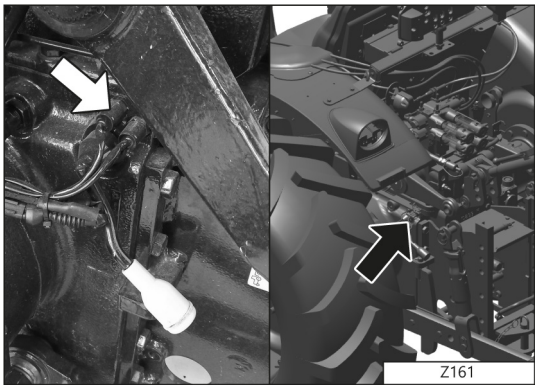

### 9.1.3.2.78 Z126 - LHS brake pedal switch



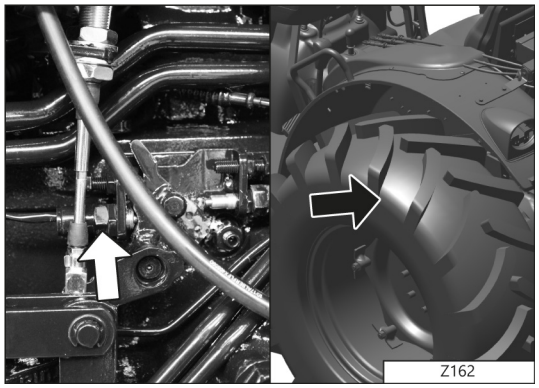

### 9.1.3.2.79 Z127 - RHS brake pedal switch



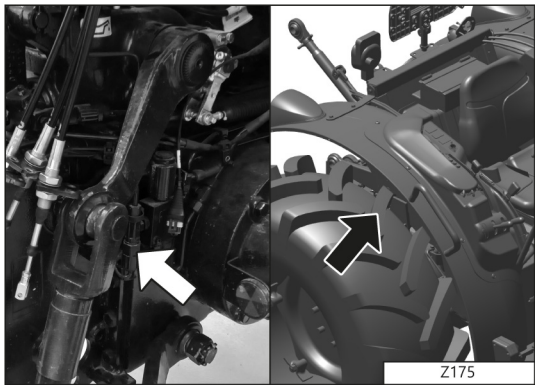

### 9.1.3.2.80 Z161 - 540 PTO speed selector switch



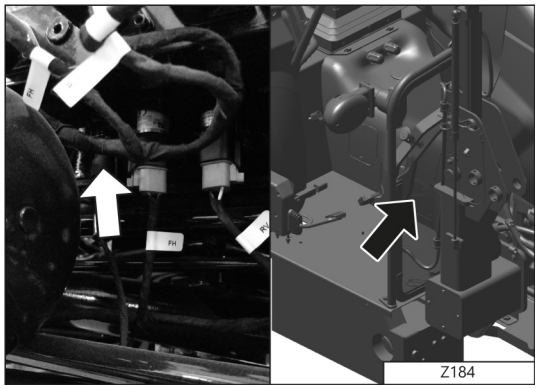
### 9.1.3.2.81 Z162 - GD PTO selector switch



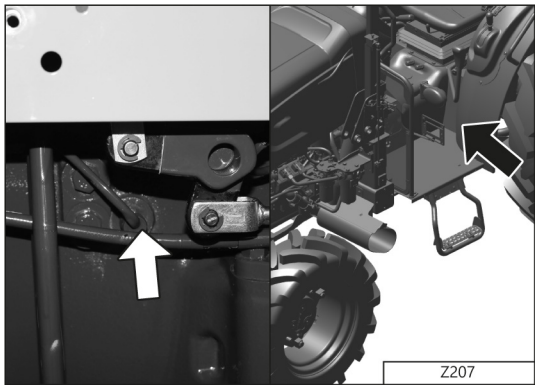

### 9.1.3.2.82 Z175 - PTO pressure switch



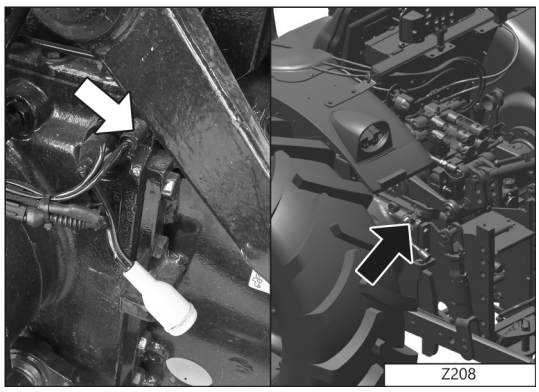

### 9.1.3.2.83 Z184 - Transmission oil pressure switch



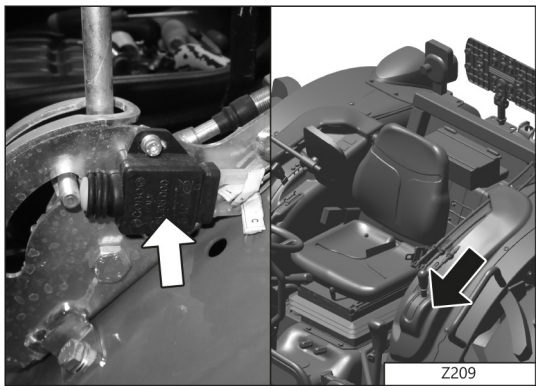

### 9.1.3.2.84 Z207 - Ranges switch



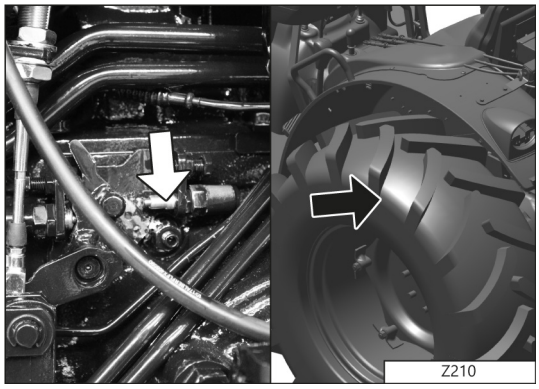

### 9.1.3.2.85 Z208 - 540E/1000 PTO speed selector switch



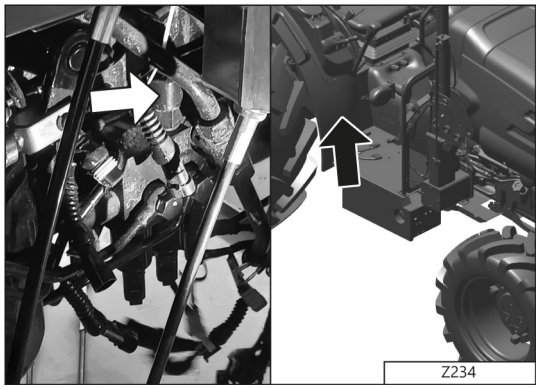

### 9.1.3.2.86 Z209 - Mechanical PTO switch



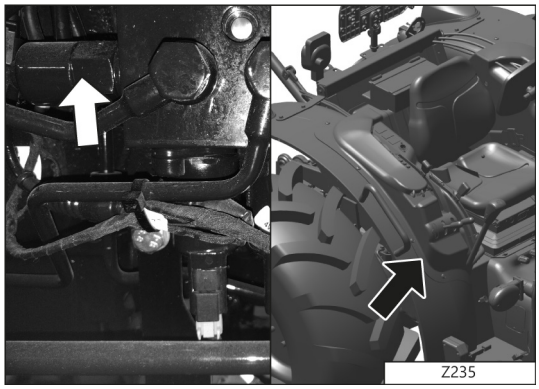

### 9.1.3.2.87 Z210 - DIR PTO selector switch




### 9.1.3.2.88 Z234 - 4WD pressure switch



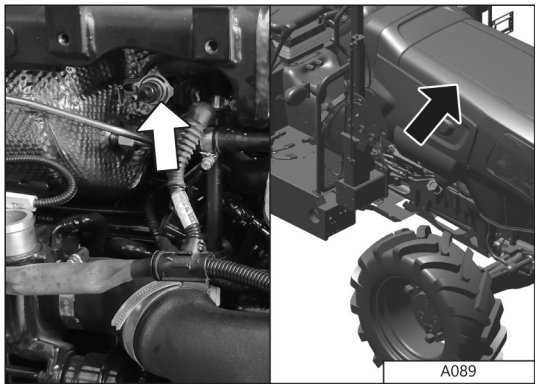
### 9.1.3.2.89 Z235 - Diff-lock pressure switch



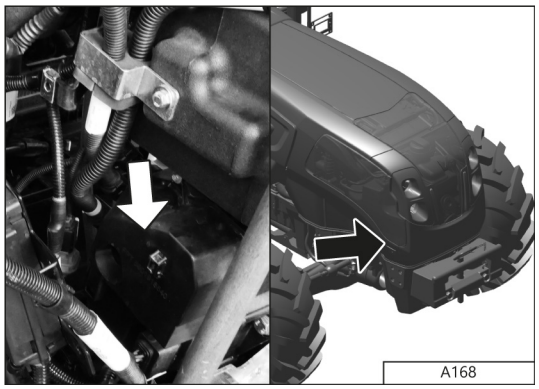

### 9.1.3.3

## 9.1.3.4 100Hp Models

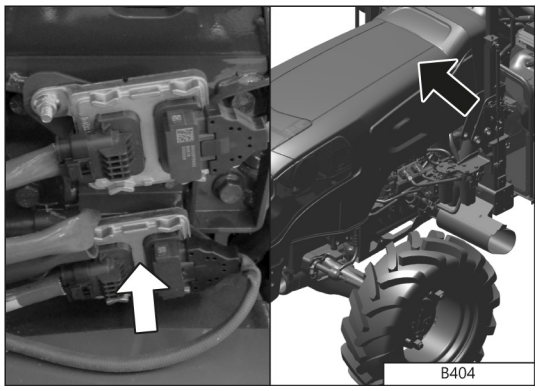
### 9.1.3.4.1 A089 - Dosing module urea (Over 75hp)



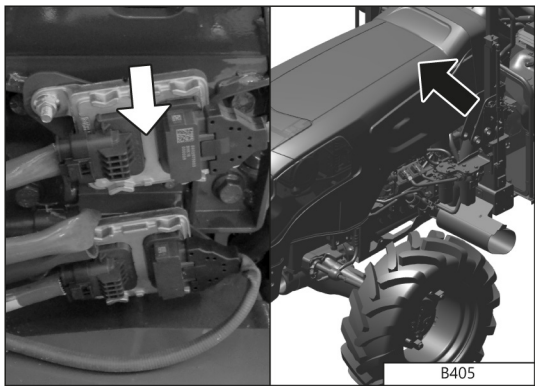

### 9.1.3.4.2 A168 - Urea supply unit module (Over 75hp)



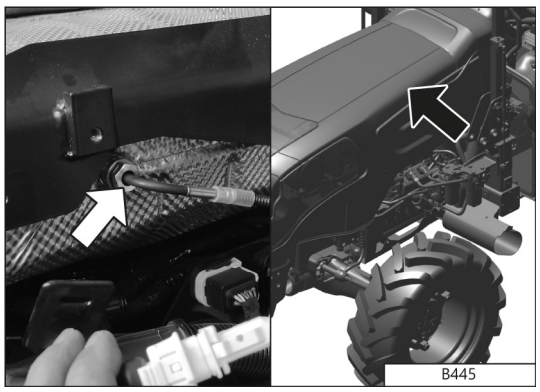

### 9.1.3.4.3 B404 - NOx input sensor (Over 75hp)



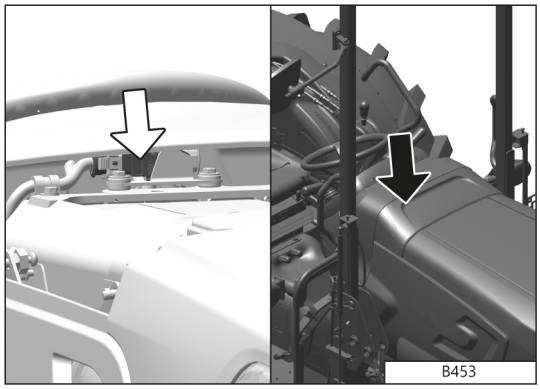

### 9.1.3.4.4 B405 - NOx output sensor (Over 75hp)



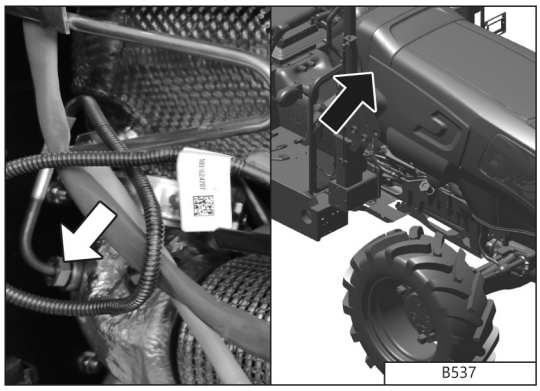

### 9.1.3.4.5 B445 - SCR inlet temperature (Over 75hp)



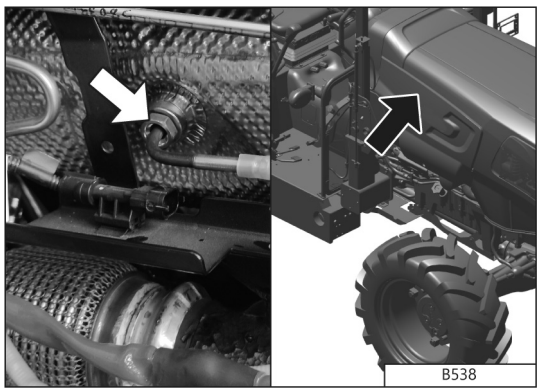

### 9.1.3.4.6 B453 - Delta pressure sensor (Over 75hp)



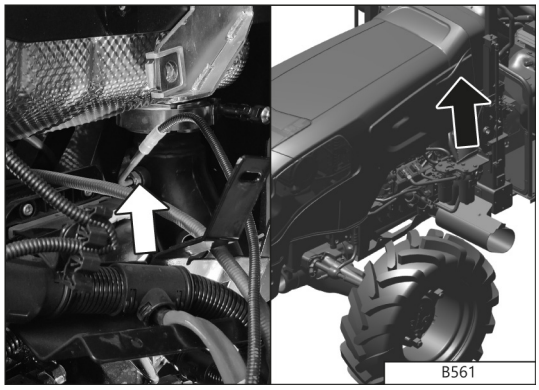

### 9.1.3.4.7 B537 - DOC catalyser inlet temperature sensor (Over 75hp)



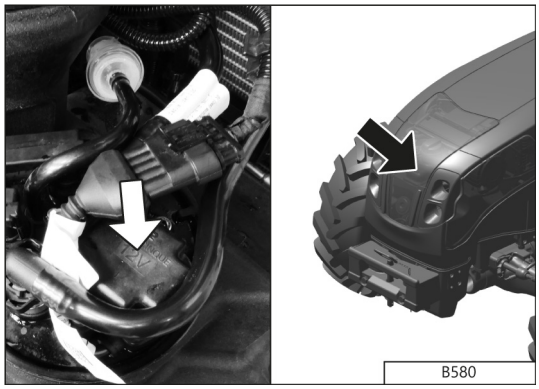

### 9.1.3.4.8 B538 - DOC catalytic outlet temperature sensor (Over 75hp)



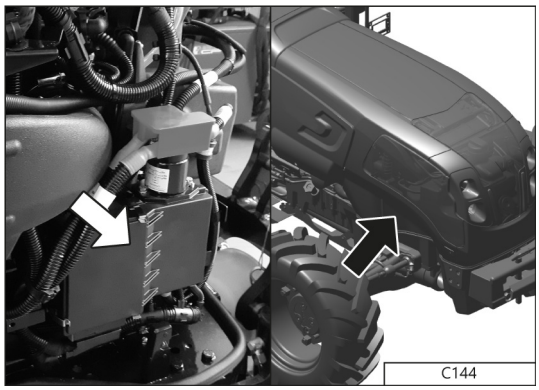
### 9.1.3.4.9 B561 - SCR outlet temperature (Over 75hp)



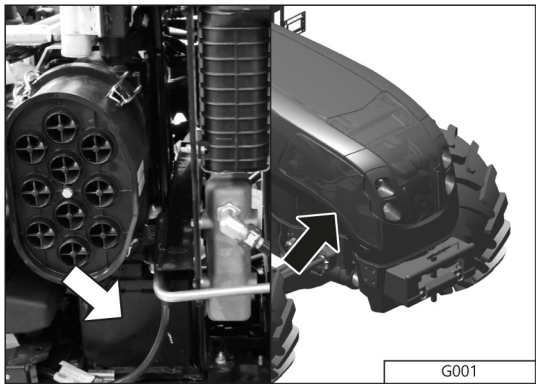

### 9.1.3.4.10 B580 - Urea quality sensor (Over 75hp)



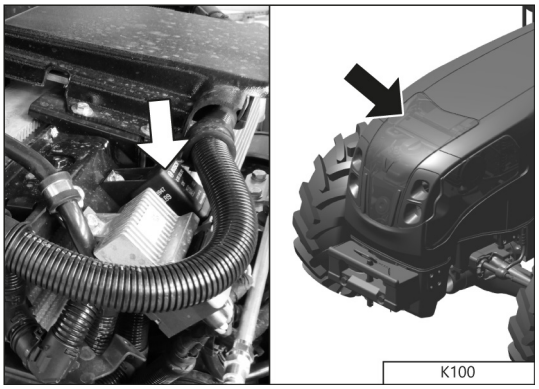

### 9.1.3.4.11 C144 - Main fuse box (Over 75hp)



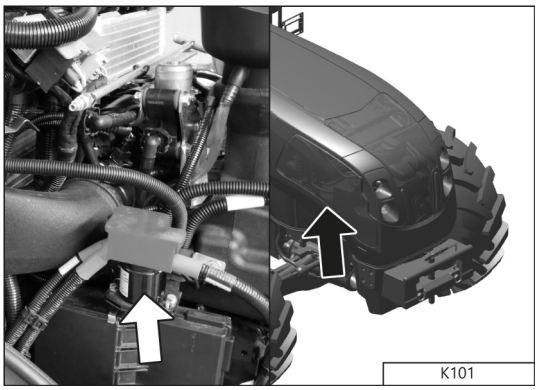

### 9.1.3.4.12 G001 - Battery (Over 75hp)



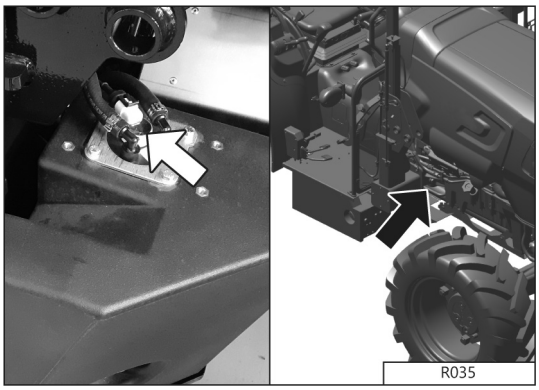

### 9.1.3.4.13 K100 (Over 75hp)



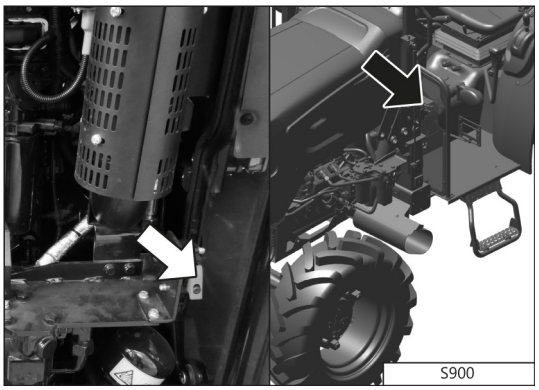

### 9.1.3.4.14 K101 - Battery cut-off relay (Over 75hp)



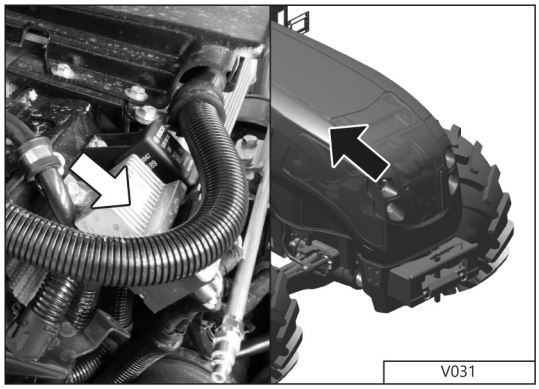

### 9.1.3.4.15 R035 - Fuel level sensor (Over 75hp)



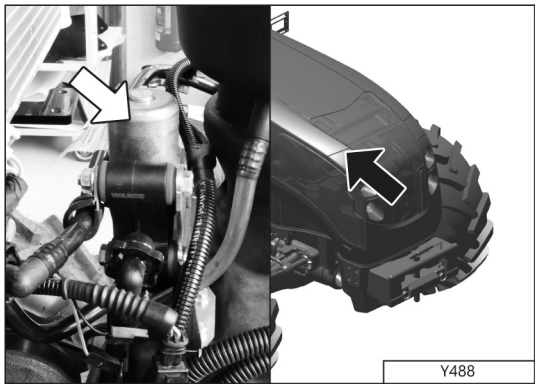

### 9.1.3.4.16 S900 - Battery cut-off switch (Over 75hp)



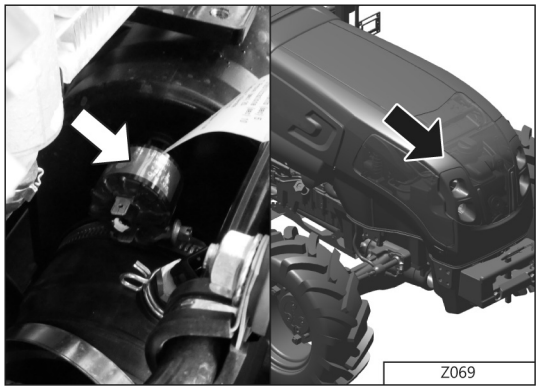
### 9.1.3.4.17 V031 - Glow plug ECU (Over 75hp)




### 9.1.3.4.18 Y488 - Urea heating valve (Over 75hp)




### 9.1.3.4.19 Z069 - Air filter switch (Over 75hp)



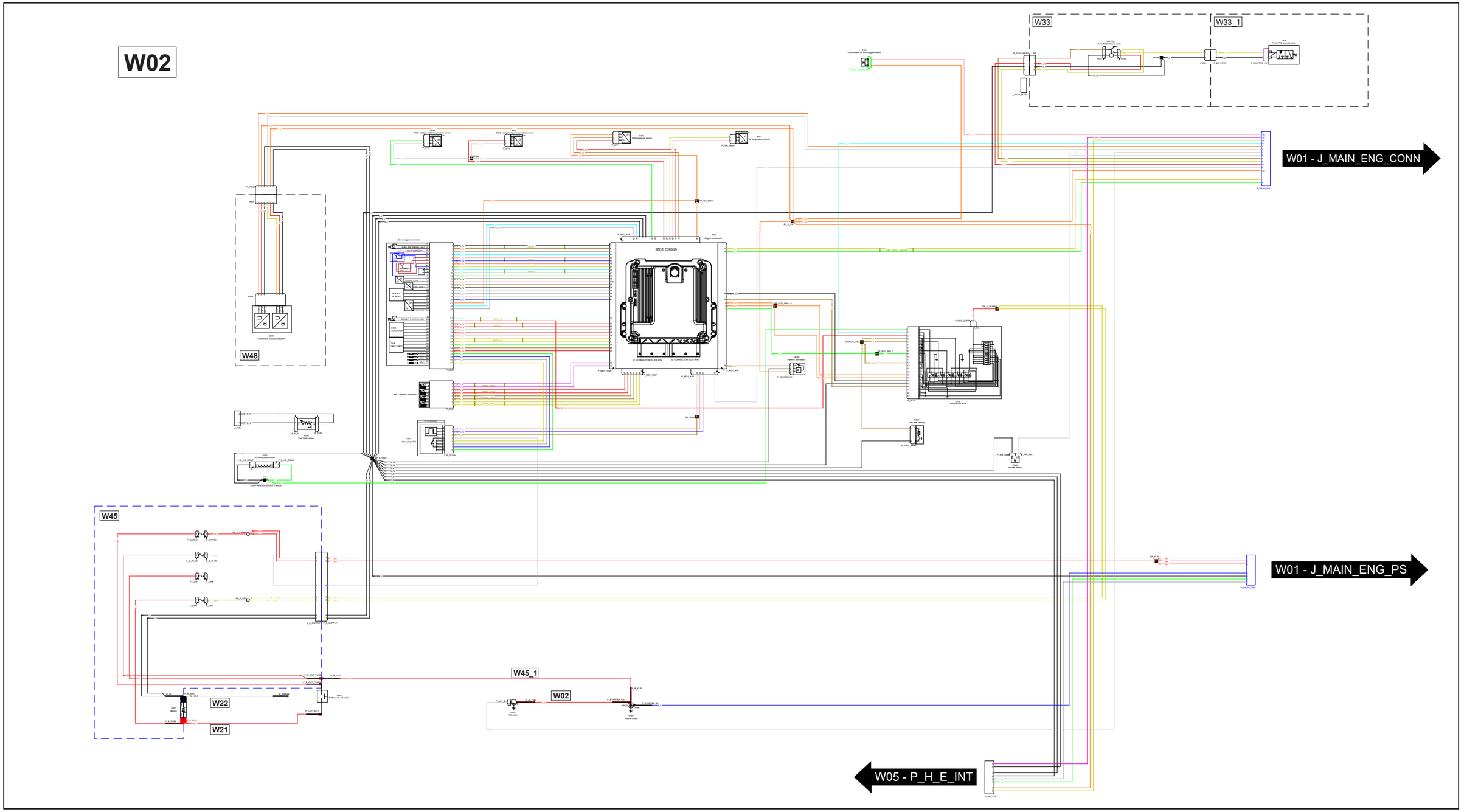
# 9.2. CAB VERSION

## 9.2.1. Electrical schematics

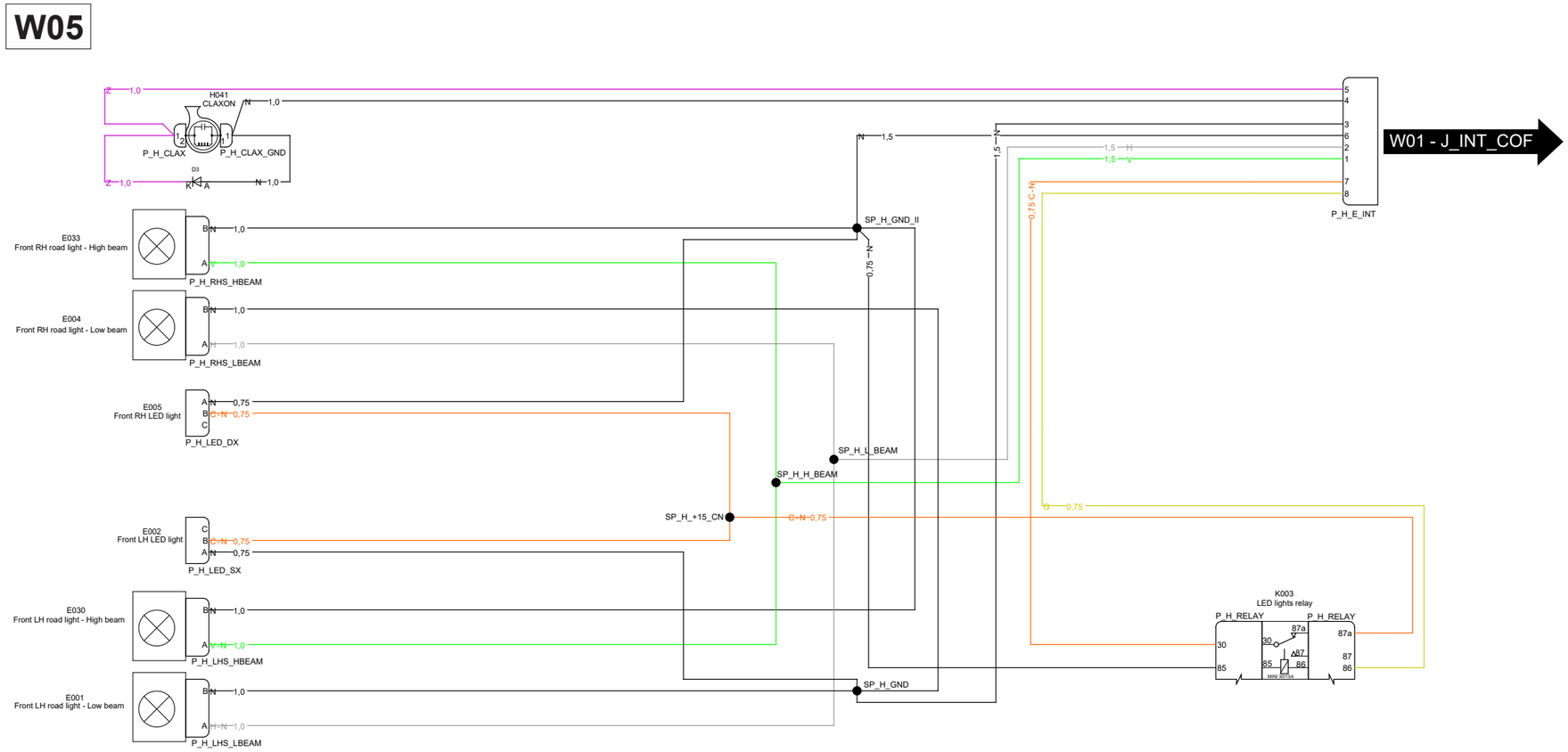
### 9.2.1.1 75Hp Cab Models (mechanical version)

| Harness name | Harness description |
|---|---|
| W01_1 | 3 PINS AND 7 PINS EXTENSION |
| W01_LH | MAIN MECH |
| W01_RH | MAIN MECH |
| W02_LH | ENGINE F28 75 CV CAB |
| W02_RH | ENGINE F28 75 CV CAB |
| W04 | TESIO ROOF |
| W04_6 | PS ROOF <75HP |
| W04_7 | REAR BEACON LIGHT EXTENSION |
| W05 | BONNET F28 |
| W06 | VFR AUTO-SELECT |
| W09 | DEPORT COMMAND |
| W09_2 | DEPORT ACTUATORS |
| W10_1 | EHC ACTUATORS |
| W11_3 | EXTERNAL ERH CONTROLS + REAR LIGHTS |
| W14 | LICENSE PLATE EXTENSION |
| W16_LH | H4 HEADLIGHTS |
| W16_RH | H4 HEADLIGHTS |
| W19 | FRONT WIPER EXTENSION |
| W21 | BATTERY POSITIVE CABLE 75CV |
| W22 | BATTERY NEGATIVE CABLE F28 |
| W22_1 | GROUND CONNECTION L = 400 |
| W25 | GEAR LEVER EXTENSION |
| W29_1 | BRAKE PEDALS SWITCH EXTENSION (LHS & RHS ) |
| W30_2 | TANK SENSOR |
| W30_LH | TRANSMISSION MECH |
| W30_RH | TRANSMISSION MECH |
| W31 | CARTER HI SPEC F28 |
| W31 | CARTER MID SPEC F28 |
| W31 | CARTER LO SPEC F28 |
| W31_2 | REAR PTO SWITCH EXTENSION |
| W31_3 | PTO FRONT COMMAND |
| W33 | FRONT PTO |
| W33_1 | PTO FRONT SOLENOID VALVE |
| W35 | BEACON LIGHT EXTENSION (CAB) |
| W36 | HVAC |
| W45 | SUPPLY POWER F28 75 CV CAB |
| W45_1 | STARTER MOTOR F28 < 75 HP |
| W48 | STEERING ANGLE SENSOR |
| W57 | IFAS ACTUATORS |
| W58 | IFAS POSITION SENSOR |

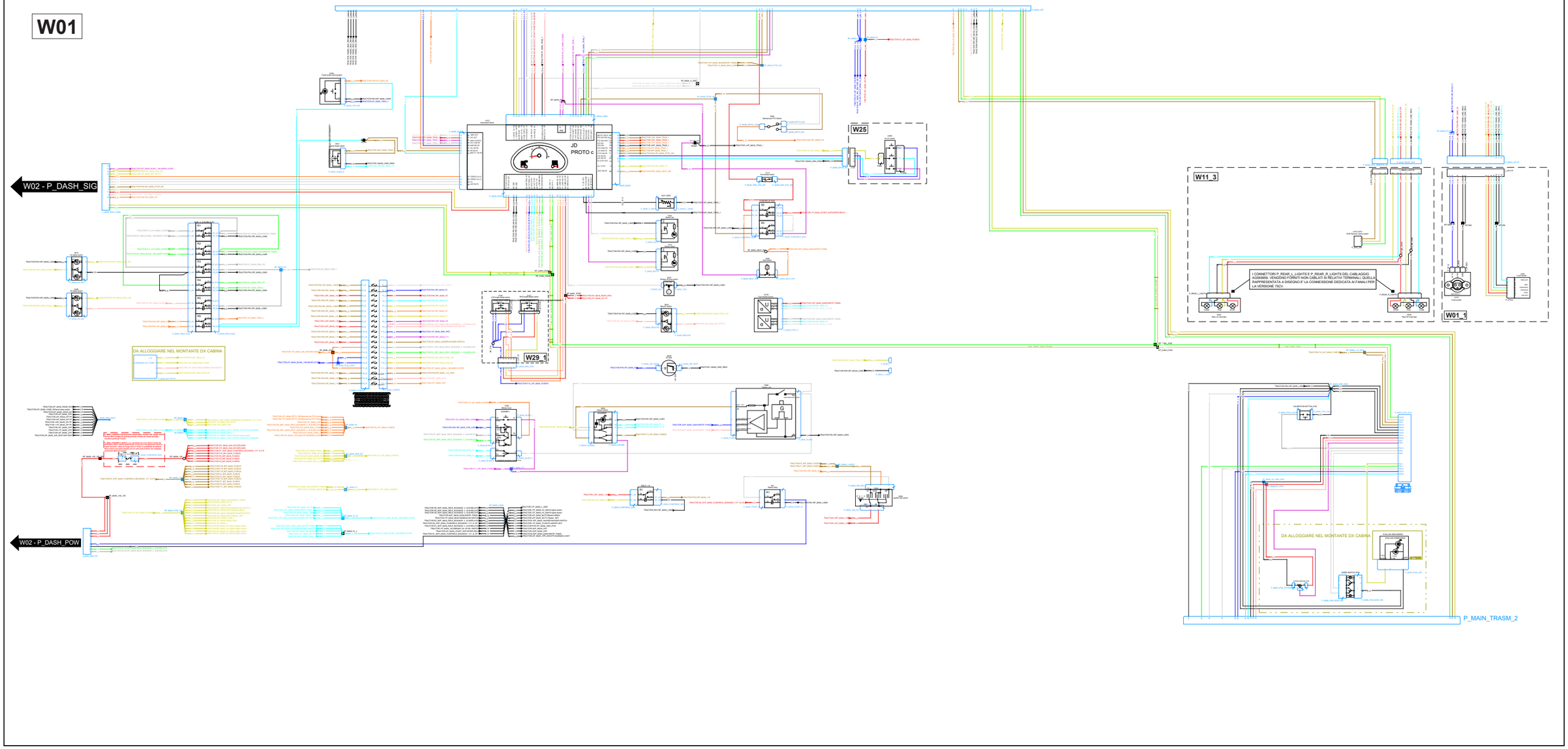
### 9.2.1.1.1 Schematic 1



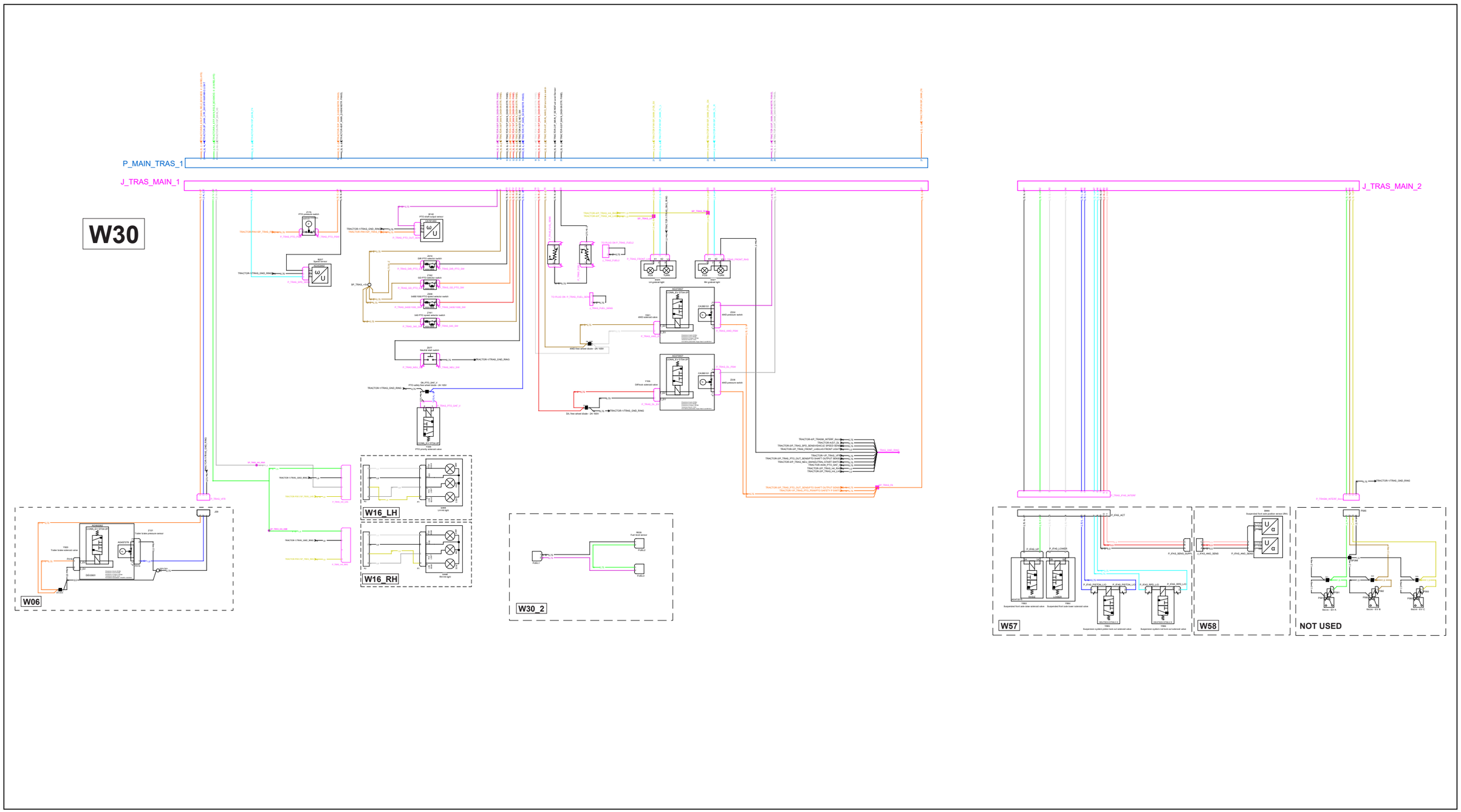
## 9.2.1.1.2 Schematic 2



### 9.2.1.1.3 Schematic 3



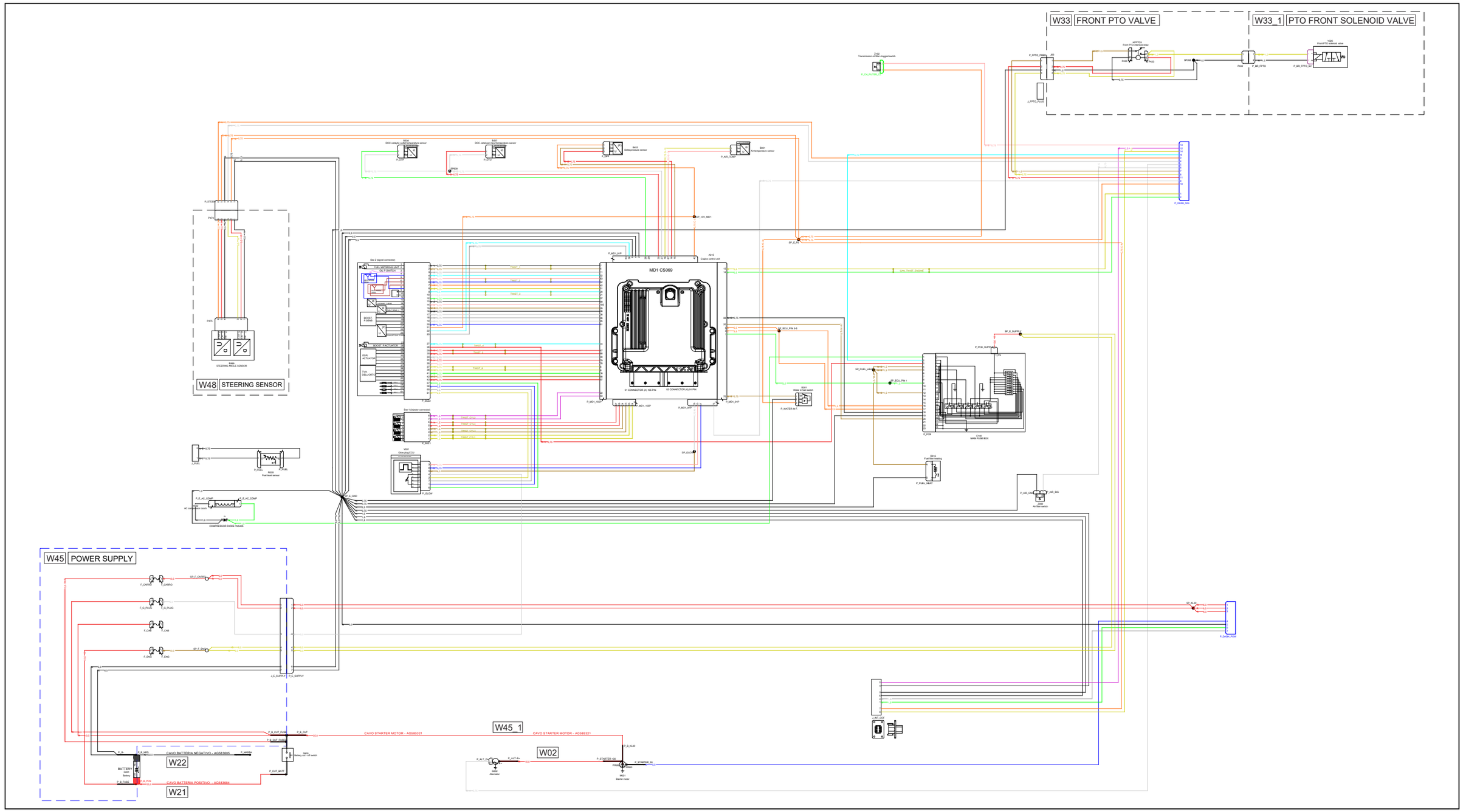
### 9.2.1.1.4 Schematic 4



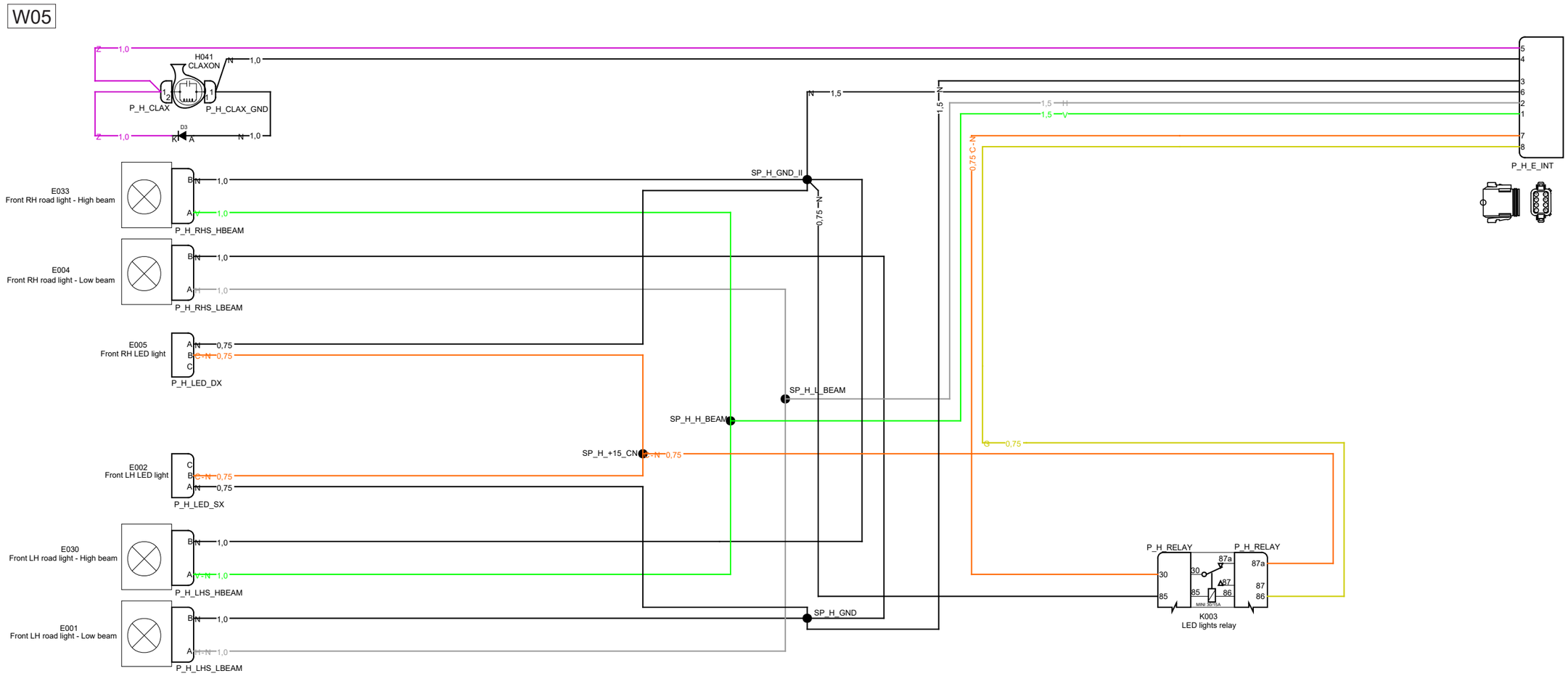
### 9.2.1.2 75 Hp Models (Power Reverser version)

| Harness name | Harness description |
|---|---|
| W01_1 | 3 PINS AND 7 PINS EXTENSION |
| W01_LH | MAIN CAB PR |
| W01_RH | MAIN CAB PR |
| W02_LH | ENGINE F28 75 CV CAB |
| W02_RH | ENGINE F28 75 CV CAB |
| W04 | TESIO ROOF |
| W04_6 | PS ROOF <75HP |
| W04_7 | REAR BEACON LIGHT EXTENSION |
| W05 | BONNET F28 |
| W06 | VFR AUTO-SELECT |
| W09 | DEPORT COMMAND |
| W09_2 | DEPORT ACTUATORS |
| W10_1 | EHC ACTUATORS |
| W11_3 | EXTERNAL ERH CONTROLS + REAR LIGHTS |
| W14 | LICENSE PLATE EXTENSION |
| W16_LH | H4 HEADLIGHTS |
| W16_RH | H4 HEADLIGHTS |
| W19 | FRONT WIPER EXTENSION |
| W21 | BATTERY POSITIVE CABLE 75CV |
| W22 | BATTERY NEGATIVE CABLE F28 |
| W22_1 | GROUND CONNECTION L = 400 |
| W25 | GEAR LEVER EXTENSION |
| W29_1 | BRAKE PEDALS SWITCH EXTENSION (LHS & RHS ) |
| W30_2 | TANK SENSOR |
| W30_LH | TRANSMISSION F28 PR HUSCO |
| W30_RH | TRANSMISSION F28 PR HUSCO |
| W31 | CARTER HI SPEC F28 |
| W31 | CARTER MID SPEC F28 |
| W31 | CARTER LO SPEC F28 |
| W31_2 | REAR PTO SWITCH EXTENSION |
| W31_3 | PTO FRONT COMMAND |
| W33 | FRONT PTO |
| W33_1 | PTO FRONT SOLENOID VALVE |
| W35 | BEACON LIGHT EXTENSION (CAB) |
| W36 | HVAC |
| W45 | SUPPLY POWER F28 75 CV CAB |
| W45_1 | STARTER MOTOR F28 < 75 HP |
| W48 | STEERING ANGLE SENSOR |
| W57 | IFAS ACTUATORS |
| W58 | IFAS POSITION SENSOR |

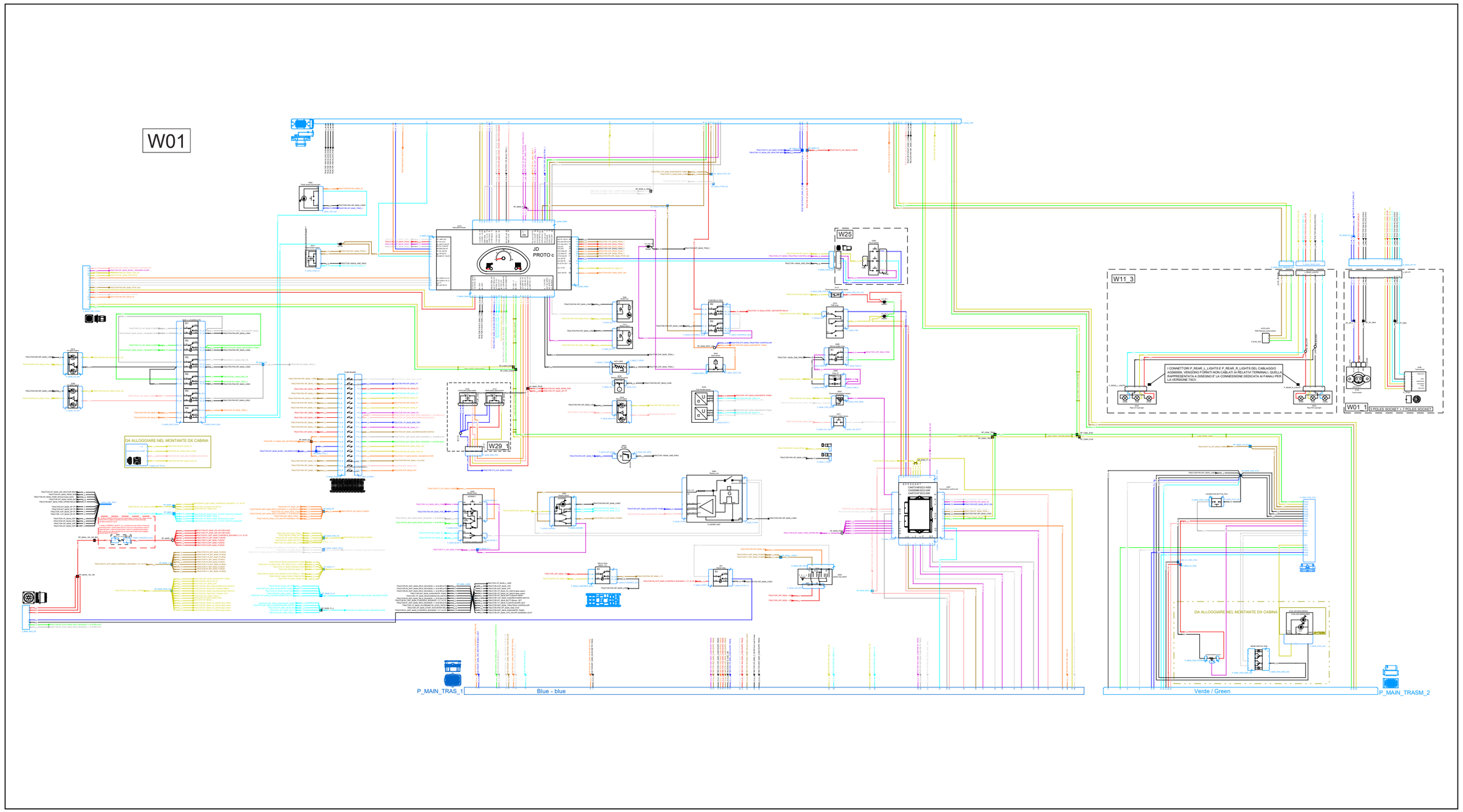
## 9.2.1.2.1 Schematic 1



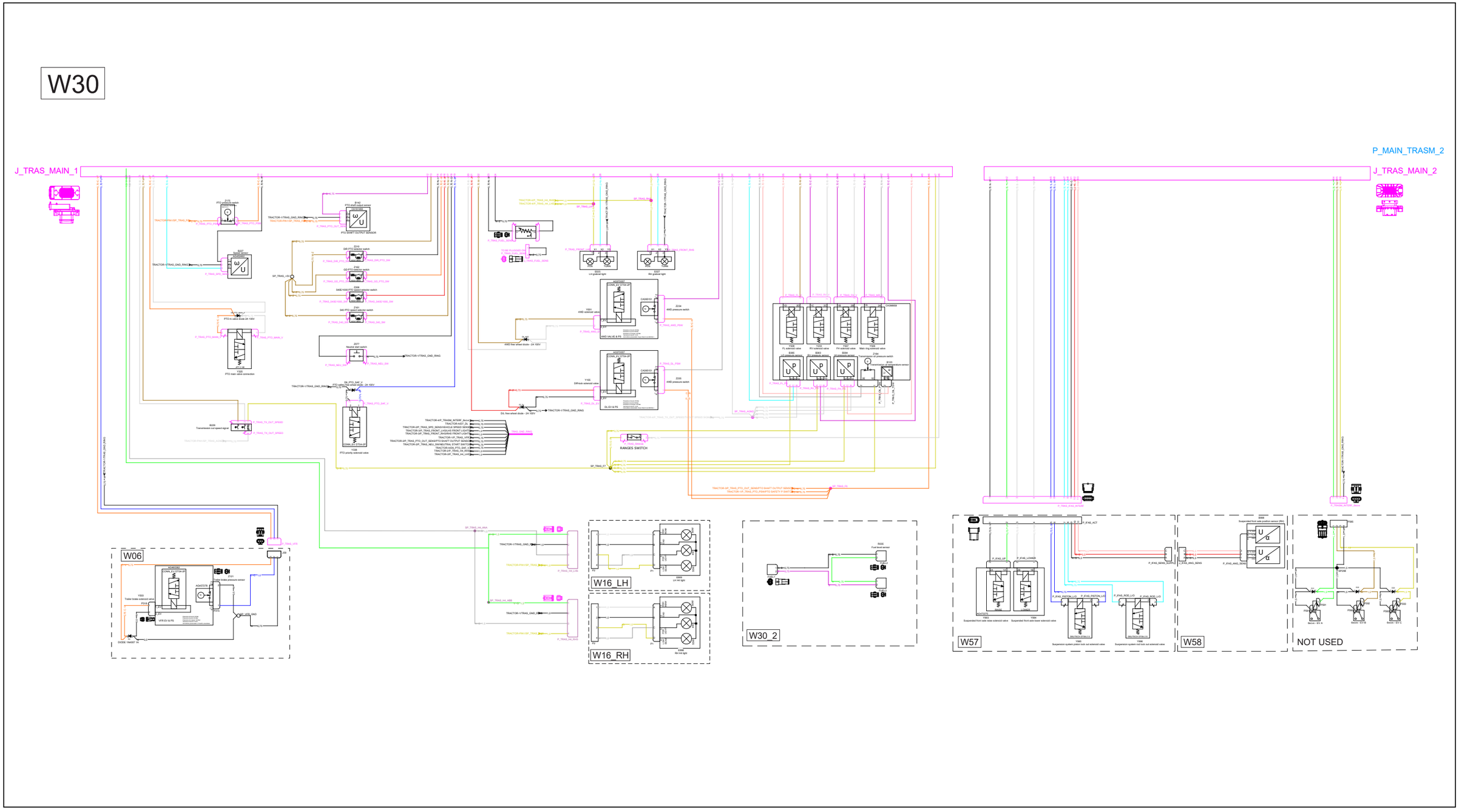
## 9.2.1.2.2 Schematic 2



### 9.2.1.2.3 Schematic 3



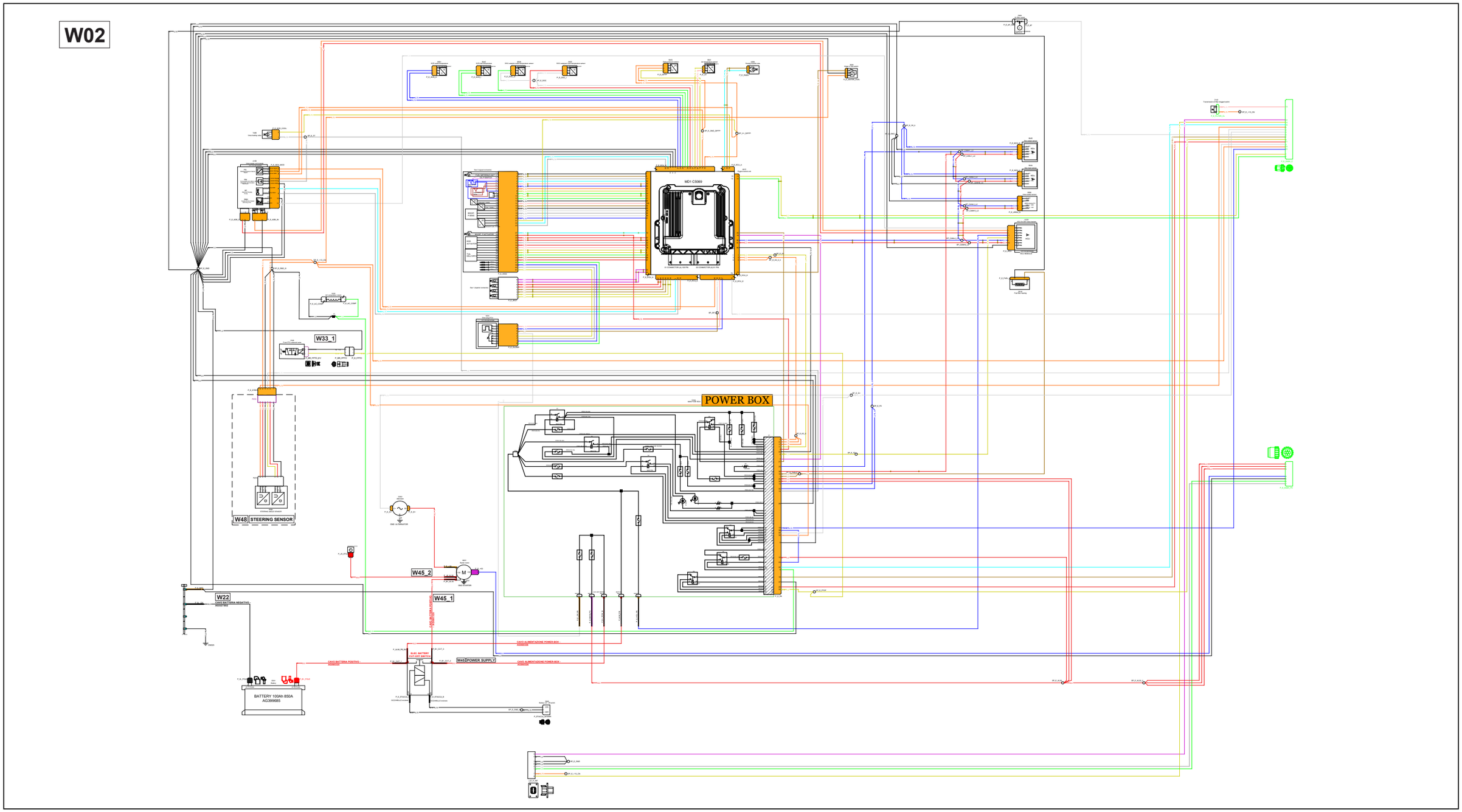
## 9.2.1.2.4 Schematic 4



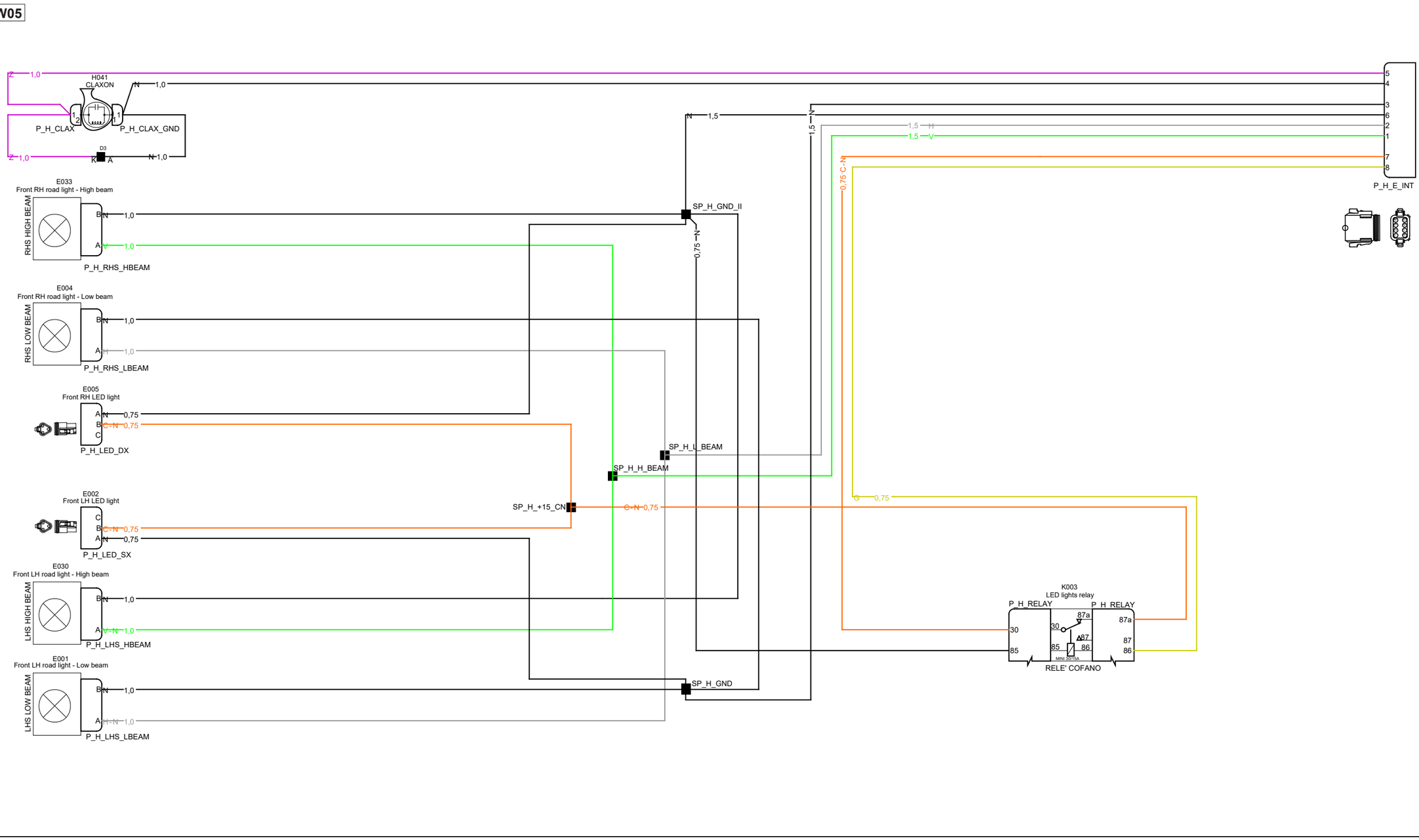
### 9.2.1.3 100Hp Models (Mechanical version)

| Harness name | Harness description |
|---|---|
| W01_1 | 3 PINS AND 7 PINS EXTENSION |
| W01_LH | MAIN MECH |
| W01_RH | MAIN MECH |
| W02_LH | ENGINE F28 > 75 CV |
| W02_RH | ENGINE F28 > 75 CV |
| W04 | TESIO ROOF |
| W04_6 | PS ROOF >75HP |
| W04_7 | REAR BEACON LIGHT EXTENSION |
| W05 | BONNET F28 |
| W06 | VFR AUTO-SELECT |
| W09 | DEPORT COMMAND |
| W09_2 | DEPORT ACTUATORS |
| W10_1 | EHC ACTUATORS |
| W11_3 | EXTERNAL ERH CONTROLS + REAR LIGHTS |
| W14 | LICENSE PLATE EXTENSION |
| W16_LH | H4 HEADLIGHTS |
| W16_RH | H4 HEADLIGHTS |
| W19 | FRONT WIPER EXTENSION |
| W22_1 | GROUND CONNECTION L = 400 |
| W25 | GEAR LEVER EXTENSION |
| W29_1 | BRAKE PEDALS SWITCH EXTENSION (LHS & RHS ) |
| W30_2 | TANK SENSOR |
| W30_LH | TRANSMISSION MECH |
| W30_RH | TRANSMISSION MECH |
| W31 | CARTER HI SPEC F28 |
| W31 | CARTER MID SPEC F28 |
| W31 | CARTER LO SPEC F28 |
| W31_2 | REAR PTO SWITCH EXTENSION |
| W31_3 | PTO FRONT COMMAND |
| W33_1 | PTO FRONT SOLENOID VALVE |
| W35 | BEACON LIGHT EXTENSION (CAB) |
| W36 | HVAC |
| W45_2 | JUMP START |
| W48 | STEERING ANGLE SENSOR |
| W57 | IFAS ACTUATORS |
| W58 | IFAS POSITION SENSOR |

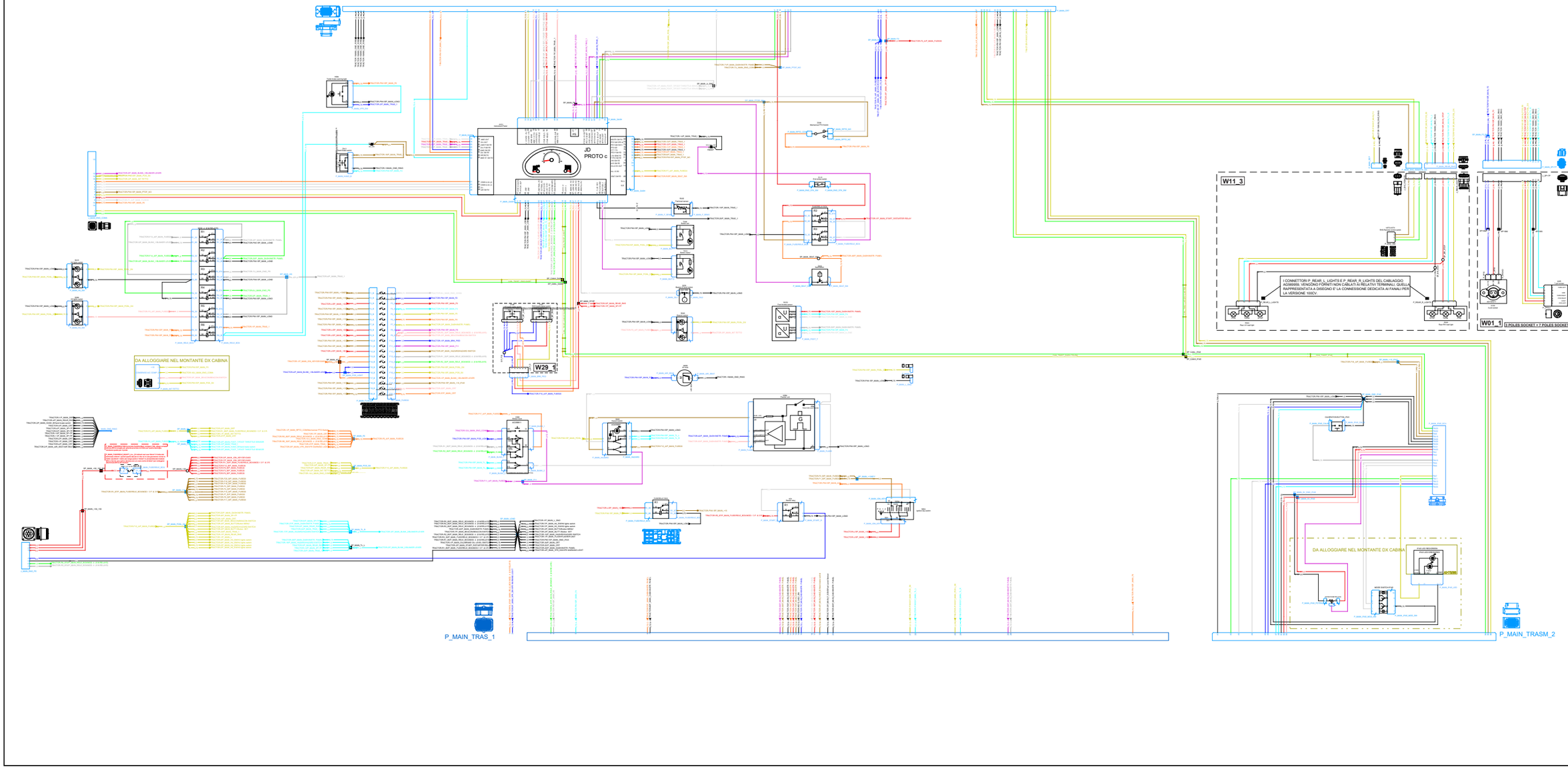
### 9.2.1.3.1 Schematic 1



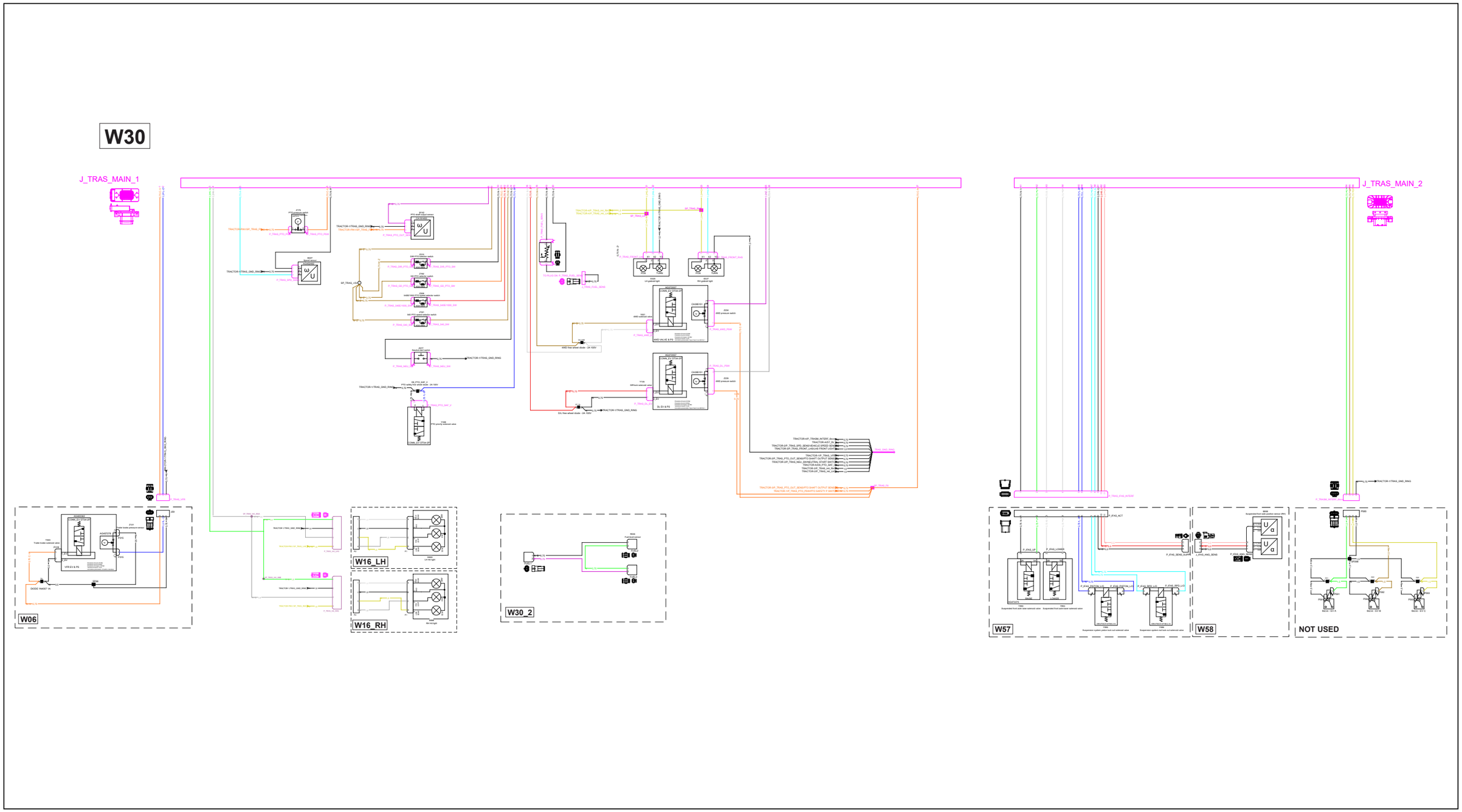
## 9.2.1.3.2 Schematic 2



## 9.2.1.3.3 Schematic 3



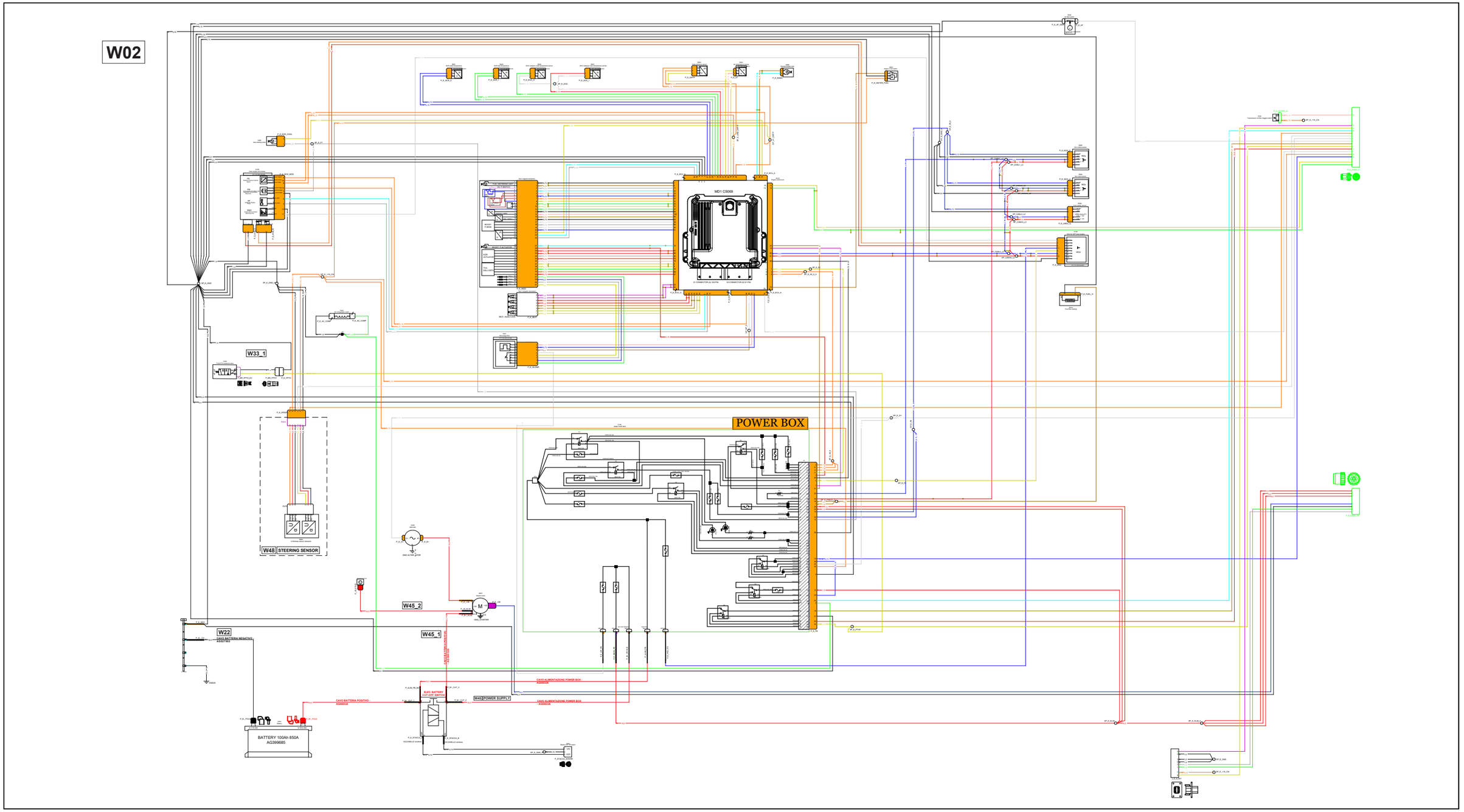
### 9.2.1.3.4 Schematic 4



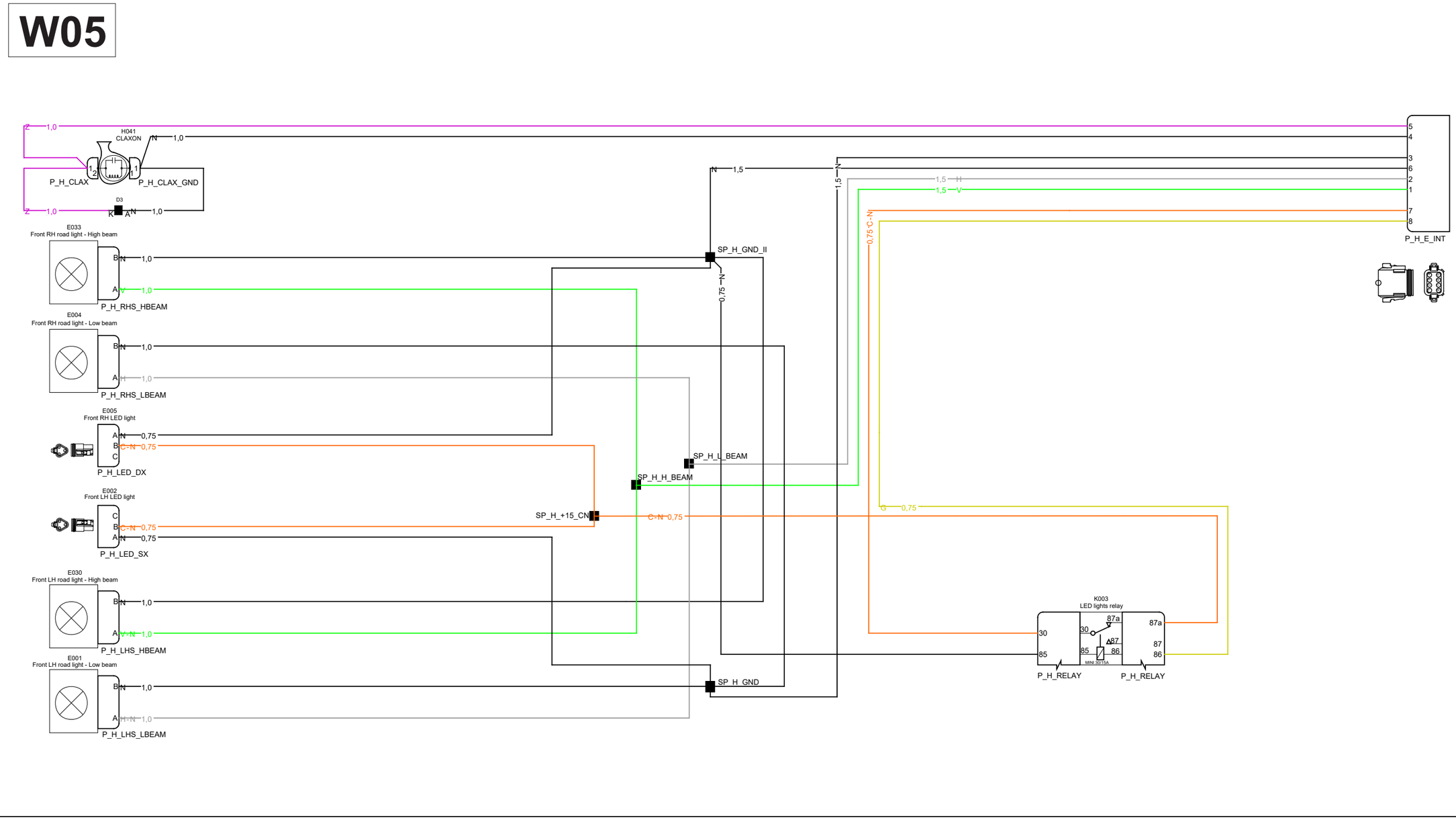
### 9.2.1.4 100Hp Models (Power Reverser version)

| Harness name | Harness description |
|---|---|
| W01_1 | 3 PINS AND 7 PINS EXTENSION |
| W01_LH | MAIN CAB PR |
| W01_RH | MAIN CAB PR |
| W02_LH | ENGINE F28 > 75 CV |
| W02_RH | ENGINE F28 > 75 CV |
| W04 | TESIO ROOF |
| W04_6 | PS ROOF >75HP |
| W04_7 | REAR BEACON LIGHT EXTENSION |
| W05 | BONNET F28 |
| W06 | VFR AUTO-SELECT |
| W09 | DEPORT COMMAND |
| W09_2 | DEPORT ACTUATORS |
| W10_1 | EHC ACTUATORS |
| W11_3 | EXTERNAL ERH CONTROLS + REAR LIGHTS |
| W14 | LICENSE PLATE EXTENSION |
| W16_LH | H4 HEADLIGHTS |
| W16_RH | H4 HEADLIGHTS |
| W19 | FRONT WIPER EXTENSION |
| W22_1 | GROUND CONNECTION L = 400 |
| W25 | GEAR LEVER EXTENSION |
| W29_1 | BRAKE PEDALS SWITCH EXTENSION (LHS & RHS ) |
| W30_2 | TANK SENSOR |
| W30_LH | TRANSMISSION F28 PR HUSCO |
| W30_RH | TRANSMISSION F28 PR HUSCO |
| W31 | CARTER HI SPEC F28 |
| W31 | CARTER MID SPEC F28 |
| W31 | CARTER LO SPEC F28 |
| W31_2 | REAR PTO SWITCH EXTENSION |
| W31_3 | PTO FRONT COMMAND |
| W33_1 | PTO FRONT SOLENOID VALVE |
| W35 | BEACON LIGHT EXTENSION (CAB) |
| W36 | HVAC |
| W45_2 | JUMP START |
| W48 | STEERING ANGLE SENSOR |
| W57 | IFAS ACTUATORS |
| W58 | IFAS POSITION SENSOR |

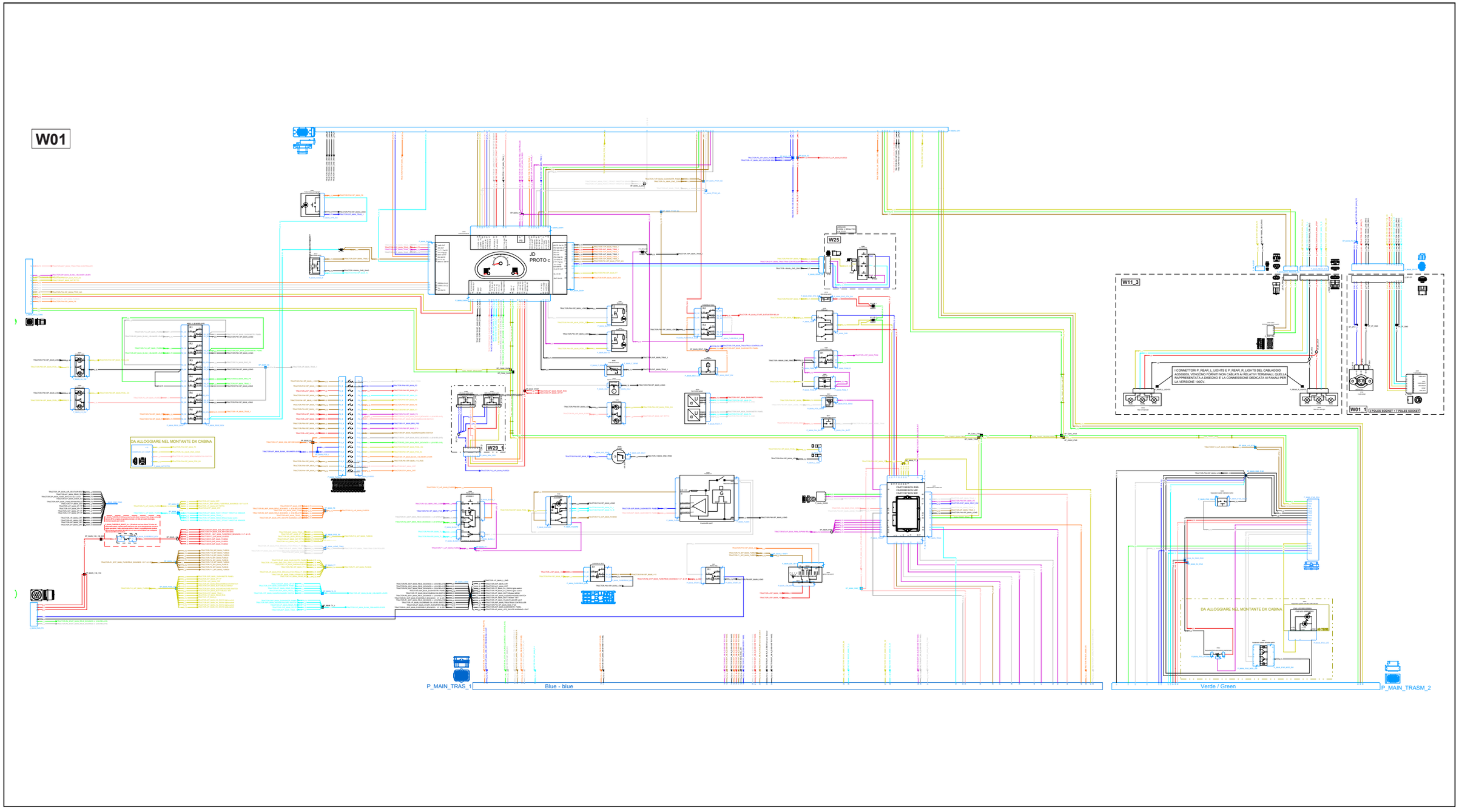
### 9.2.1.4.1 Schematic 1



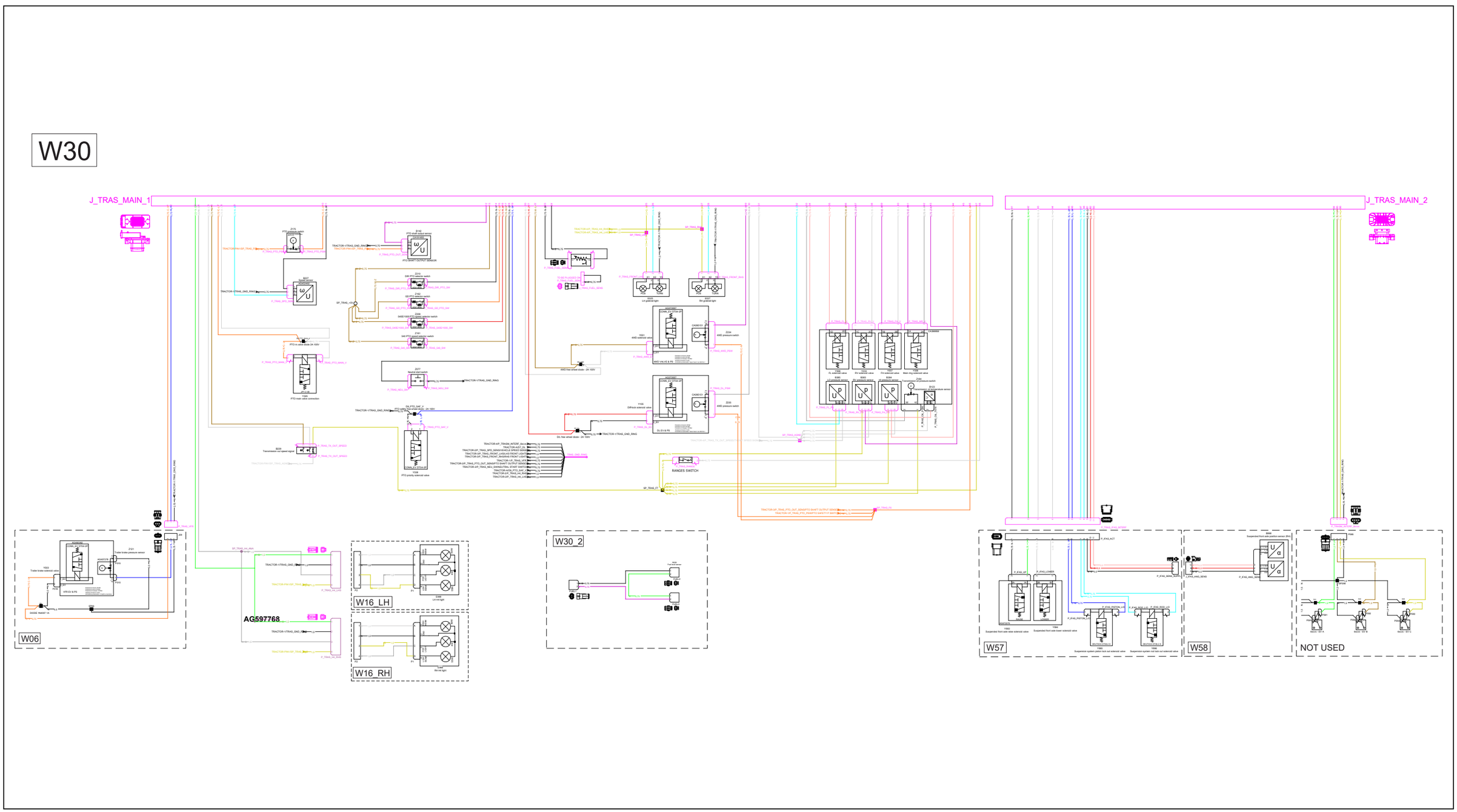
## 9.2.1.4.2 Schematic 2



## 9.2.1.4.3 Schematic 3



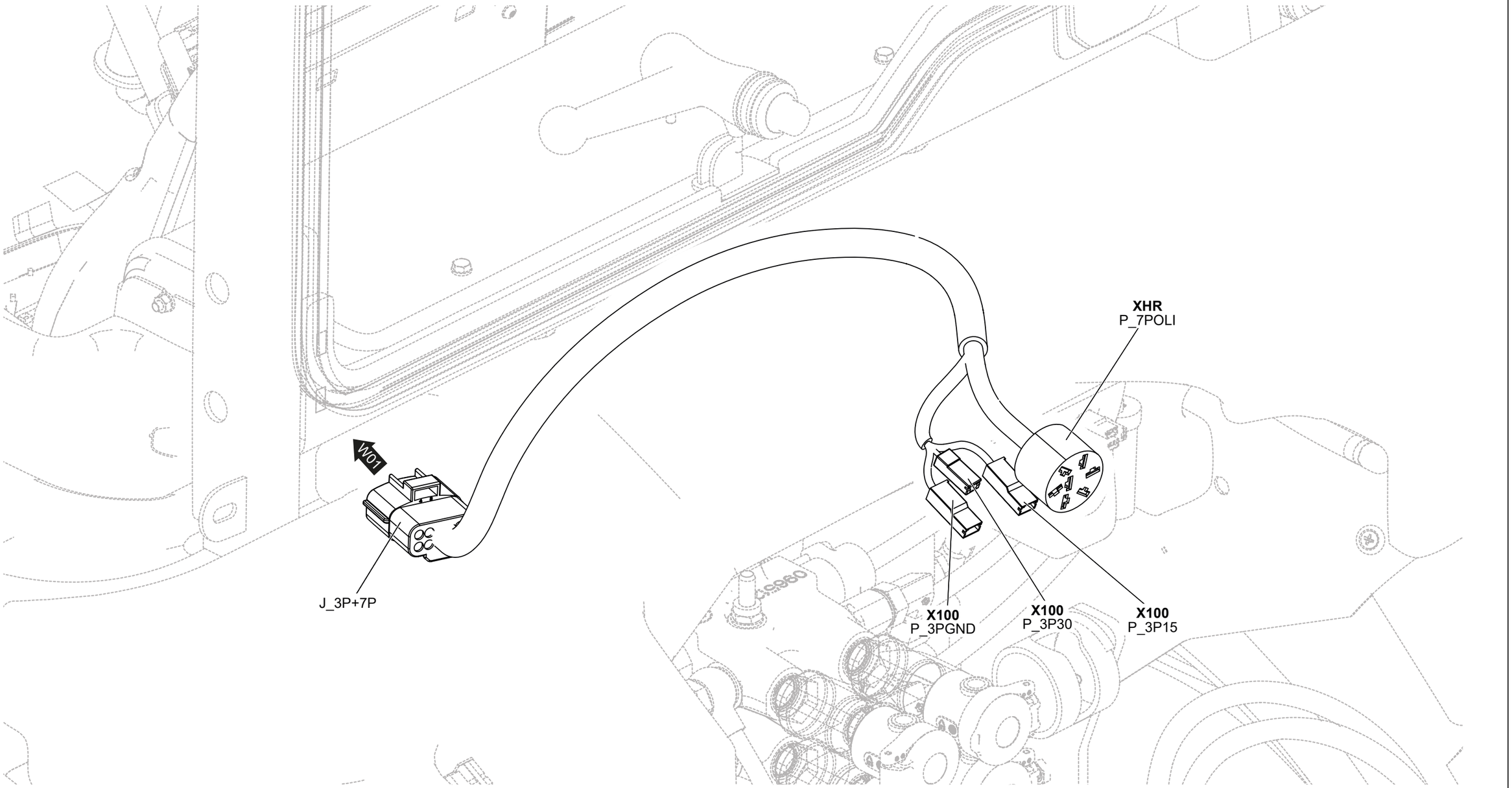
### 9.2.1.4.4 Schematic 4



## 9.2.2. 3D Routings

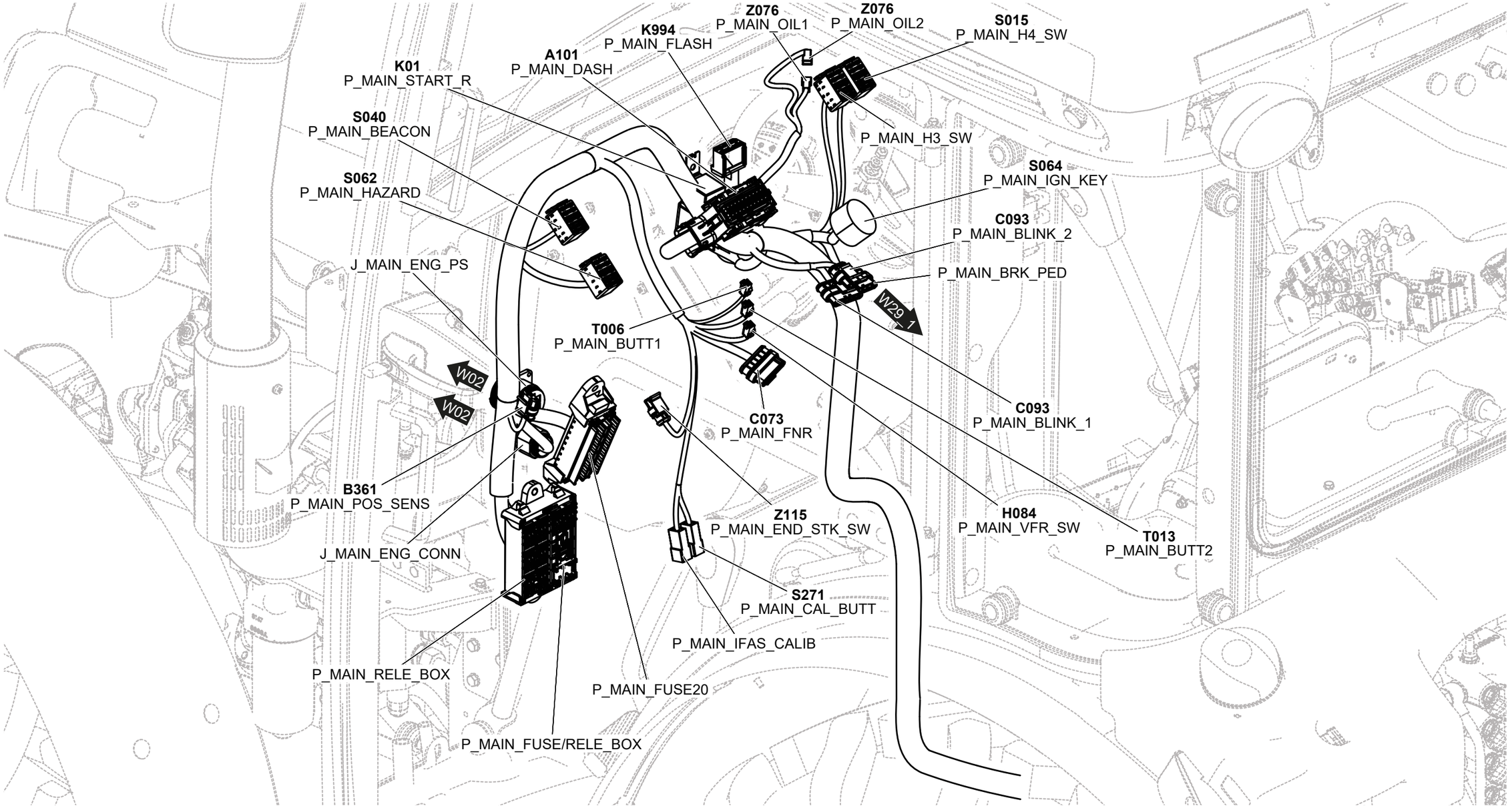
### 9.2.2.1 75Hp models

#### 9.2.2.1.1 W01 - MAIN WIRING HARNESS LH



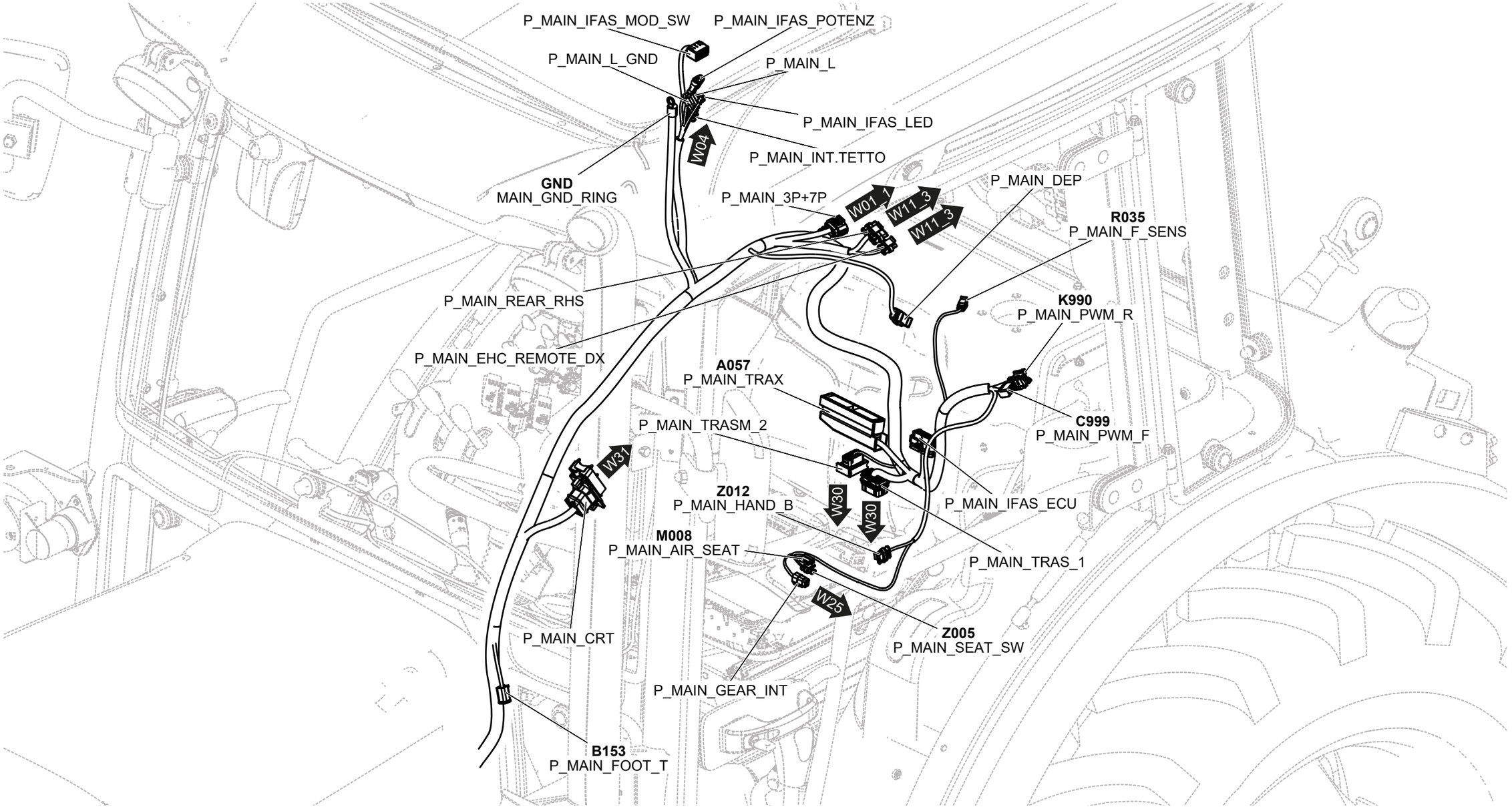

W01_1_VA_IN_569962_A_0_20230306

### 9.2.2.1.2 W01 - MAIN WIRING HARNESS RH

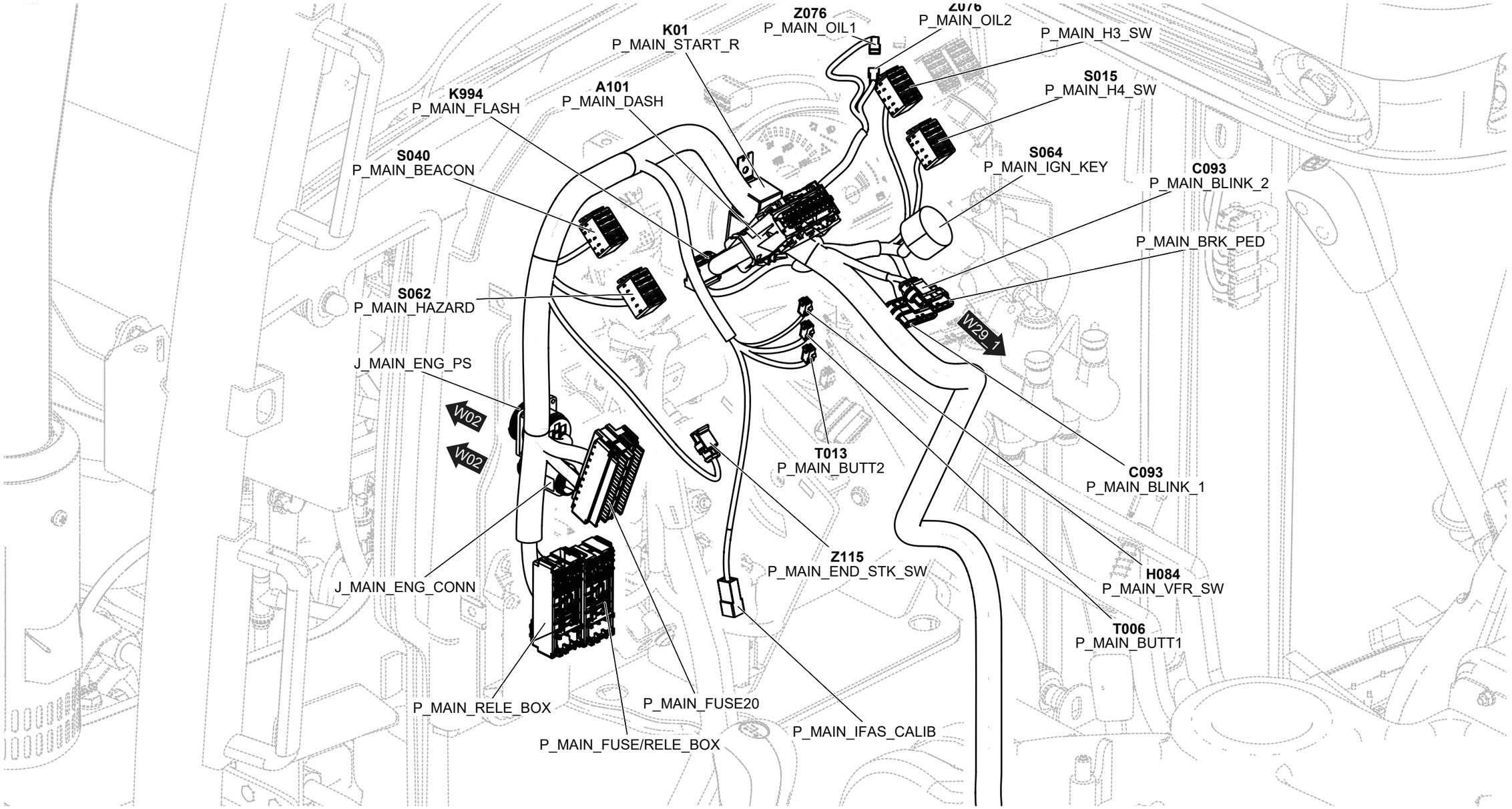



W01_VA_IN_566391_A_2_LH_20230306

### 9.2.2.1.3 W01 - MAIN WIRING HARNESS LH

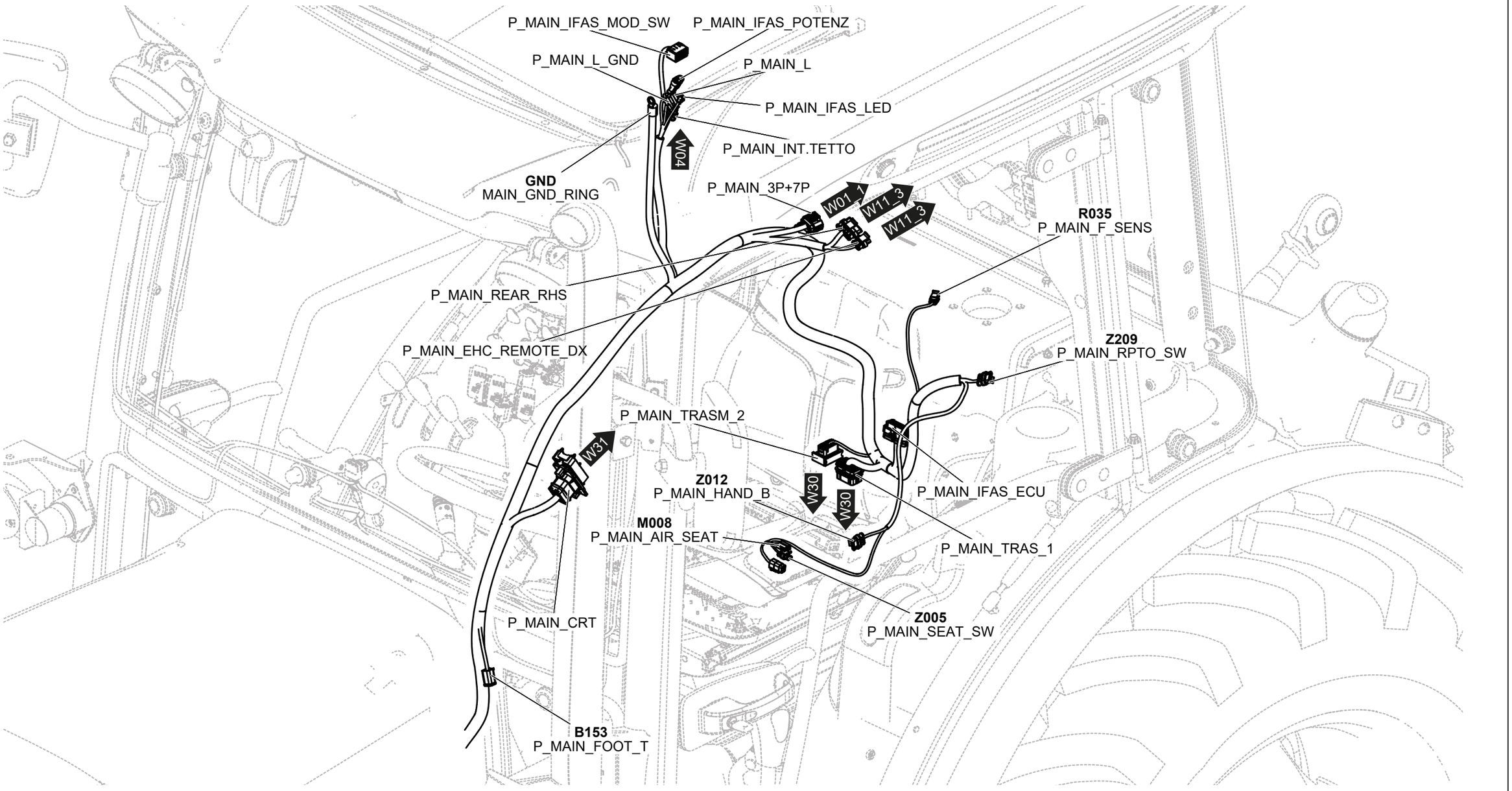



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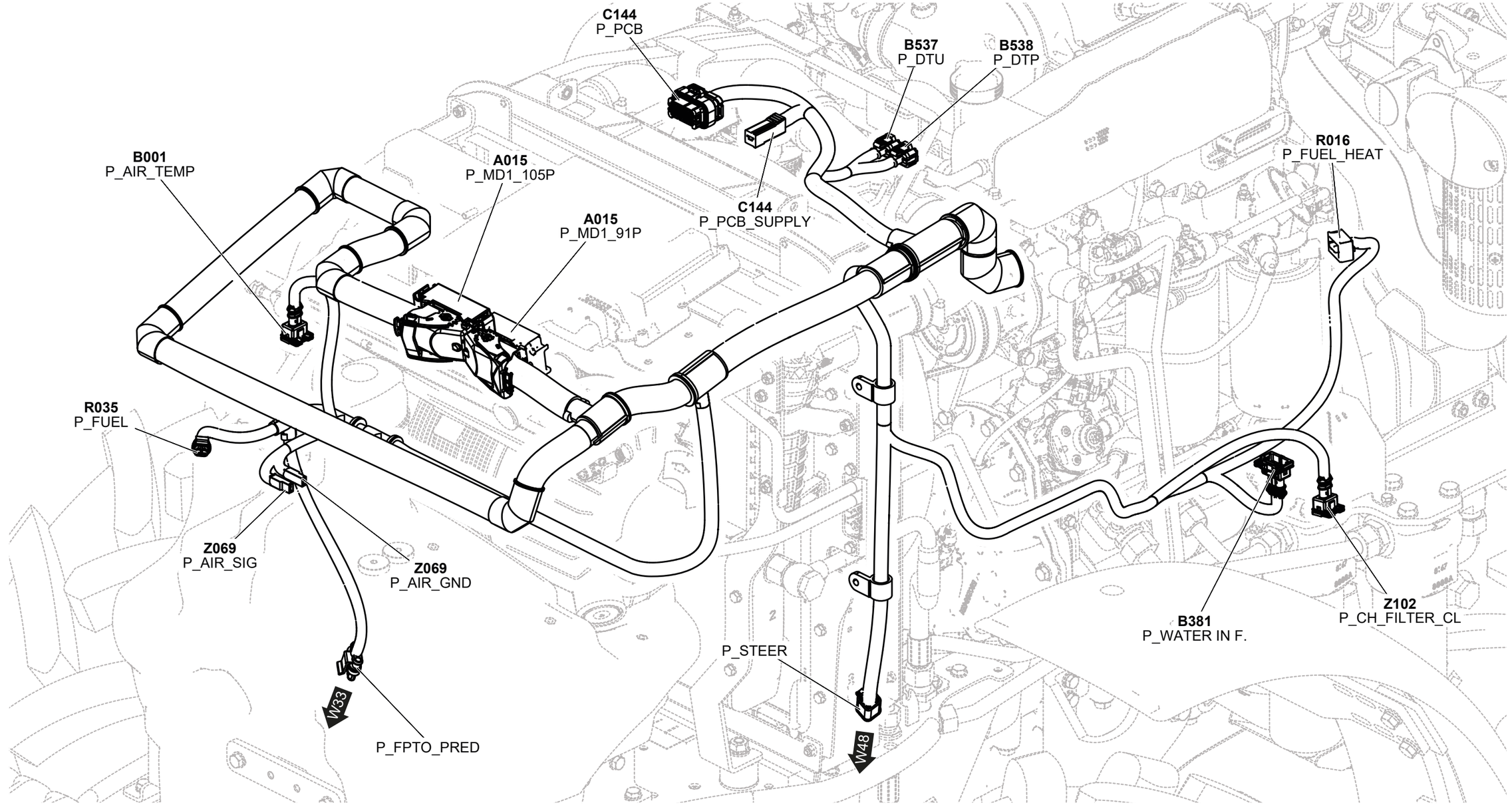



W01_VA_IN_566402_A_1_LH_20230306

### 9.2.2.1.5 W01_1 - REAR SOCKETS WIRING HARNESS

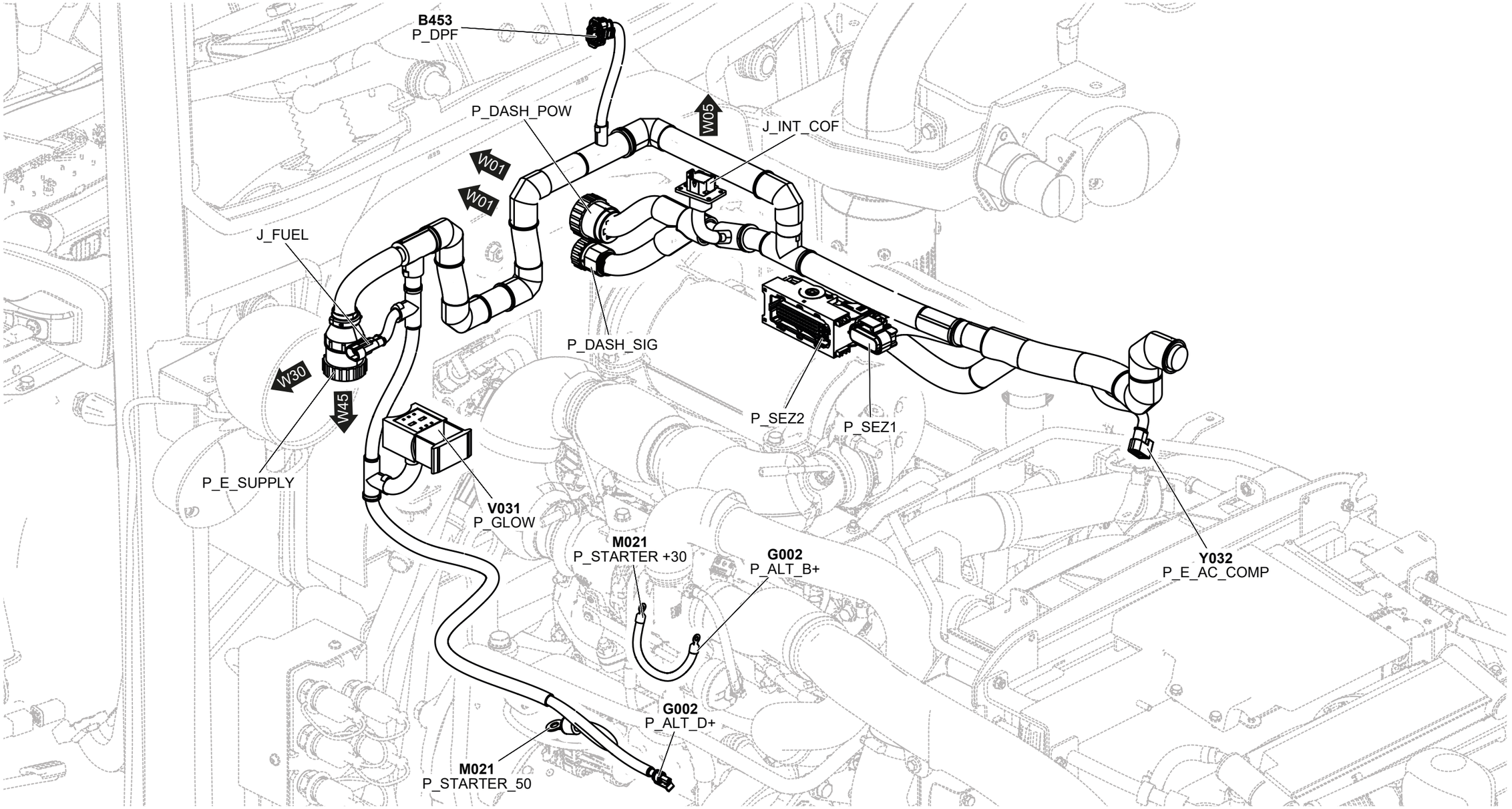



W01_VA_IN_566402_A_1_RH_20230306



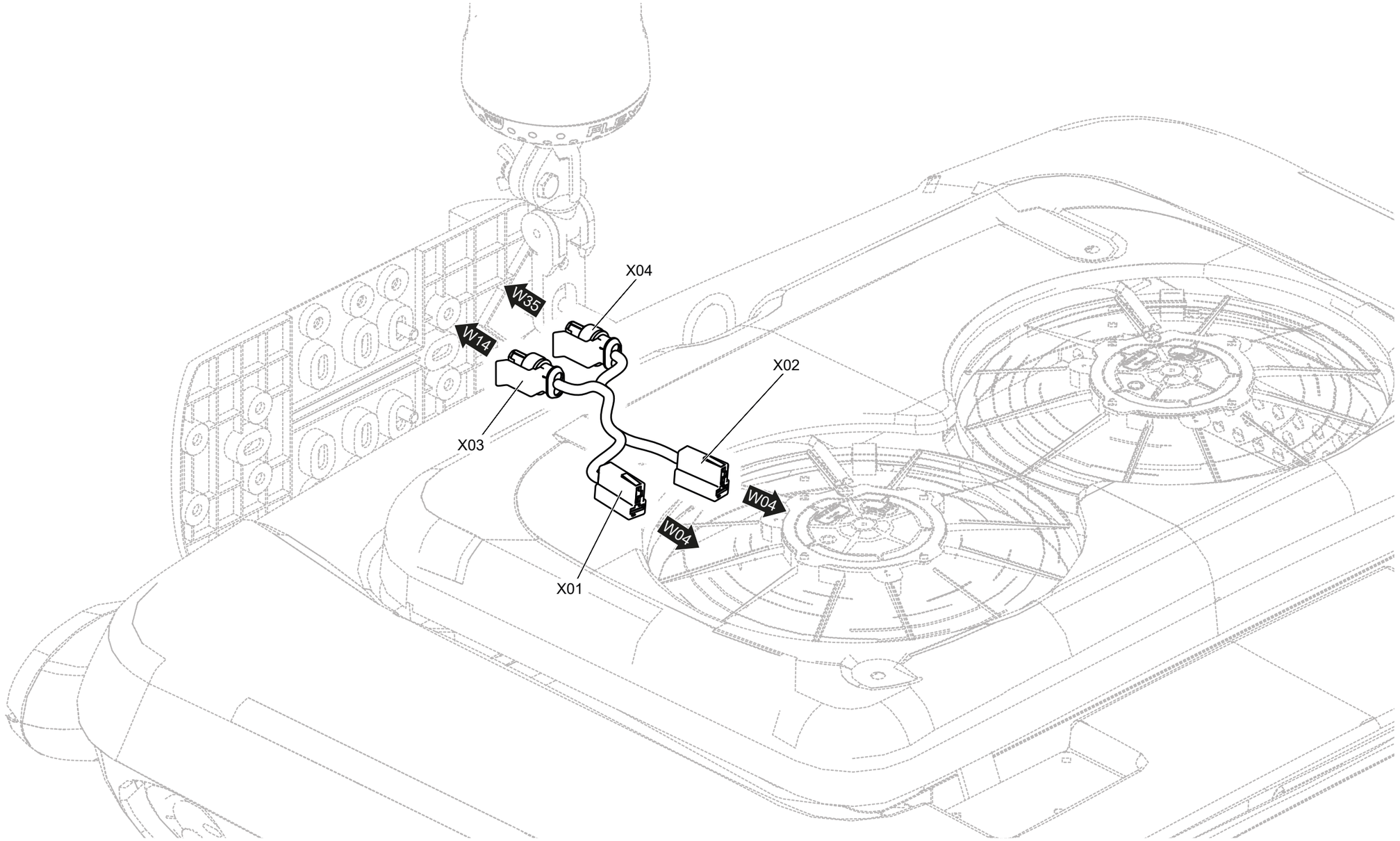

W02_VA_IN_583687_A_0_LH_20230306

### 9.2.2.1.7 W02 - ENGINE WIRING HARNESS RH



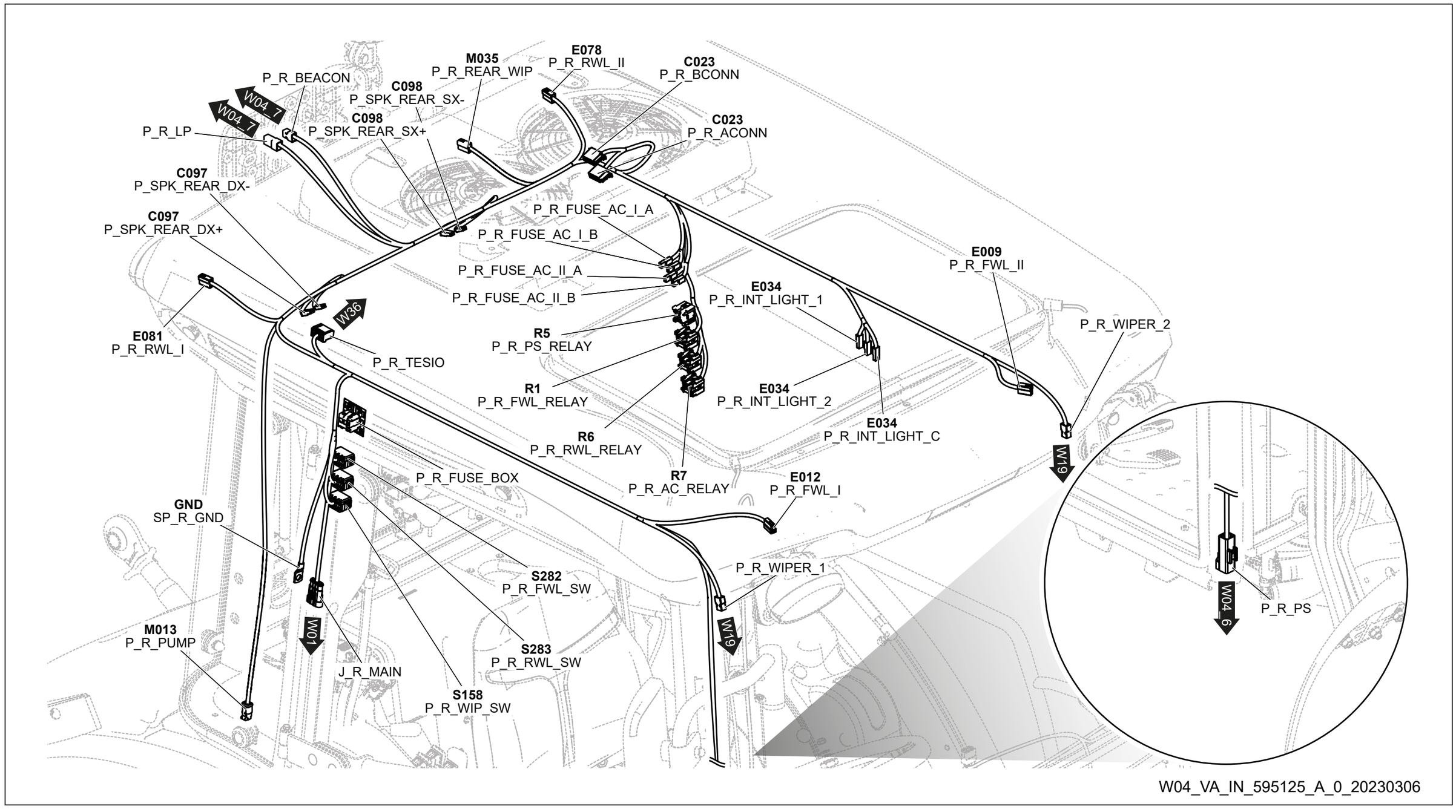

W02_VA_IN_583687_A_0_RH_20230306

### 9.2.2.1.8 W04 - CAB ROOF WIRING HARNESS



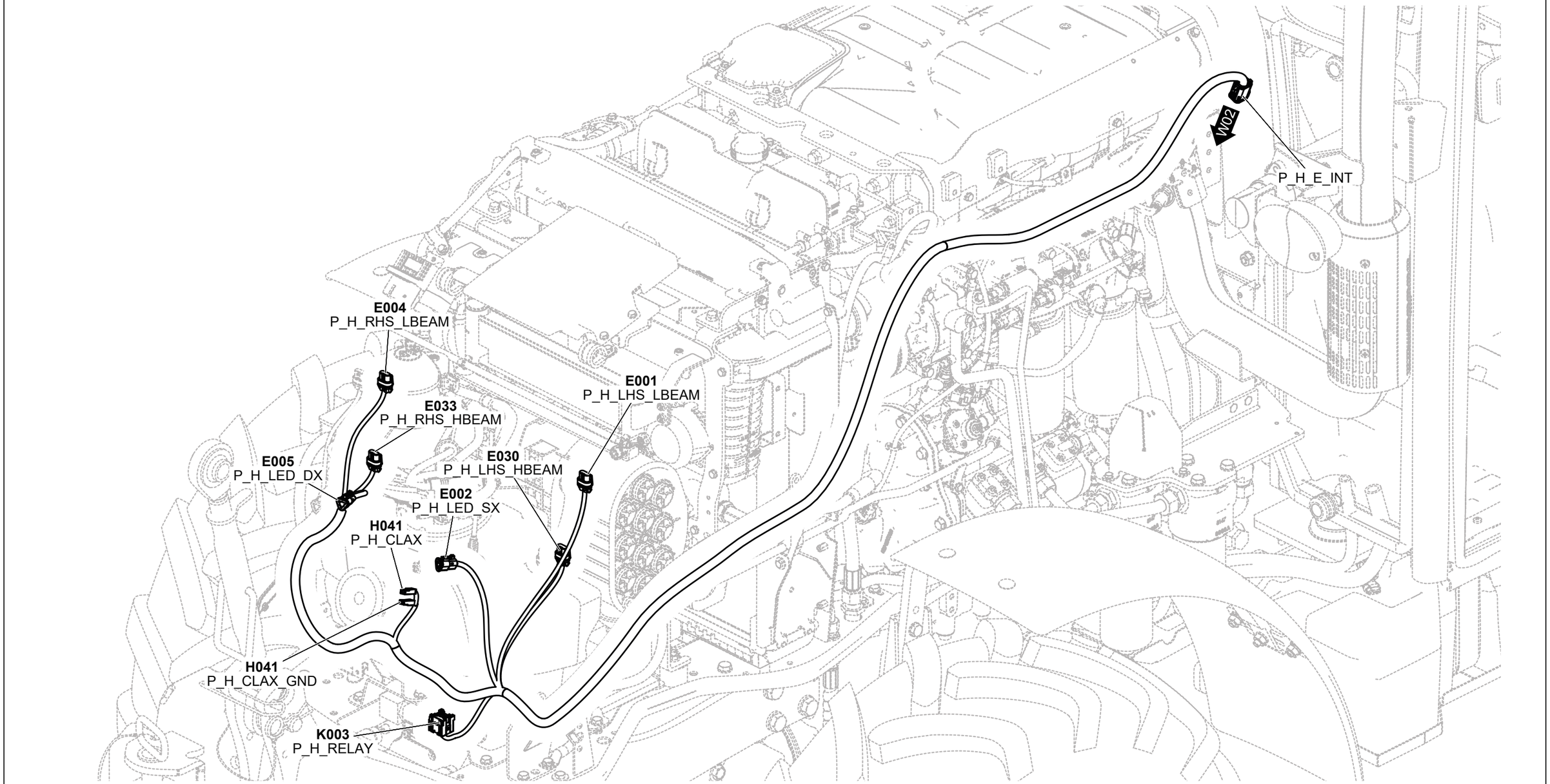

W04_7_VA_IN_211481_A_0_20230306

### 9.2.2.1.9 W04_7 - BEACON & LICENCE PLATE LIGHT WIRING HARNESS



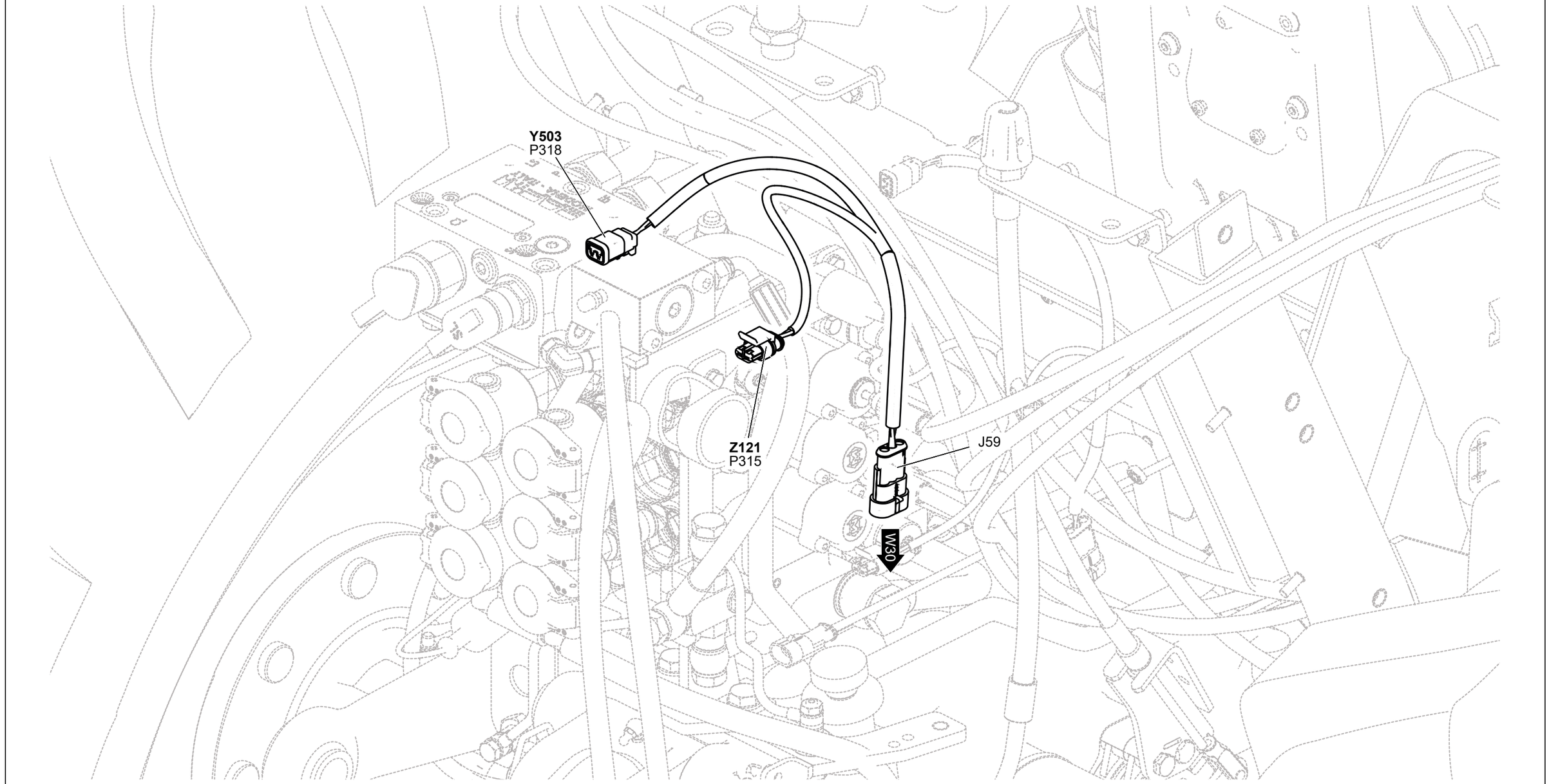

W04_VA_IN_595125_A_0_20230306

### 9.2.2.1.10 W05 - HOOD WIRING HARNESS



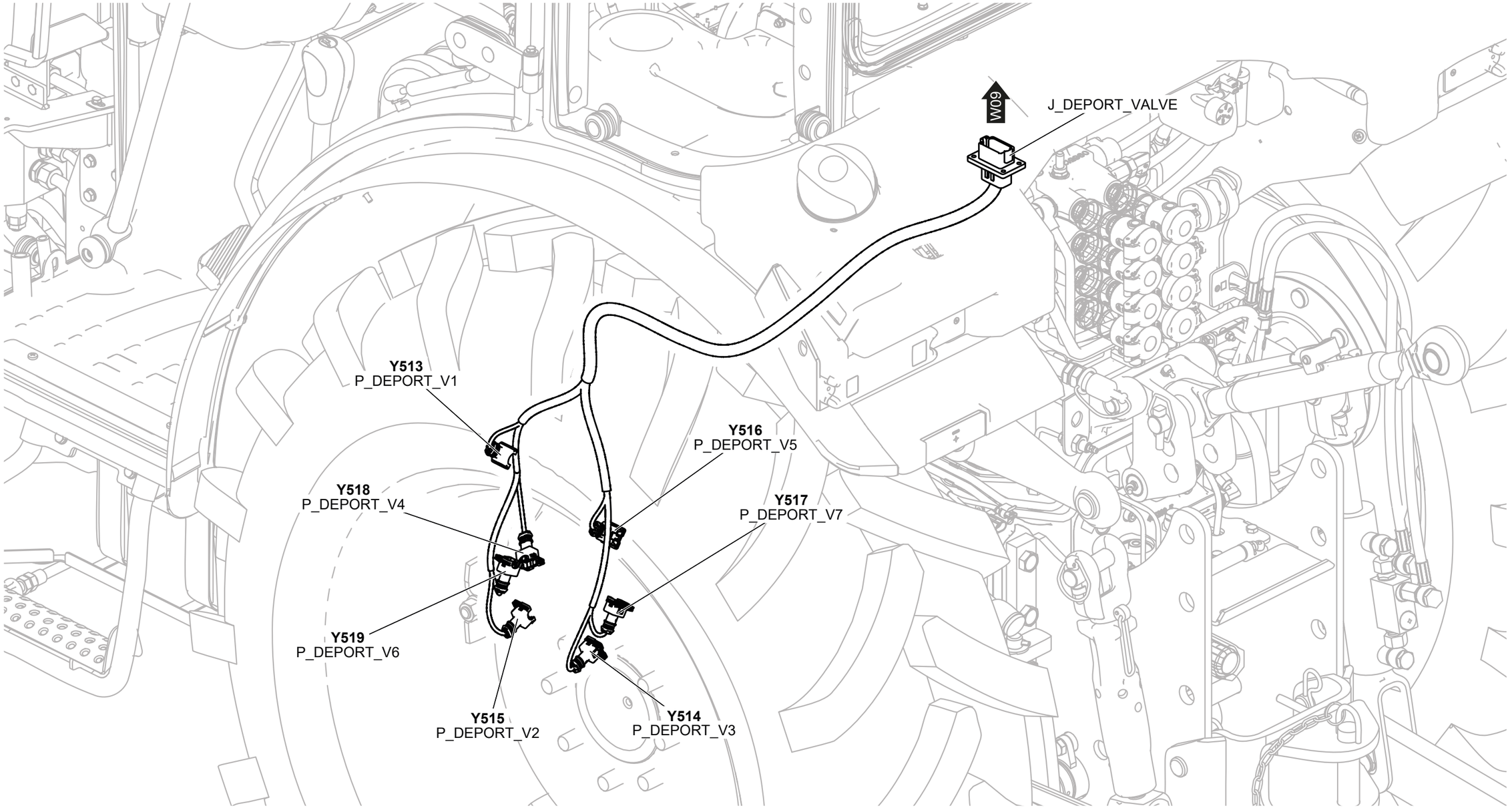

W05_VA_IN_599834_A_0_20230306

## 9.2.2.1.11 W06 - TRAILER BRAKE VALVE WIRING HARNESS



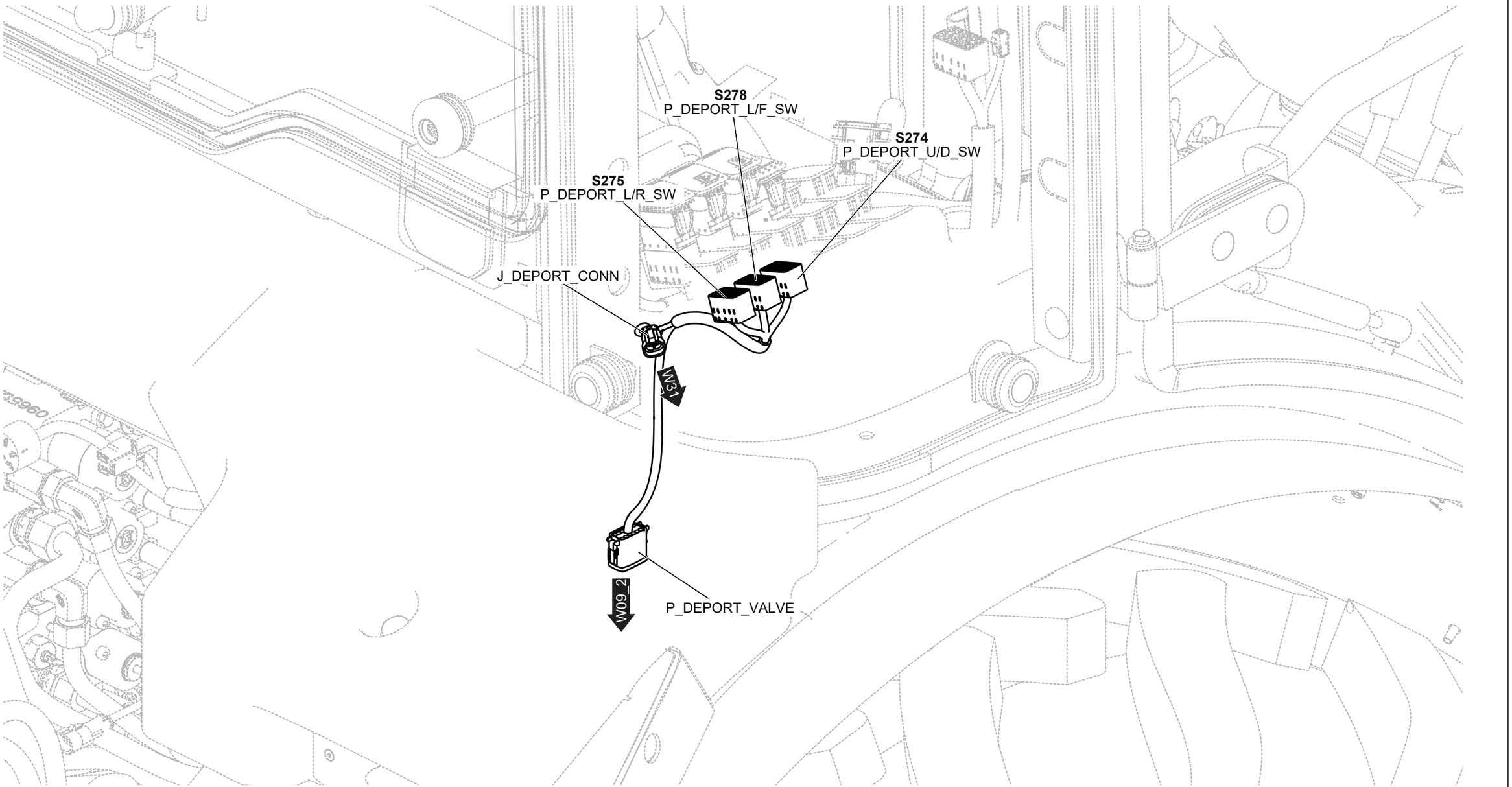

W06_VA_IN_522591_A_0_20230306

## 9.2.2.1.12 W09 - DEPORT CONTROLS WIRING HARNESS



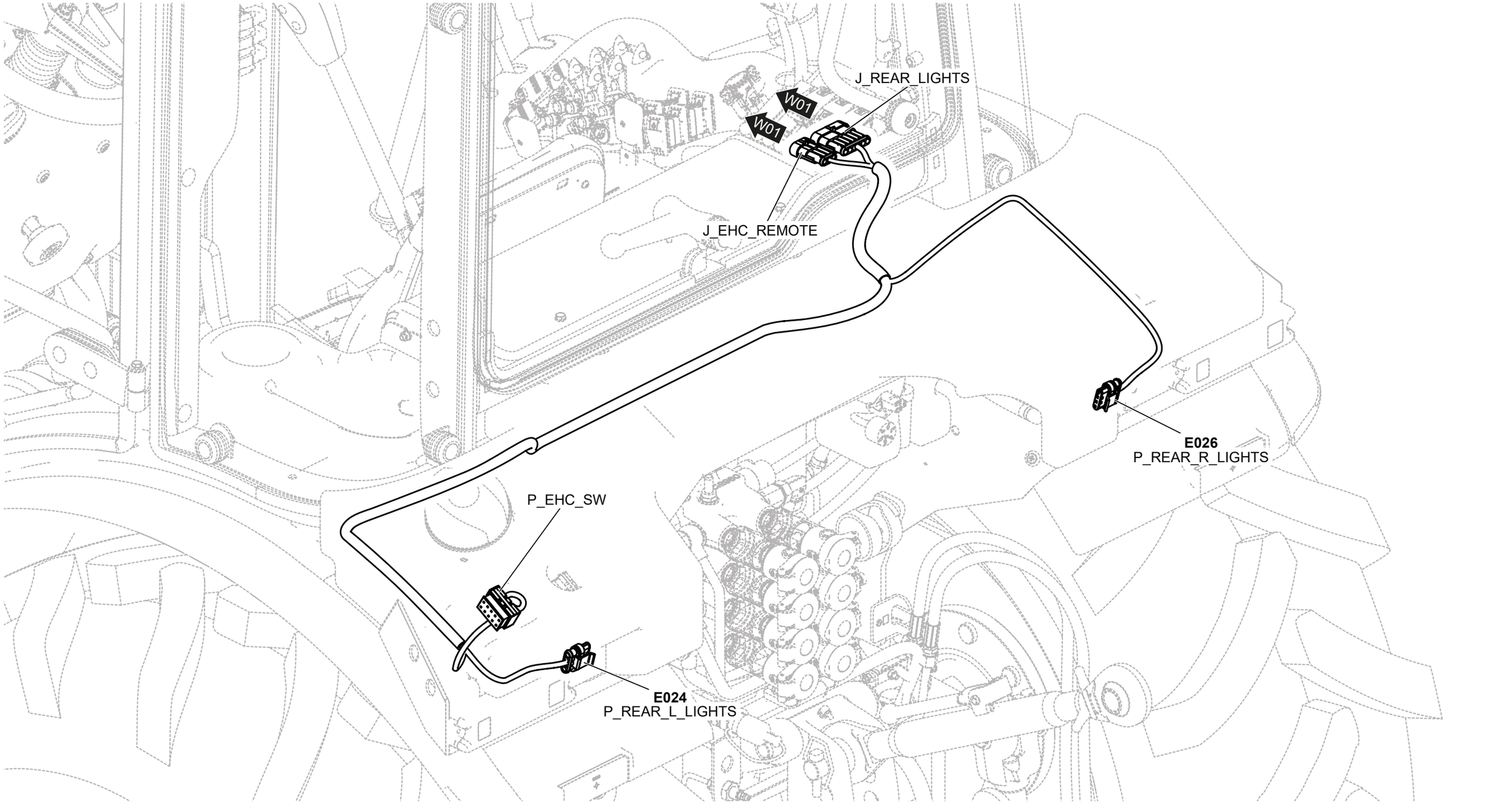

W09_2_VA_IN_569968_A_0_20230306

### 9.2.2.1.13 W09_2 - DEPORT ACTUATORS WIRING HARNESS



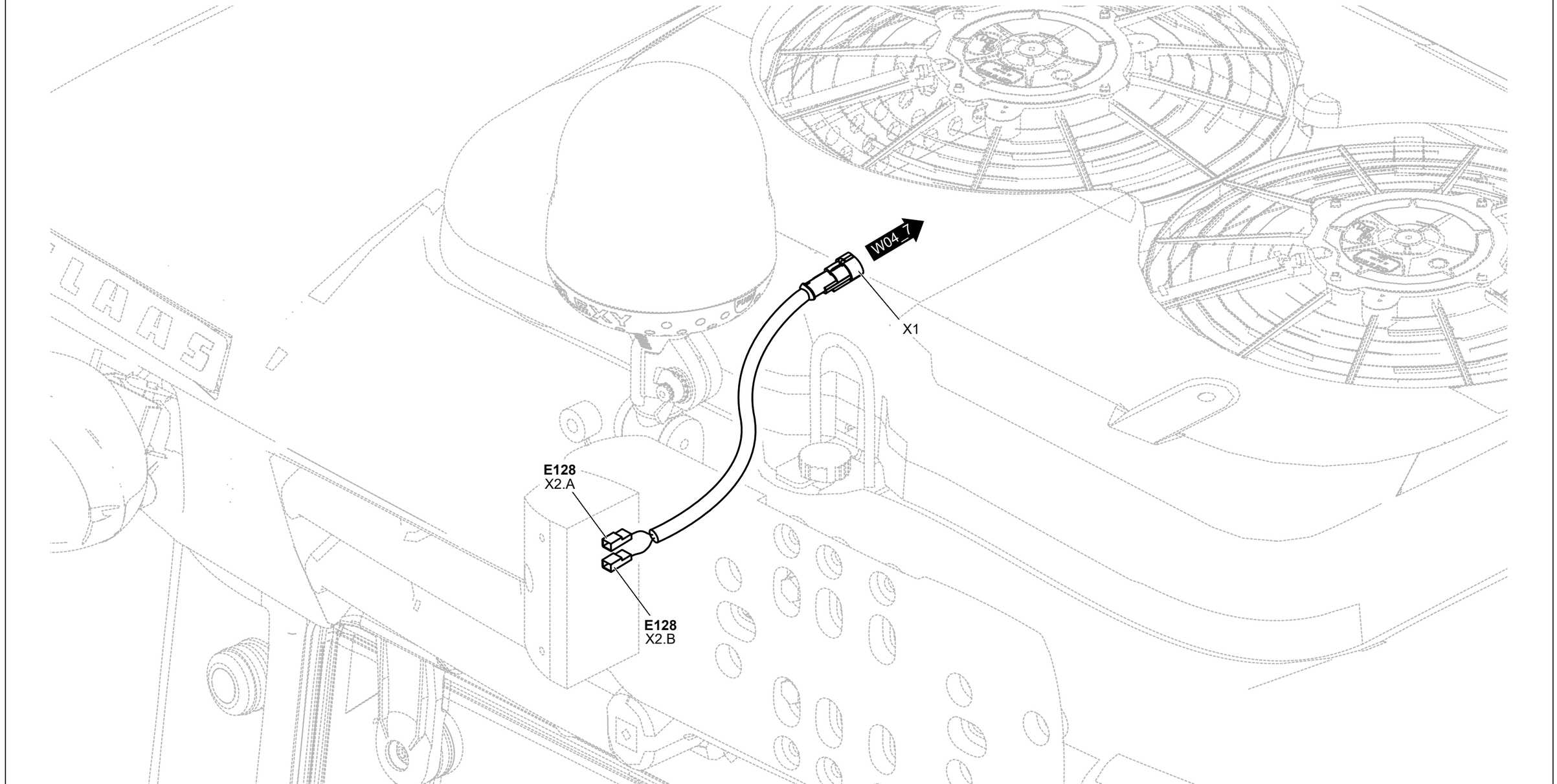

W09_VA_IN_569969_A_0_20230306

### 9.2.2.1.14 W11_3 - EHC REMOTE CONTROLS WIRING HARNESS



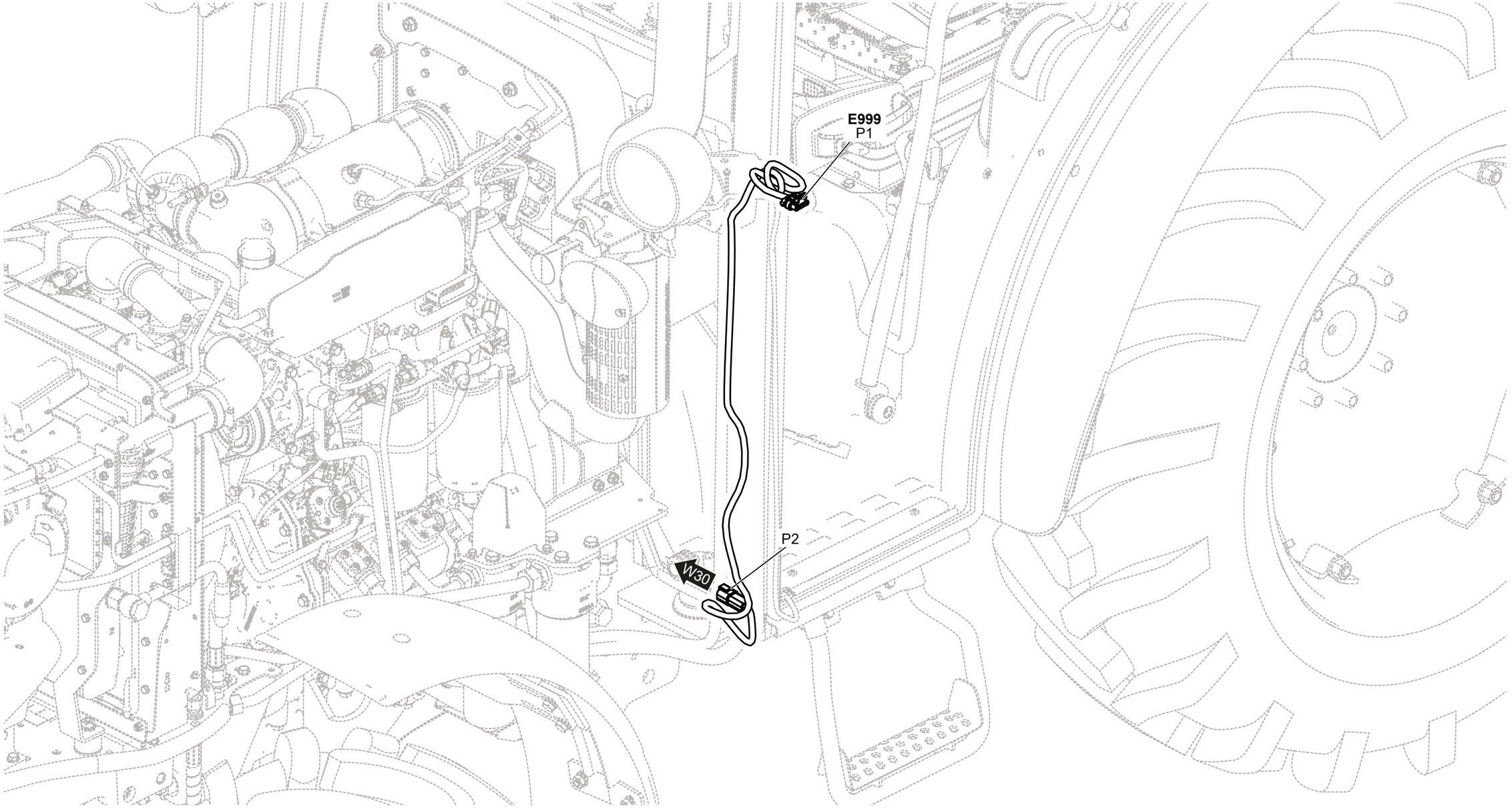

W11_3_VA_IN_569959_A_0_20230306

## 9.2.2.1.15 W14 - LICENCE PLATE LIGHT WIRING HARNESS



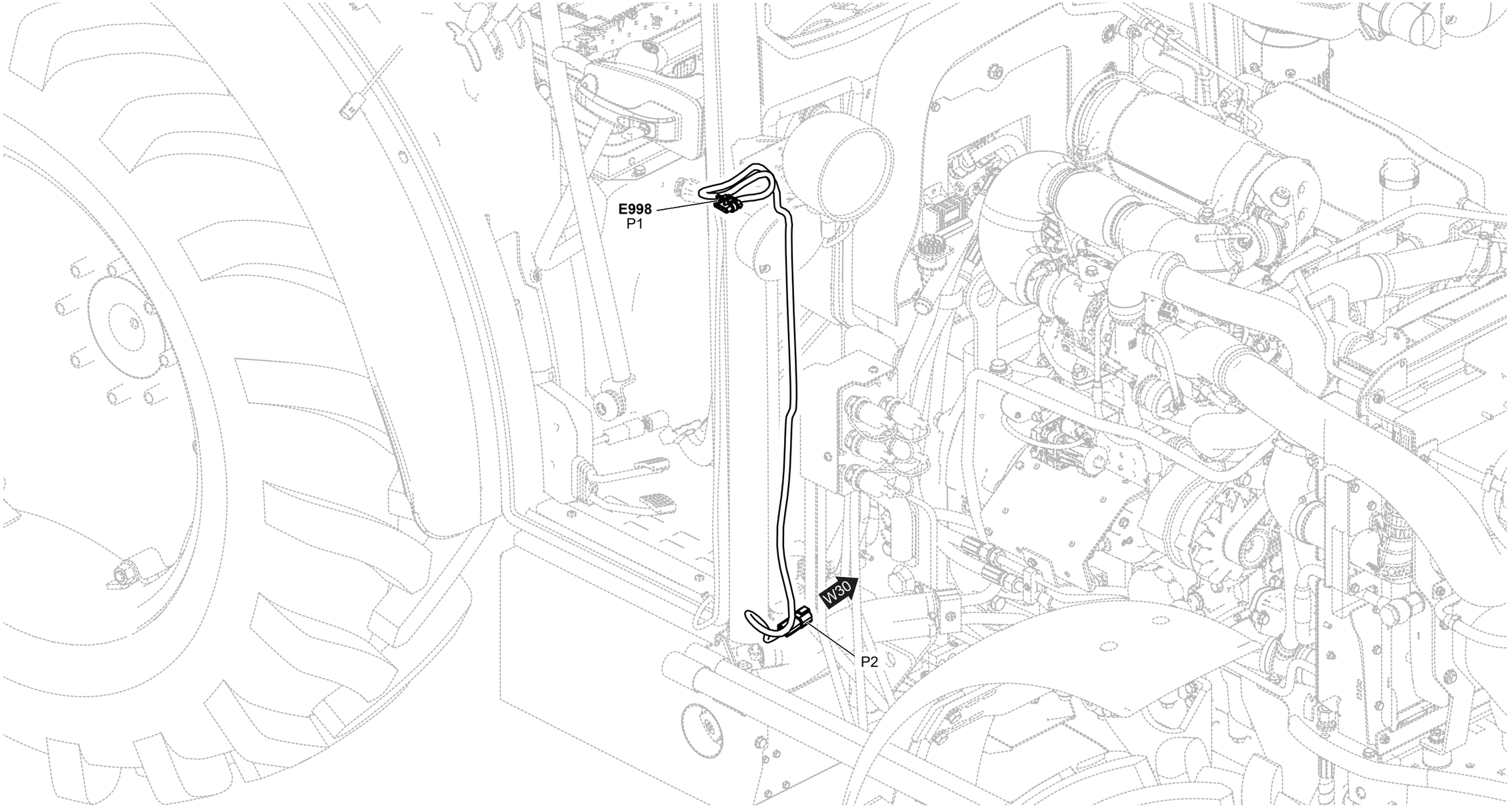

W14_VA_IN_389908_A_0_20230306

## 9.2.2.1.16 W16 - H4 LIGHT WIRING HARNESS LH



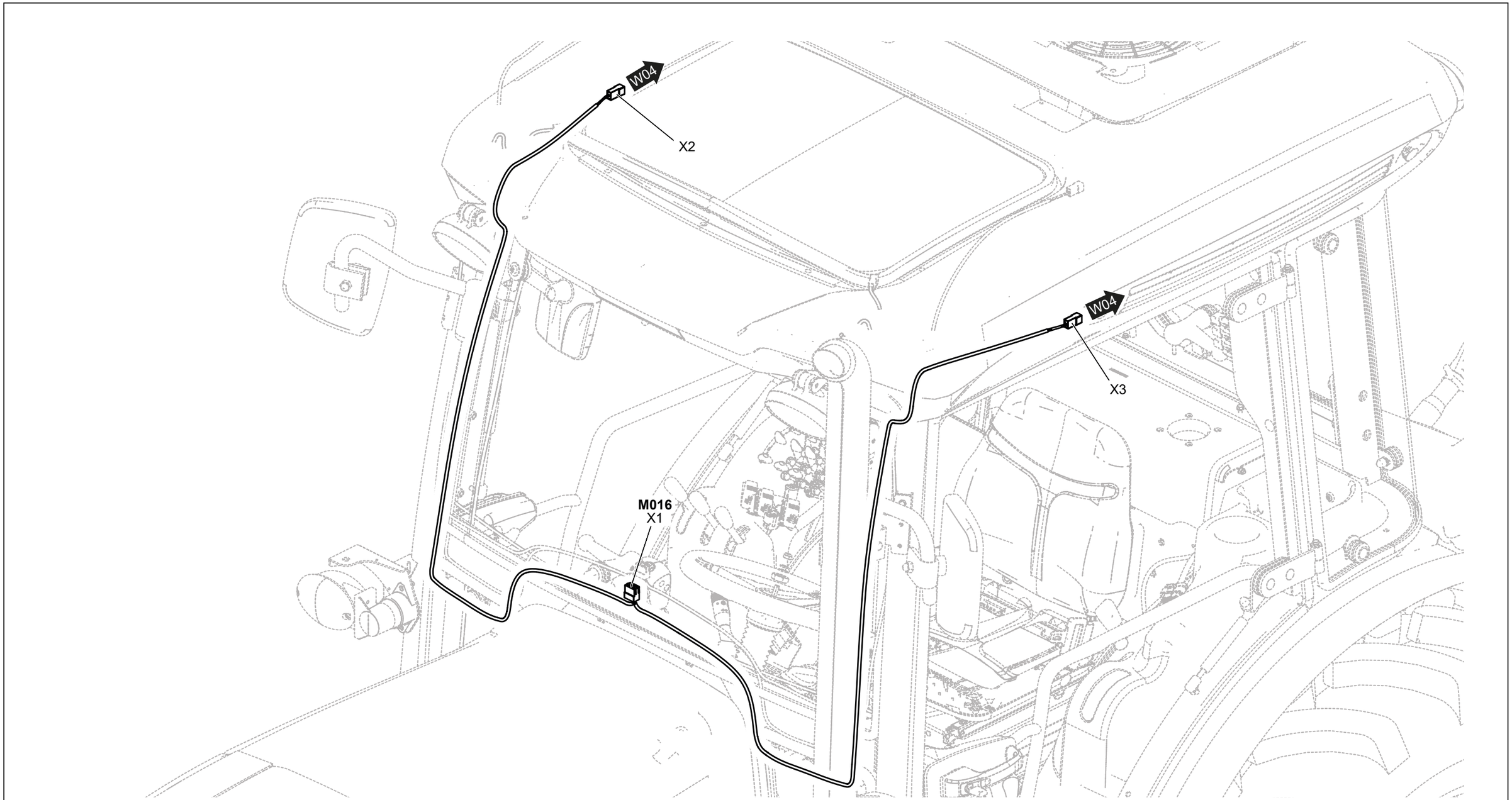

W16_LH_VA_IN_380631_A_0_20230306

## 9.2.2.1.17 W16 - H4 LIGHT WIRING HARNESS RH



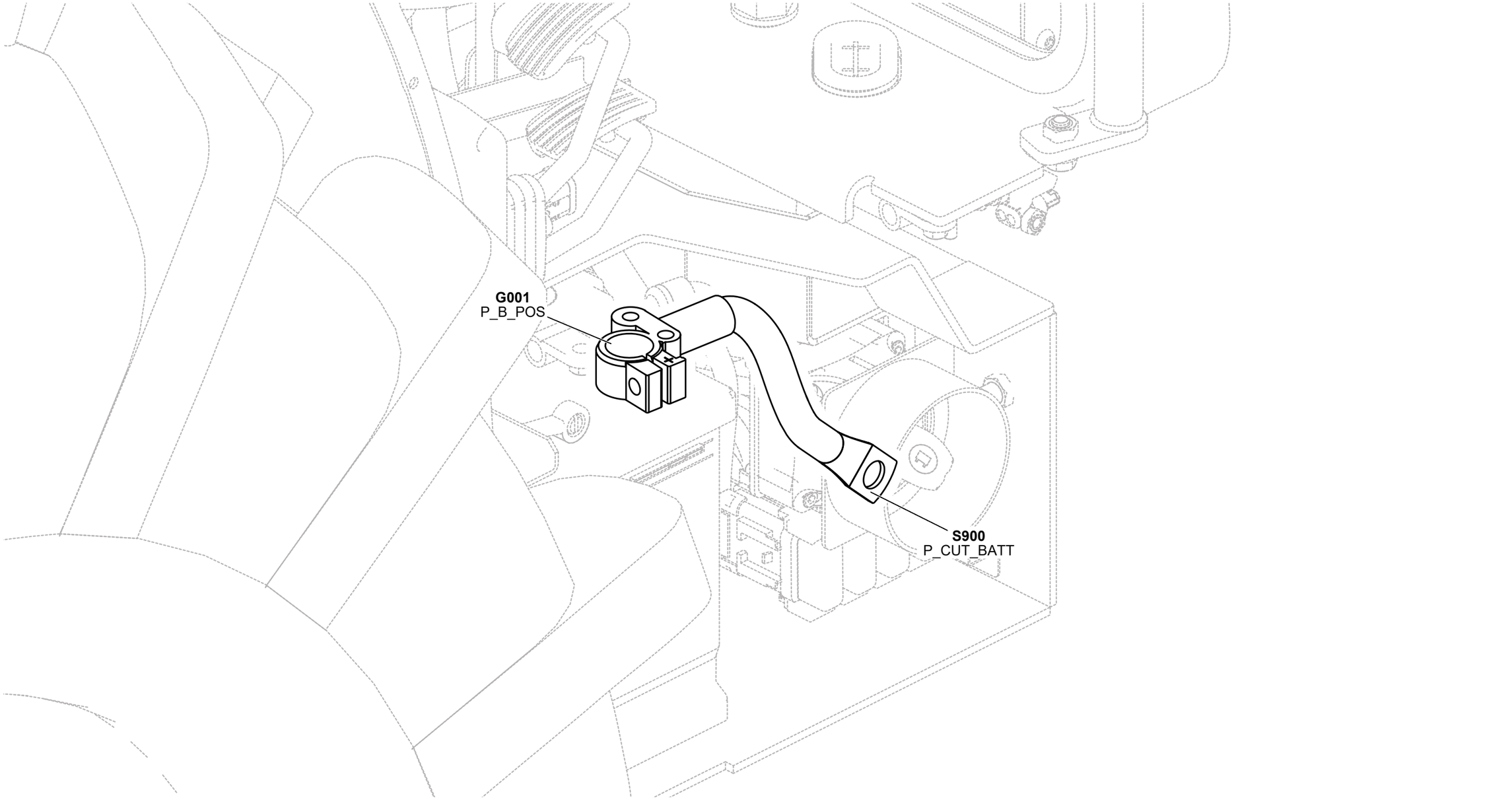

W16_RH_VA_IN_380631_A_0_20230306

### 9.2.2.1.18 W19 - FRONT WIPER MOTOR WIRING HARNESS

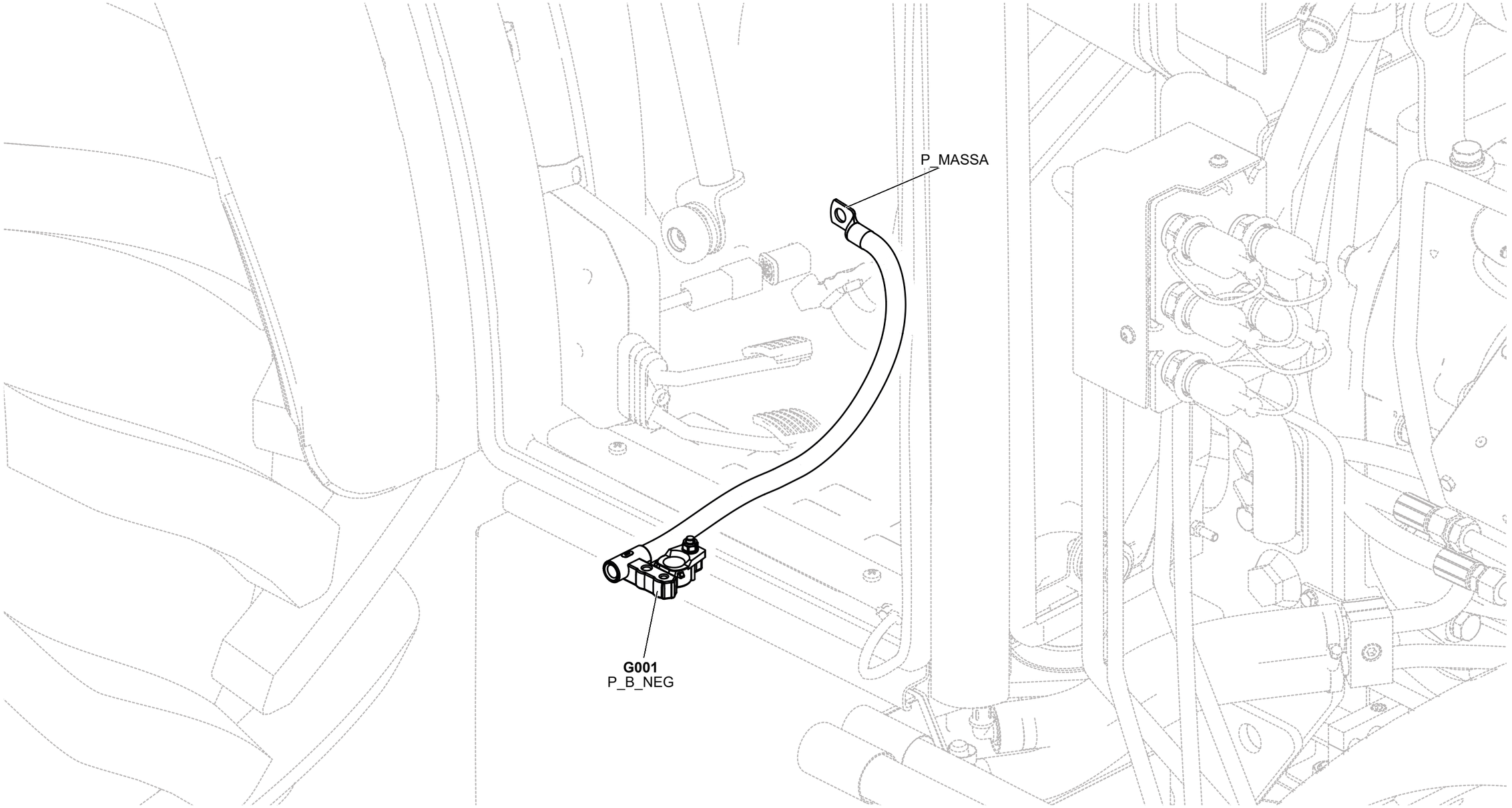



W19_VA_IN_201554_A_0_20230306

### 9.2.2.1.19 W21 - POSITIVE BATTERY CABLE

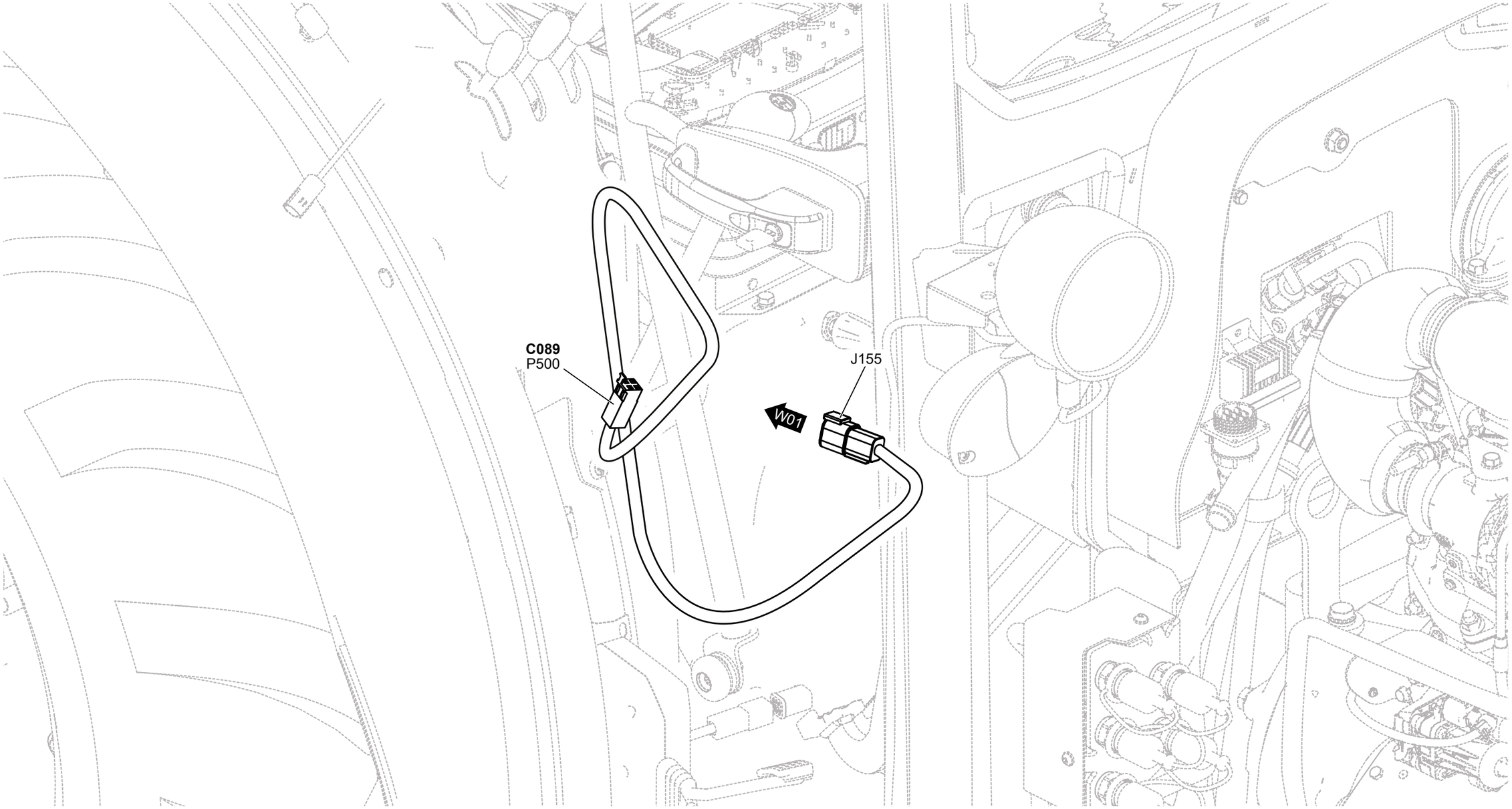



W21_VA_IN_583684_A_0_20230306



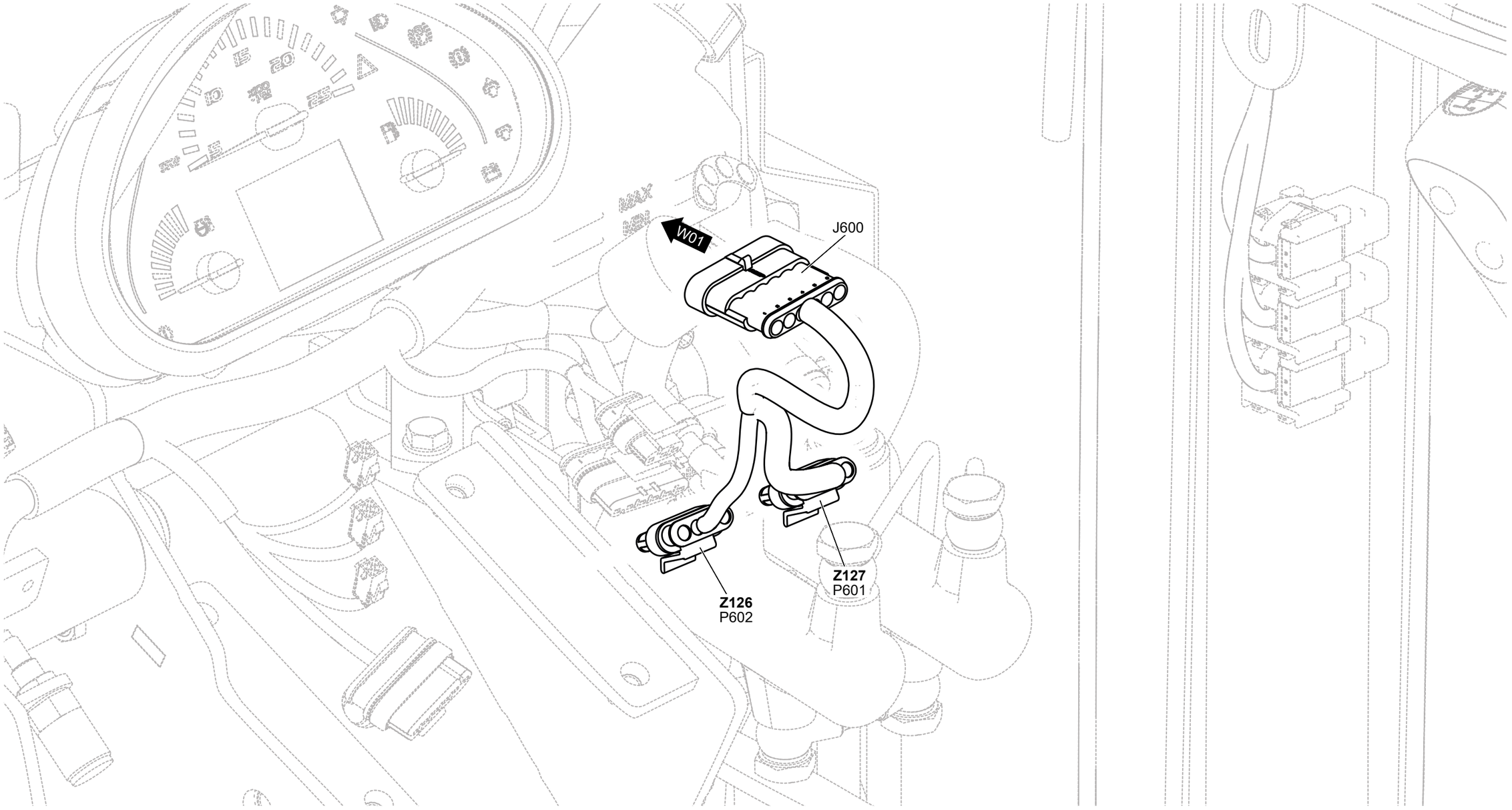

W22_VA_IN_588173_A_0_20230306

### 9.2.2.1.21 W25_1 - HI-LO ELECTRIC CABLE EXTENSION

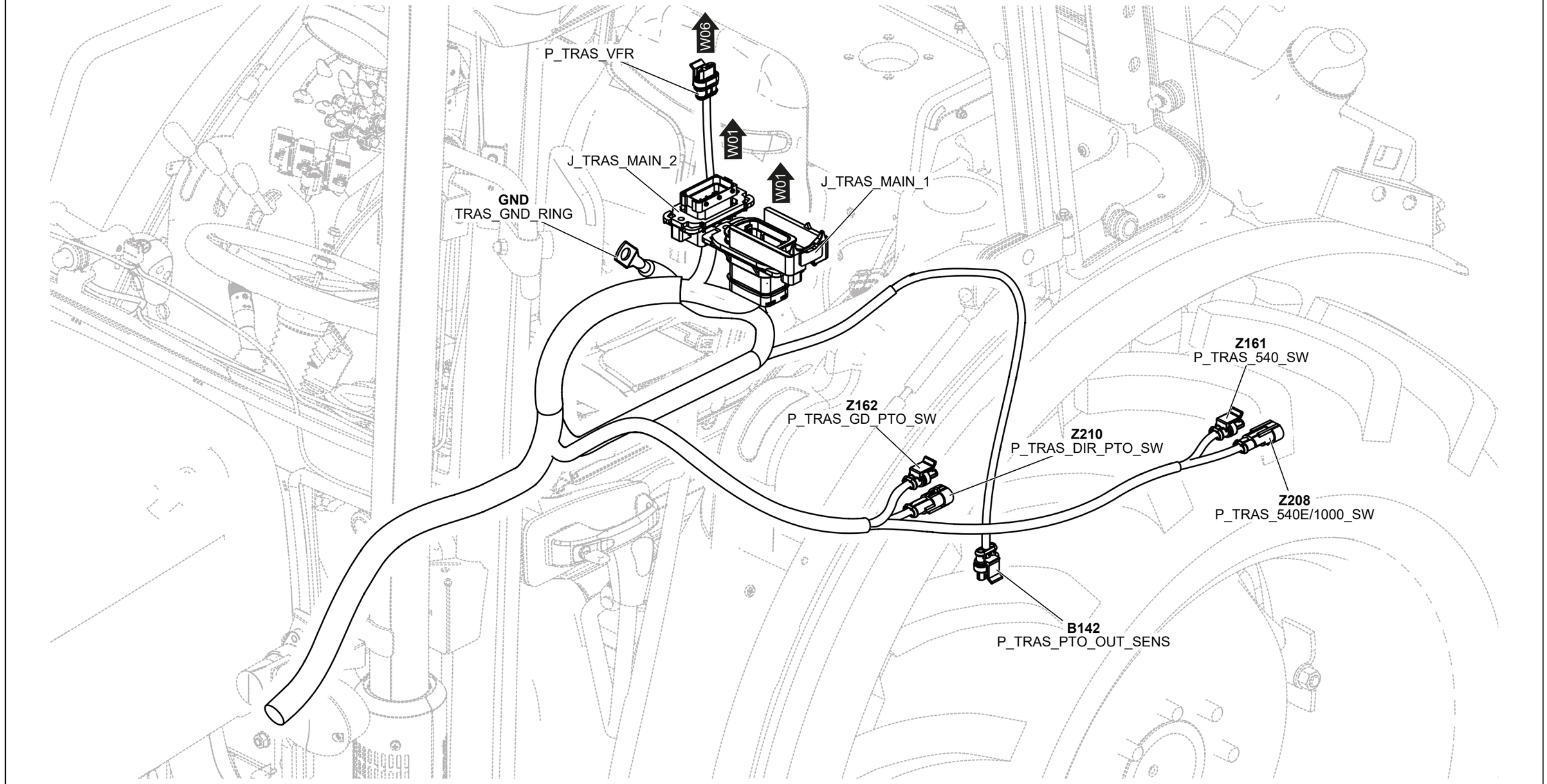



W25_1_VA_IN_473558_A_2_20230306

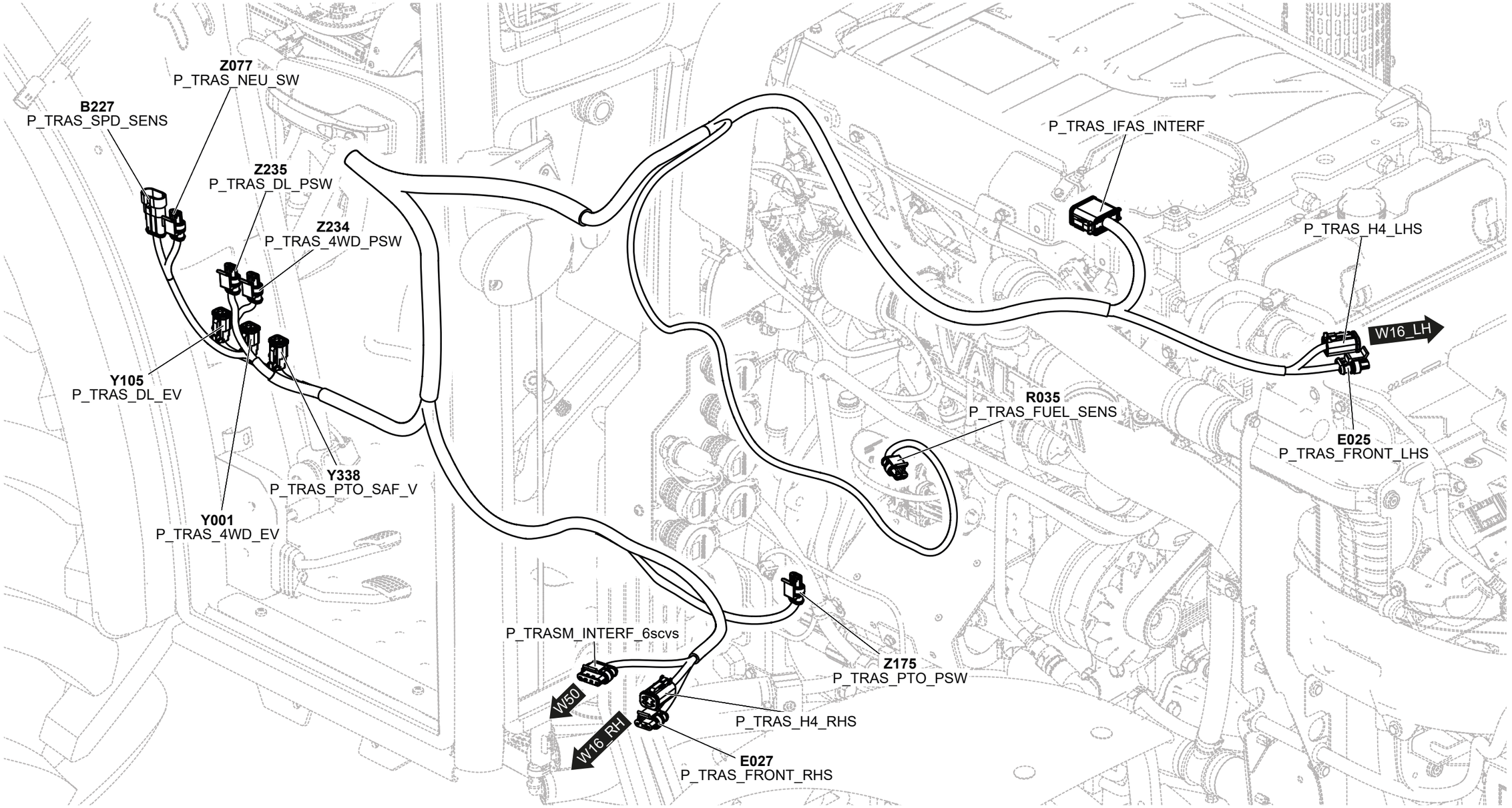
## 9.2.2.1.22 W29_1 - BRAKE SWITCHES WIRING HARNESS



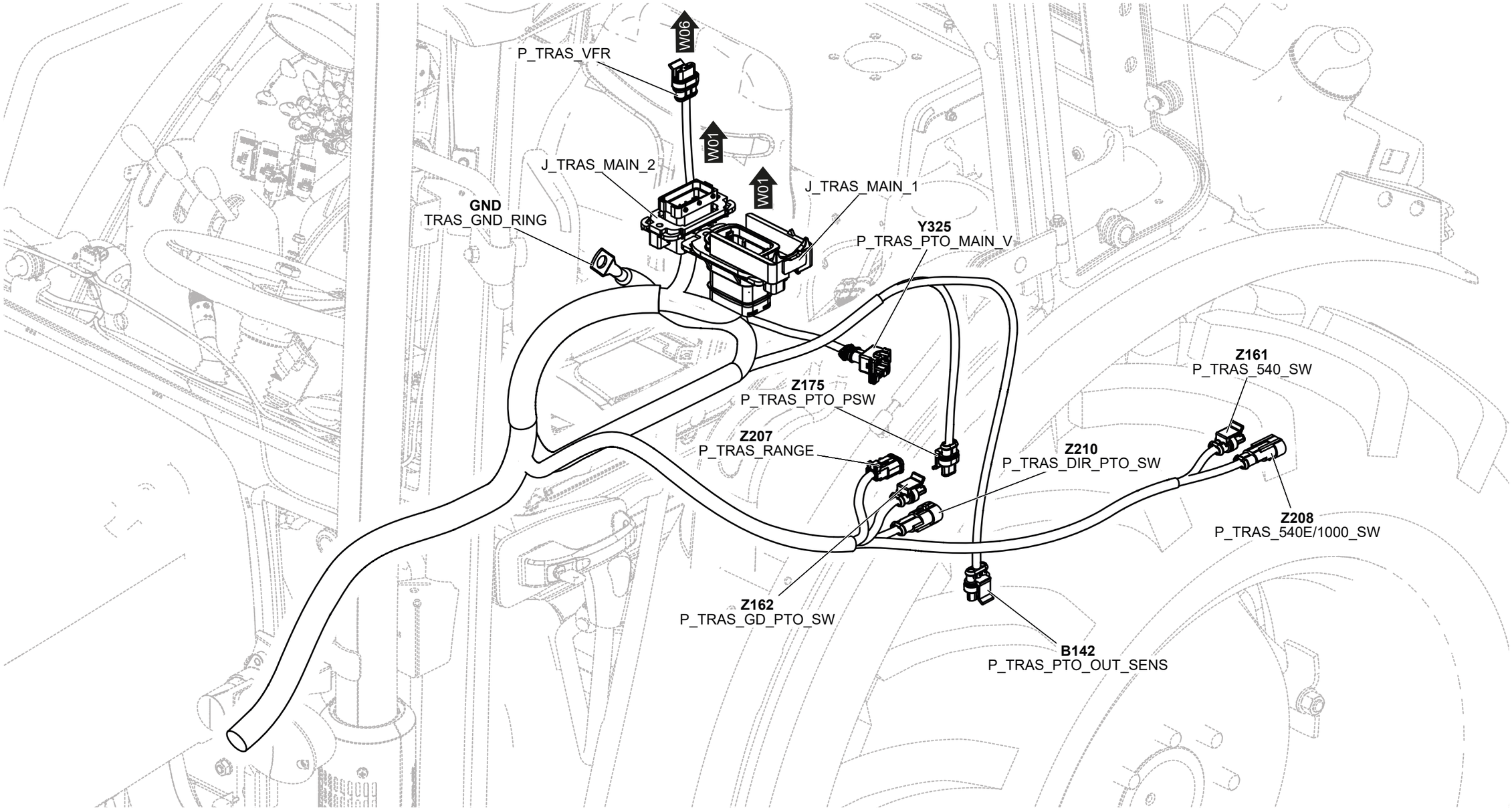

W29_1_VA_IN_464658_A_0_20230306




W30_VA_IN_569961_A_1_LH_20230306

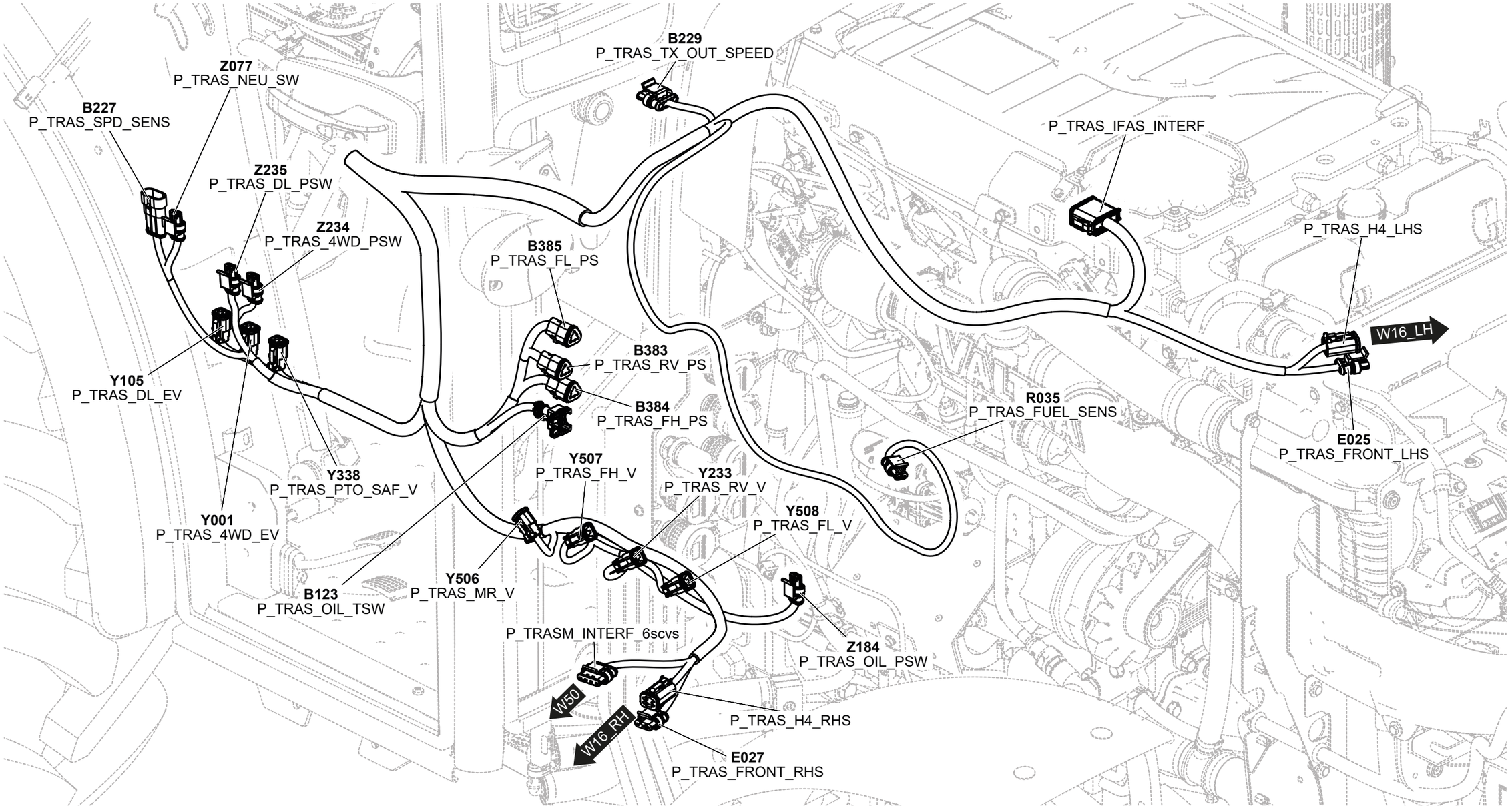



W30_VA_IN_569961_A_1_RH_20230306



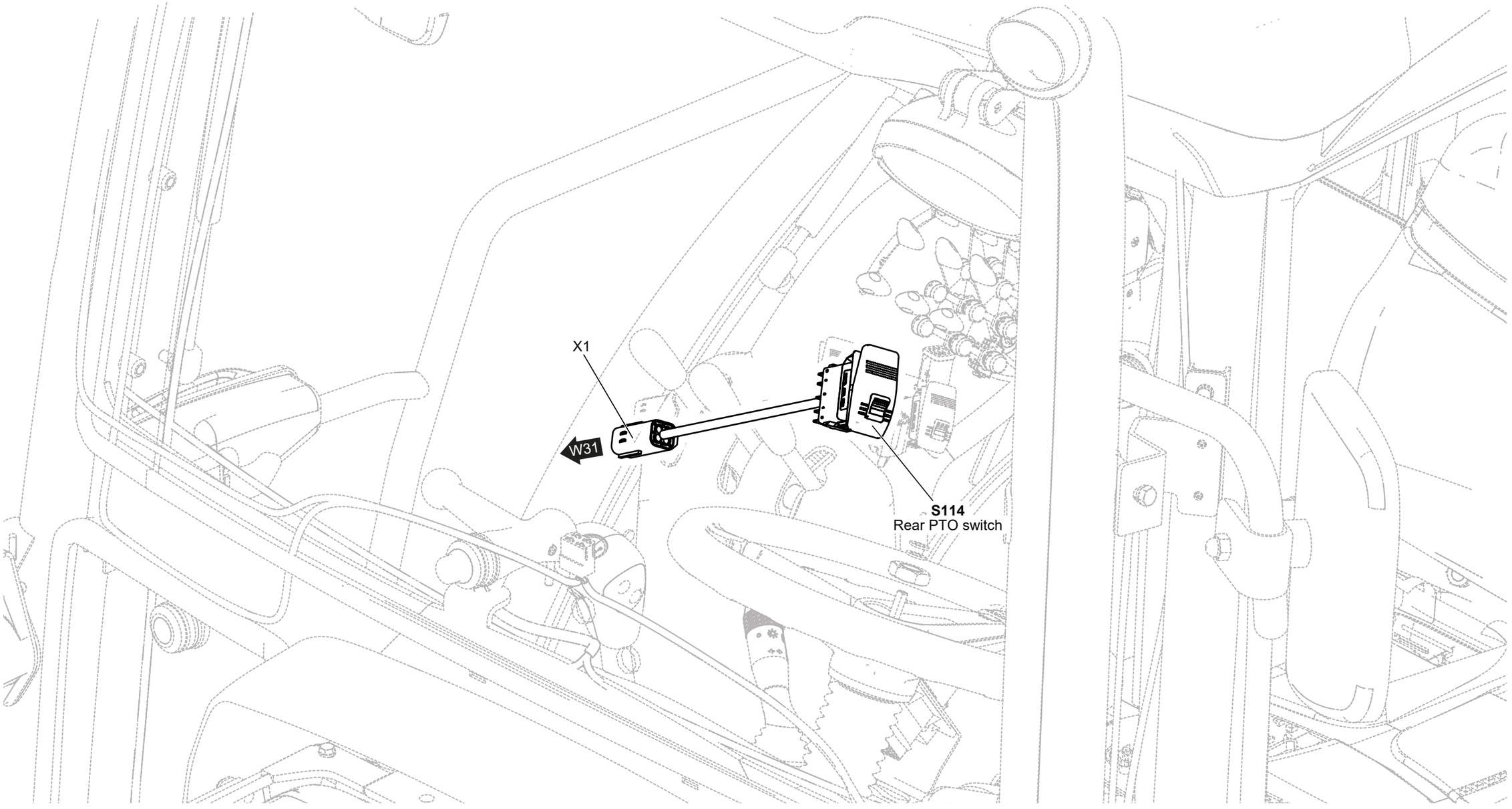

W30_VA_IN_582957_A_2_LH_20230306

### 9.2.2.1.26 W30 - TRANSMISSION WIRING HARNESS RH

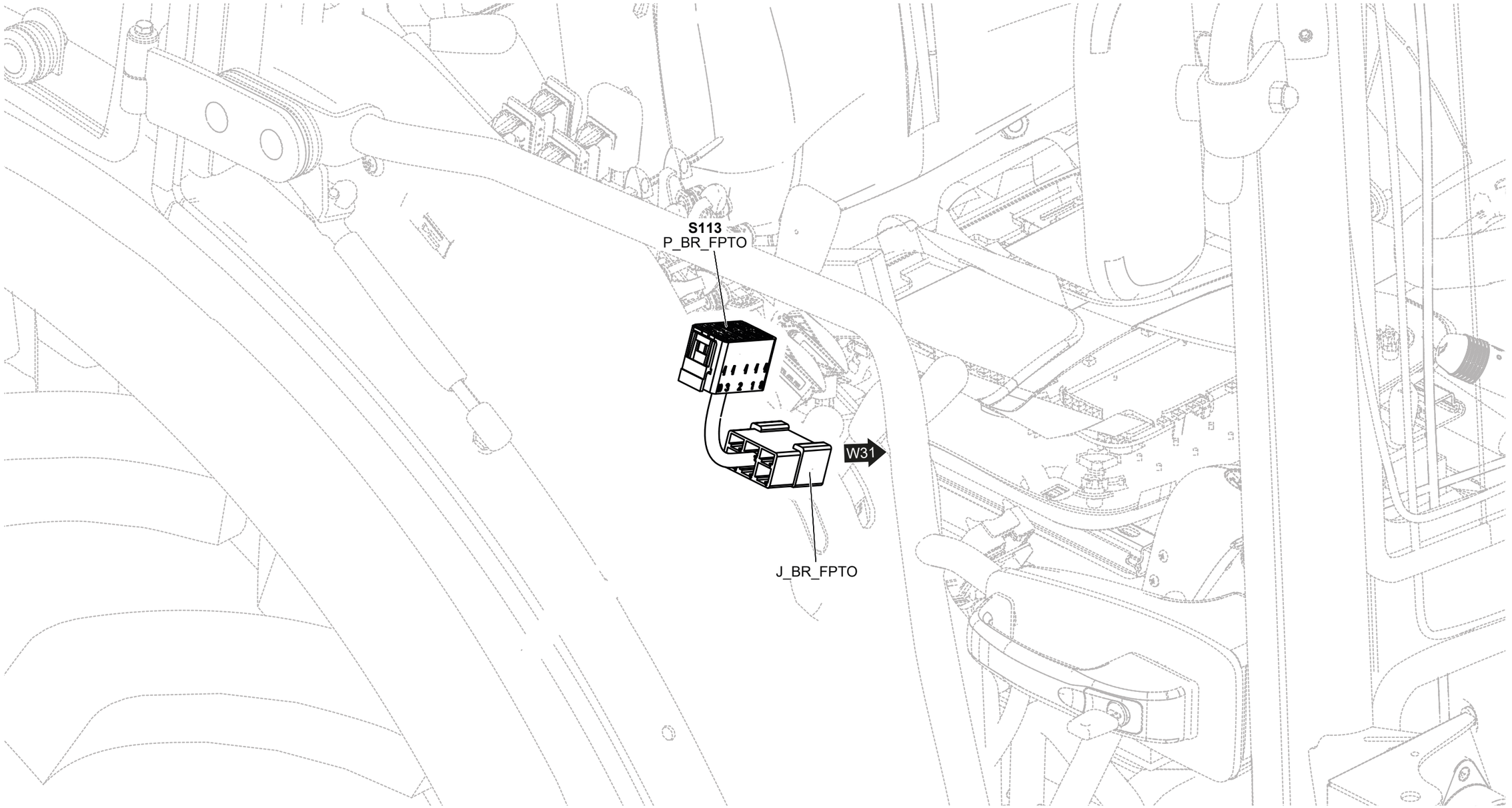



W30_VA_IN_582957_A_2_RH_20230306

### 9.2.2.1.27 W31 - RIGHT CARTER CONTROLS WIRING HARNESS

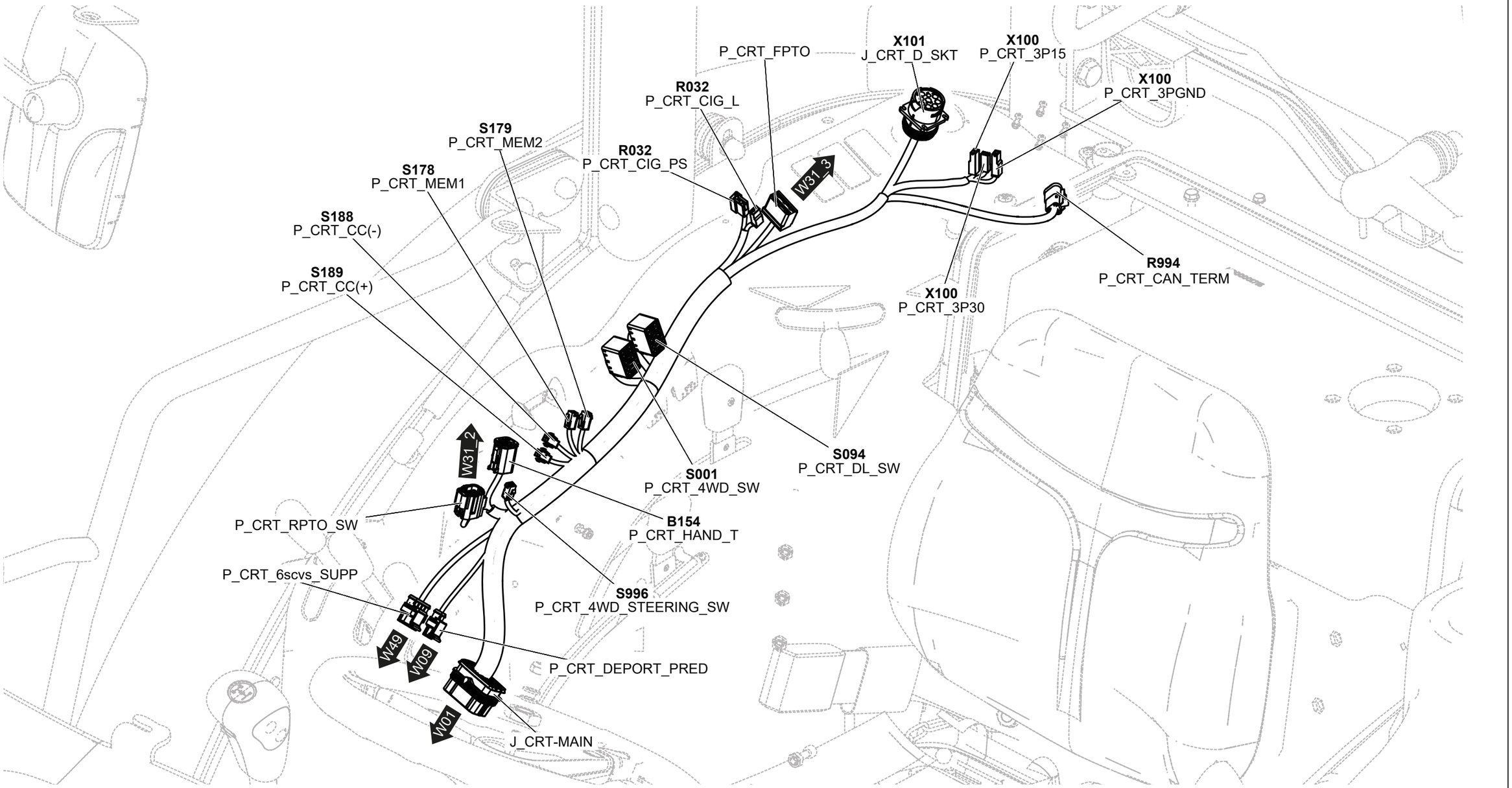



W31_2_VA_IN_397198_A_0_20230306



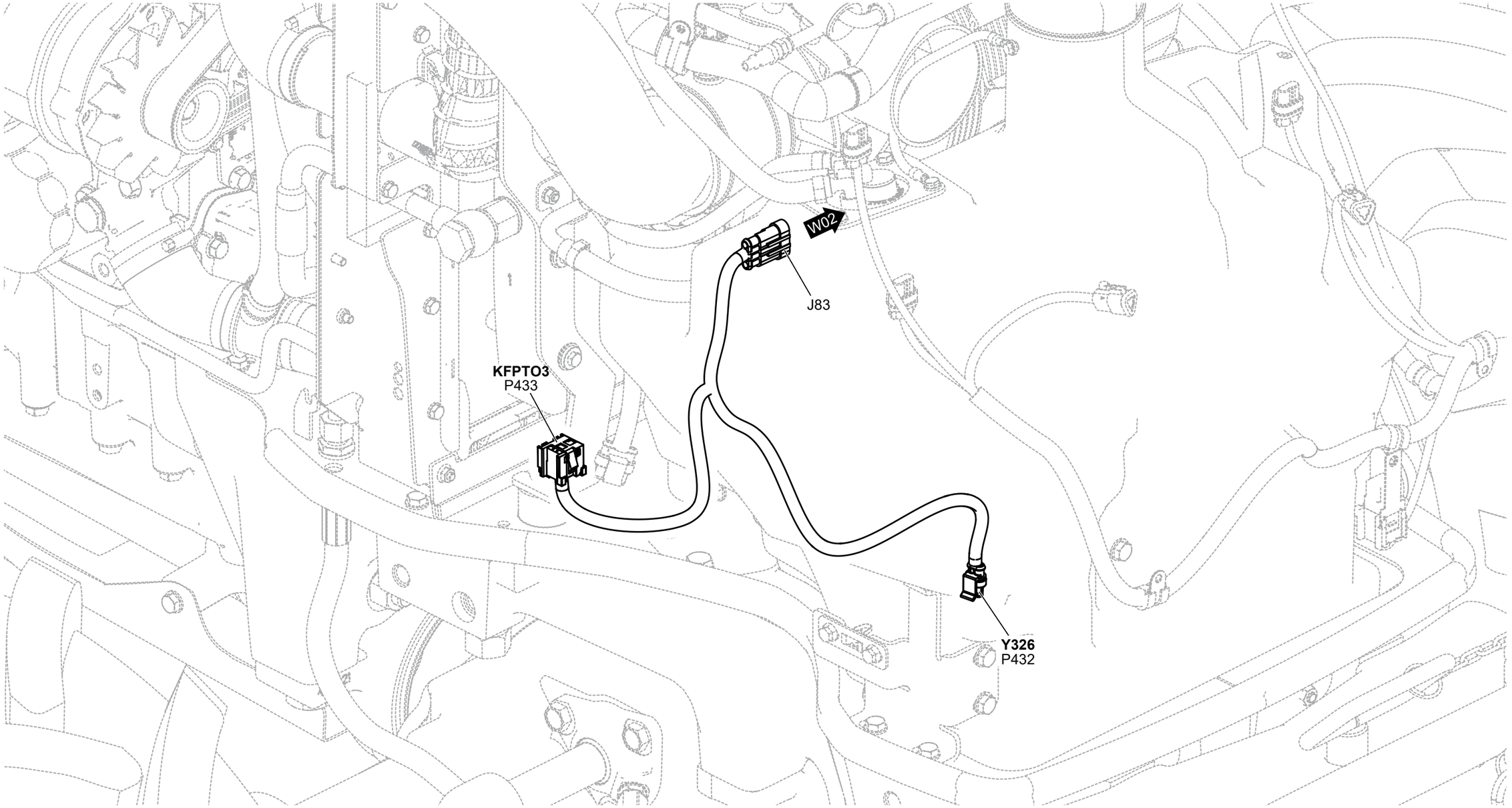

W31_3_VA_IN_599861_A_0_20230306

### 9.2.2.1.29 W31_3 - FRONT PTO SWITCH WIRING HARNESS



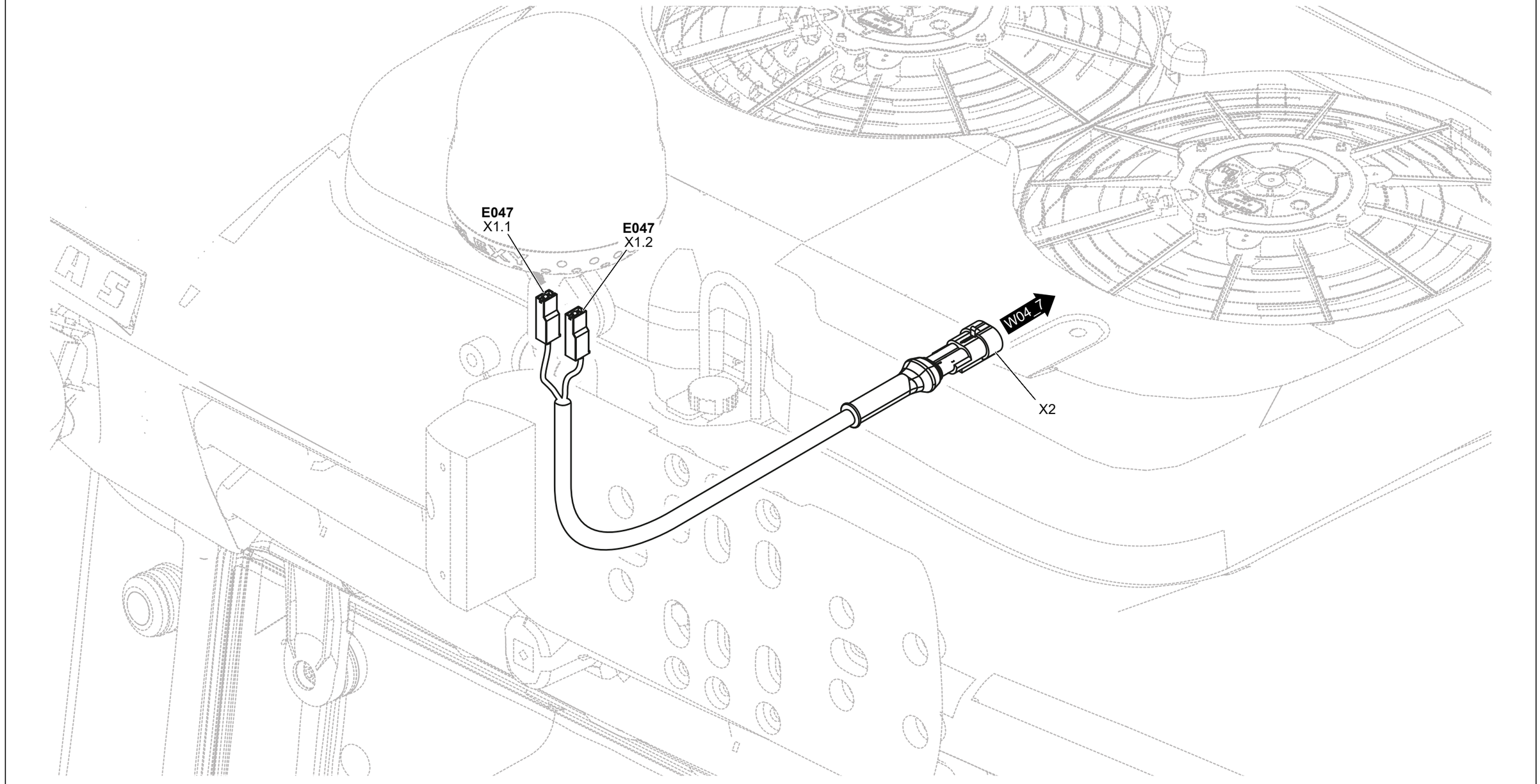

W31_VA_IN_566399_A_0_20230306

## 9.2.2.1.30 W33 - FRONT PTO MAIN WIRING HARNESS



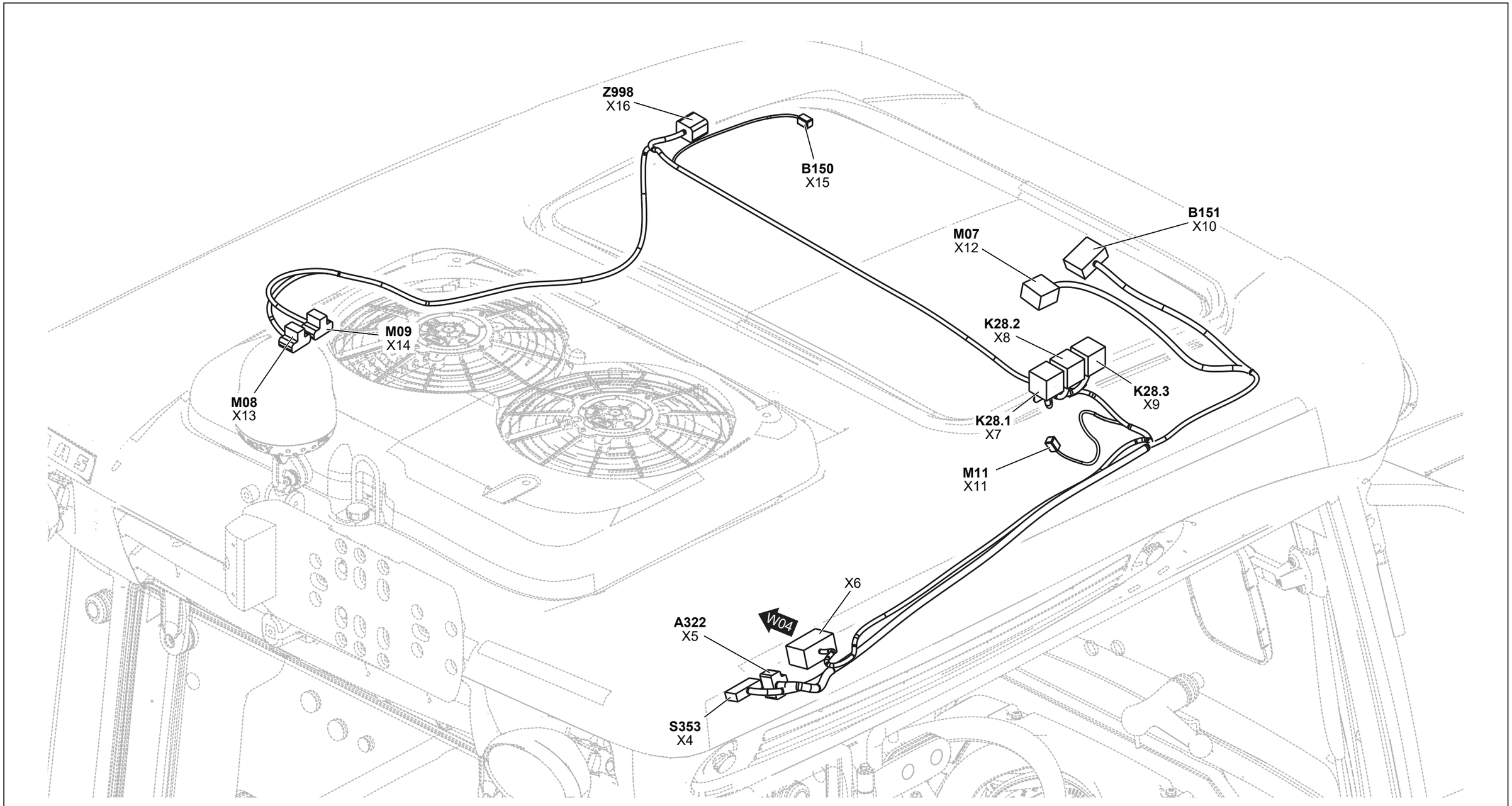

W33_VA_IN_448938_A_0_20230306

## 9.2.2.1.31 W35 - CAB BEACON LIGHT WIRING HARNESS



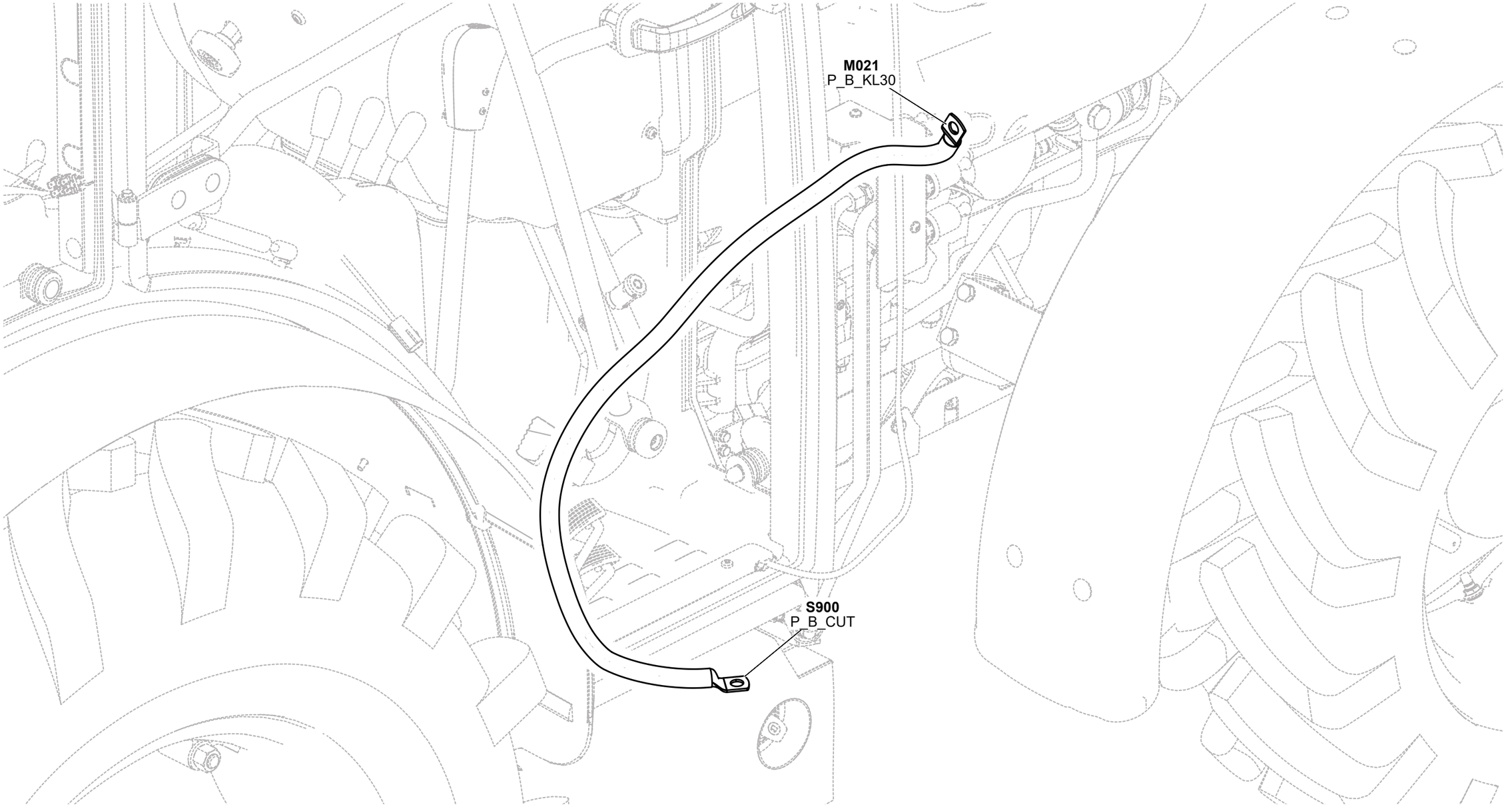

W35_VA_IN_485983_A_0_20230306

## 9.2.2.1.32 W36 - A/C SYSTEM WIRING HARNESS



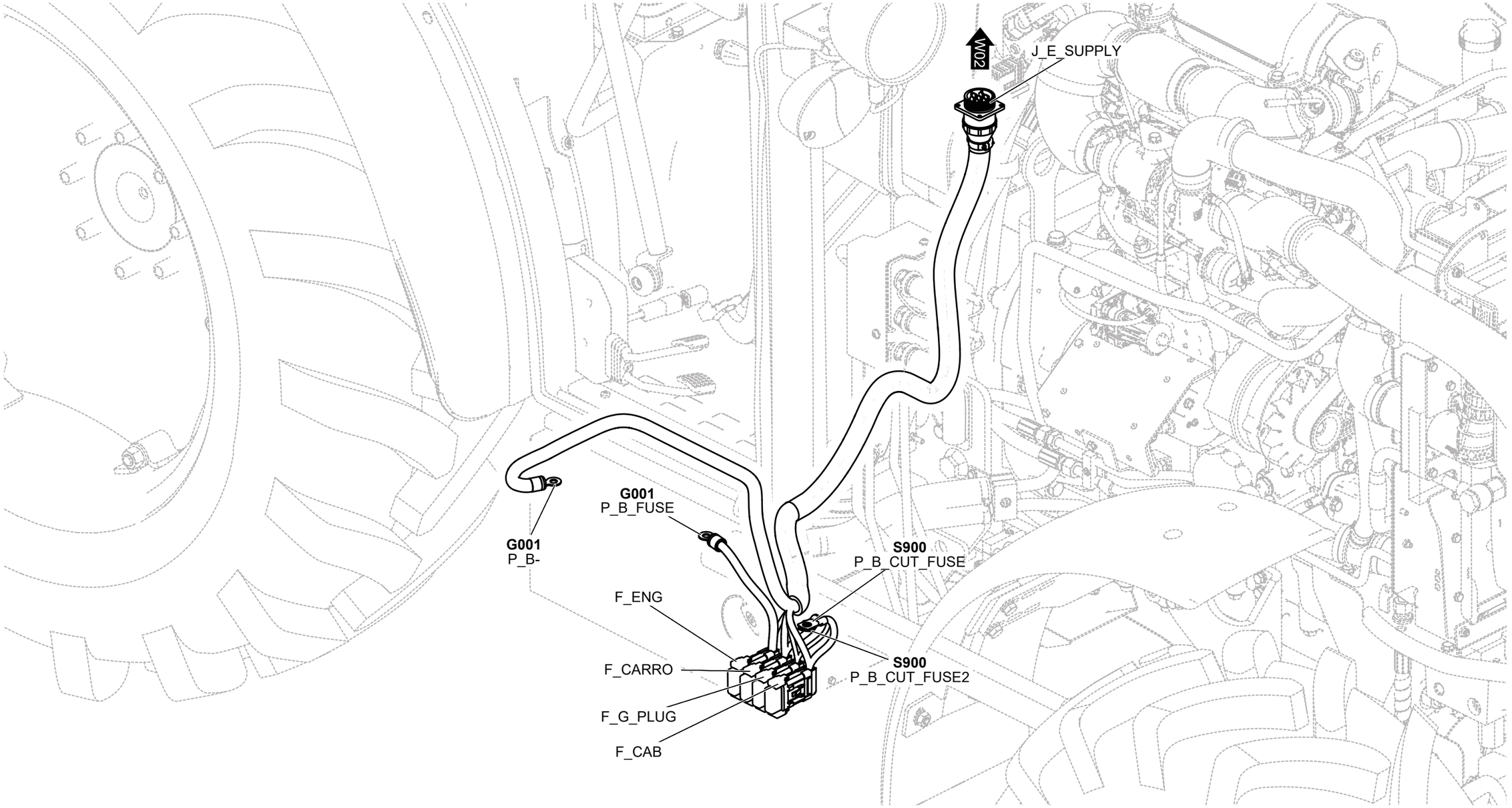

W36_VA_IN_211451_A_0_20230309

## 9.2.2.1.33 W45 - ENGINE POWER SUPPLY CABLES



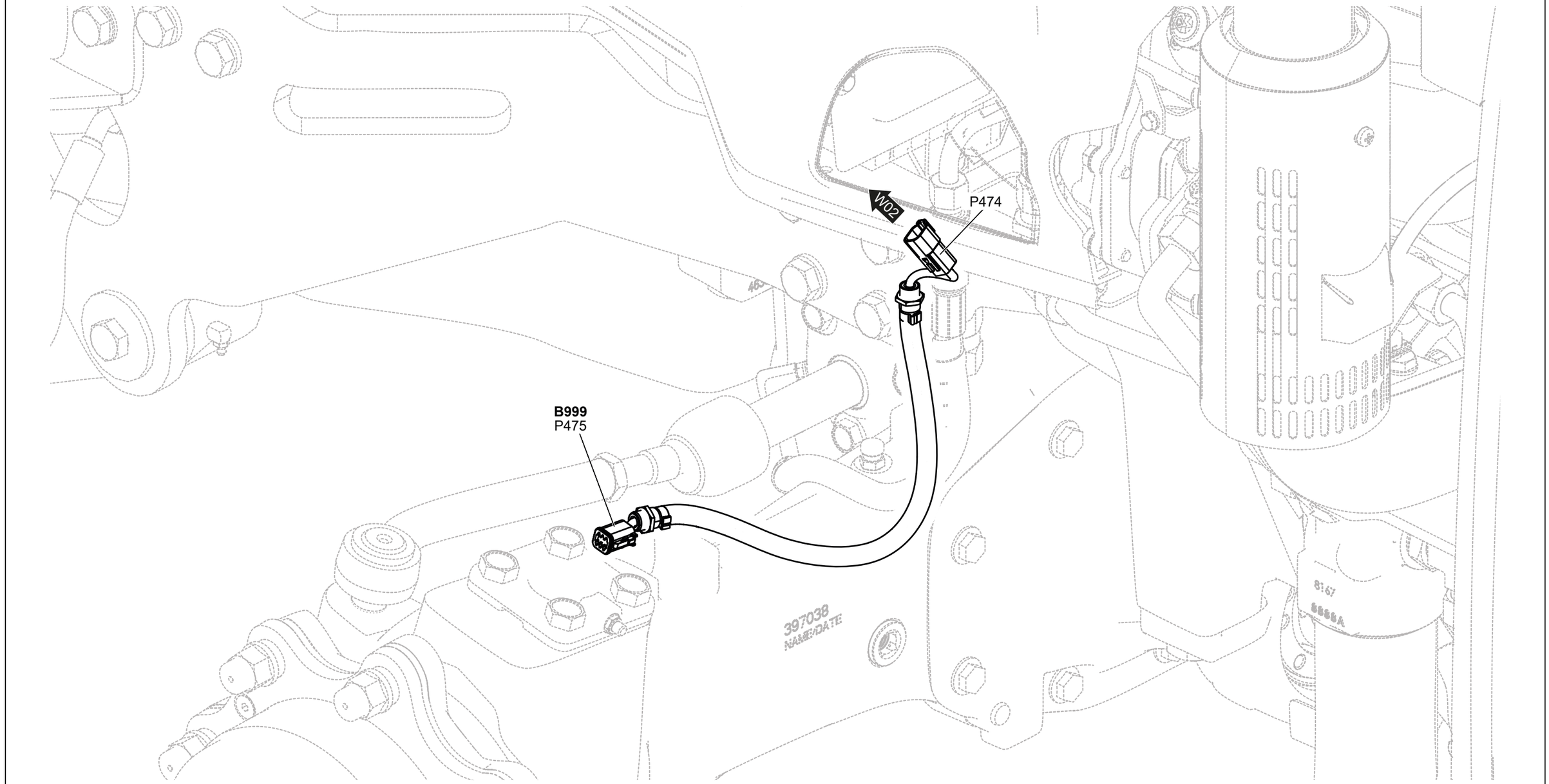

W45_1_VA_IN_585321_A_0_20230306

## 9.2.2.1.34 W45_1 - STARTER MOTOR ELECTRIC CABLES




W45_VA_IN_598461_A_0_20230306

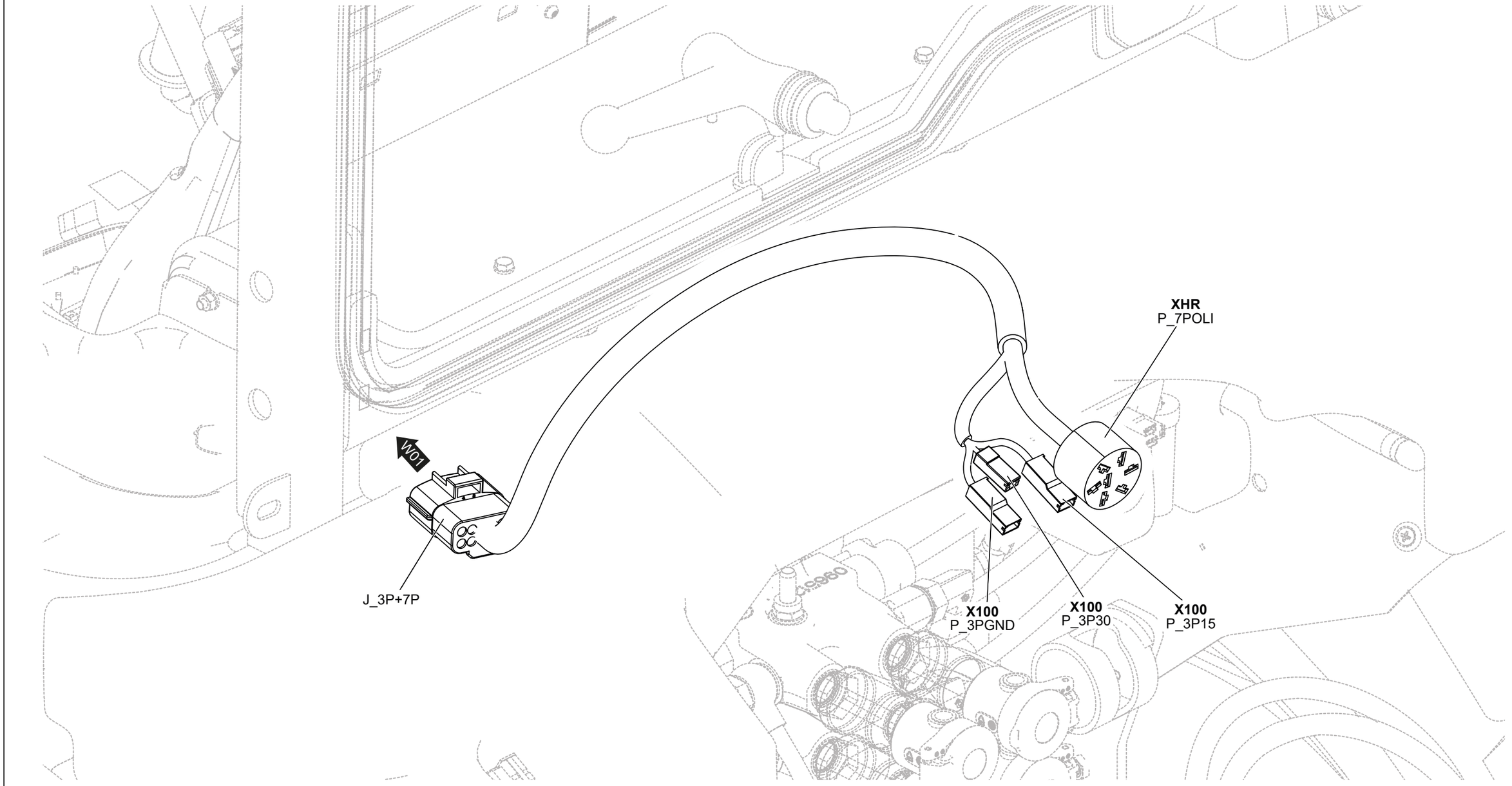
## 9.2.2.1.35 W48 - STEERING SENSOR WIRING HARNESS




W48_VA_IN_471504_A_0_20230306

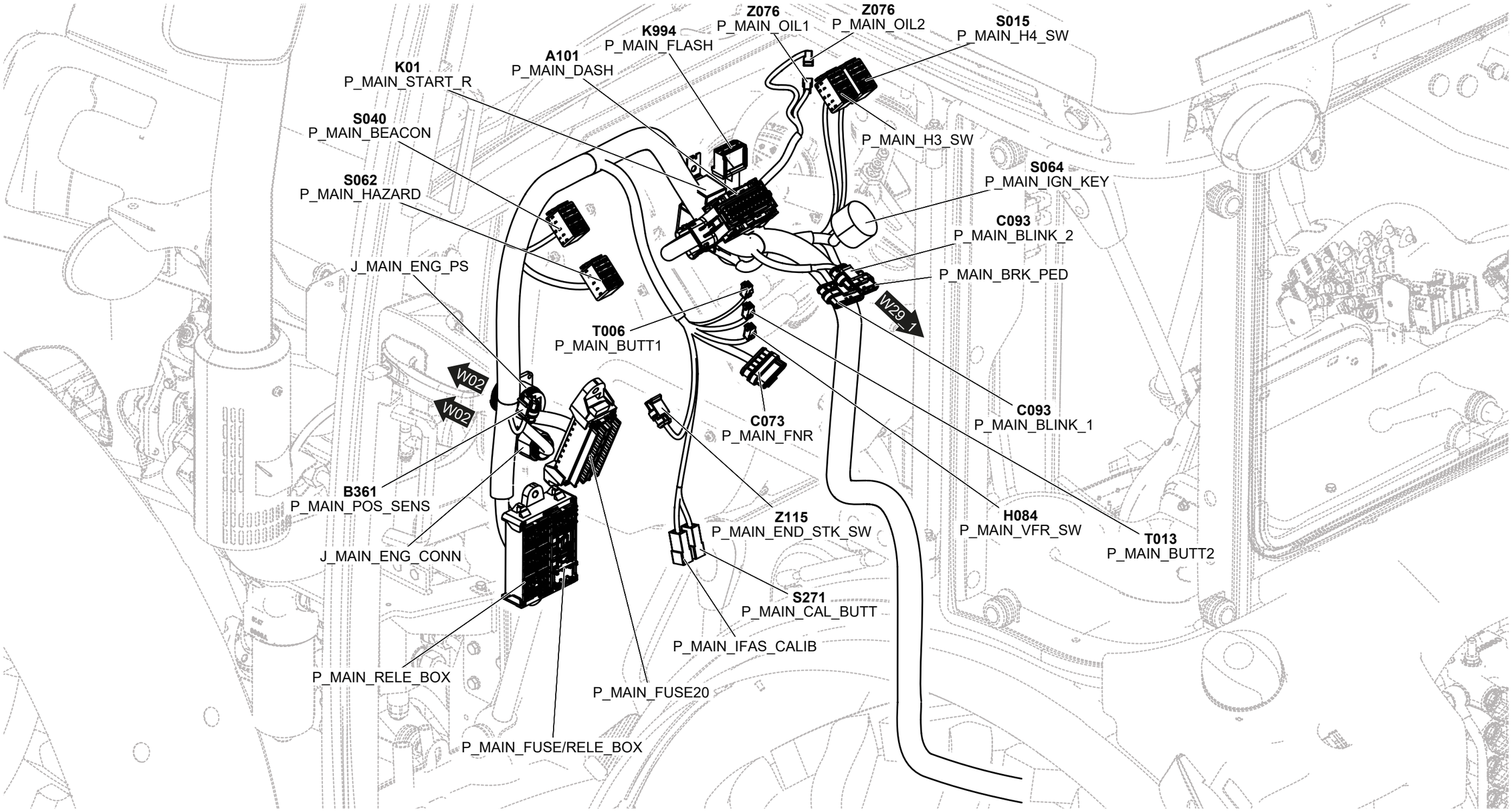
### 9.2.2.2 100Hp models

#### 9.2.2.2.1 W01 - MAIN WIRING HARNESS LH



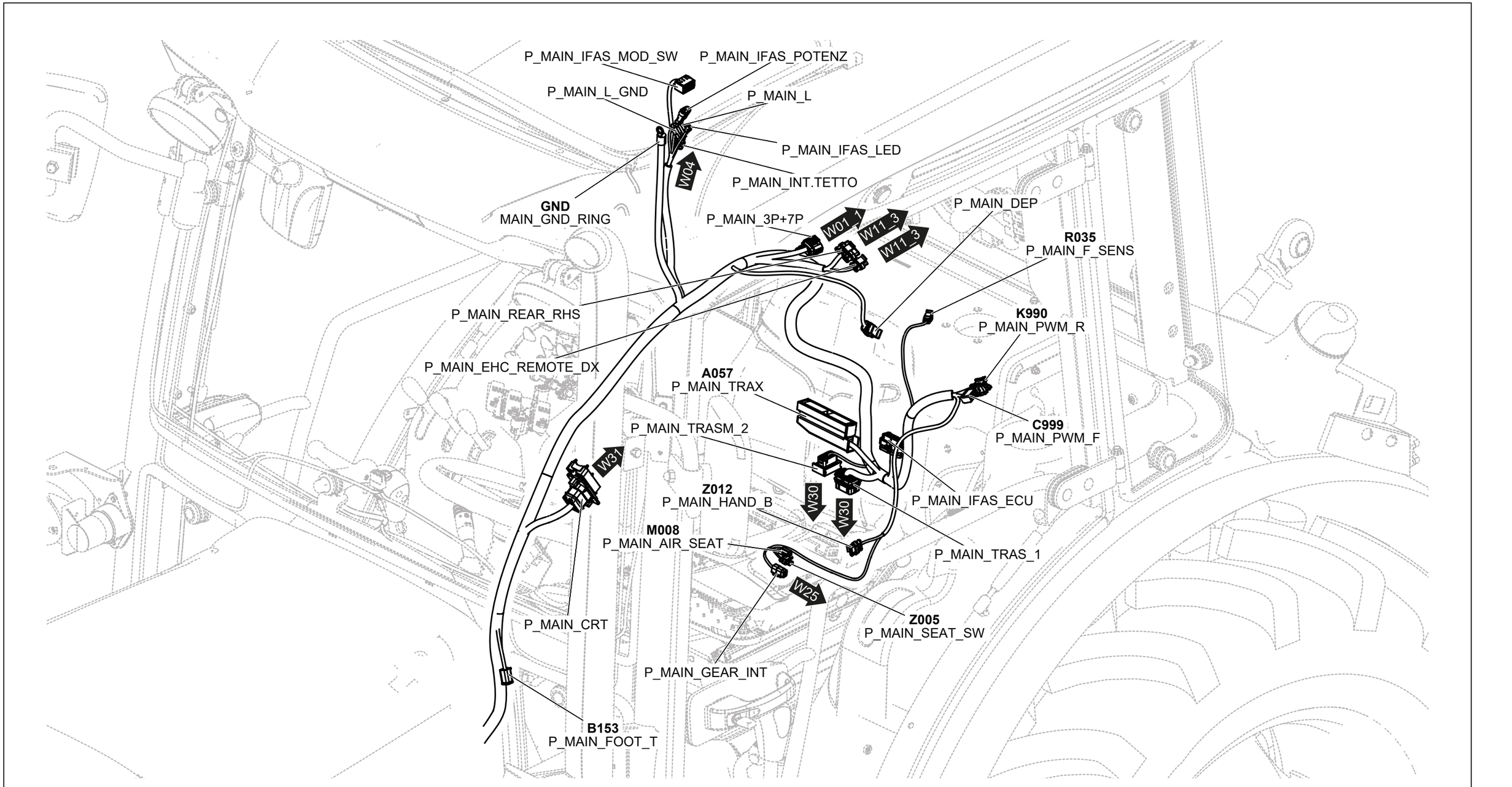

W01_1_VA_IN_569962_A_0_20230306

### 9.2.2.2.2 W01 - MAIN WIRING HARNESS RH



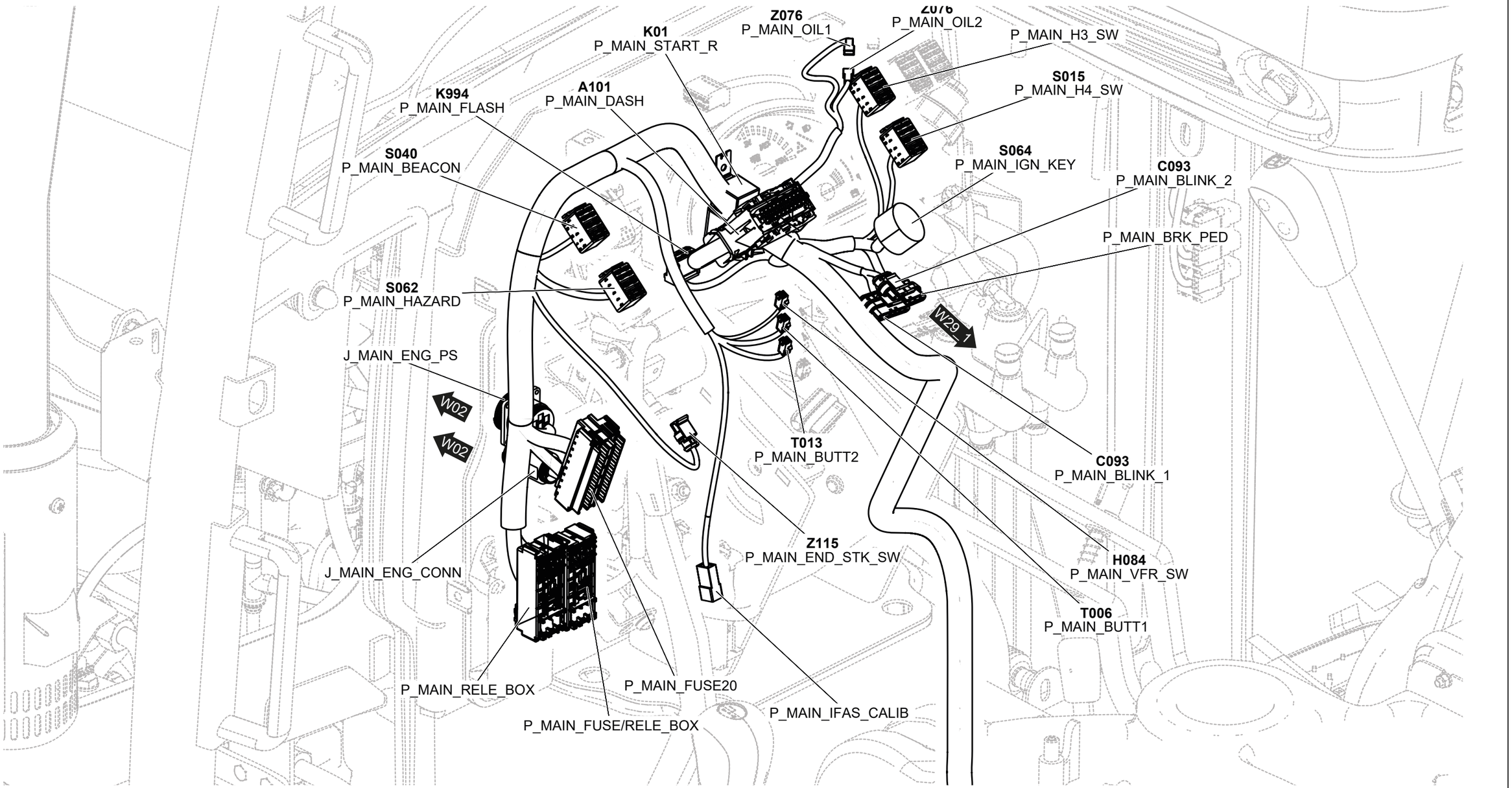

W01_VA_IN_566391_A_2_LH_20230306

### 9.2.2.2.3 W01 - MAIN WIRING HARNESS LH



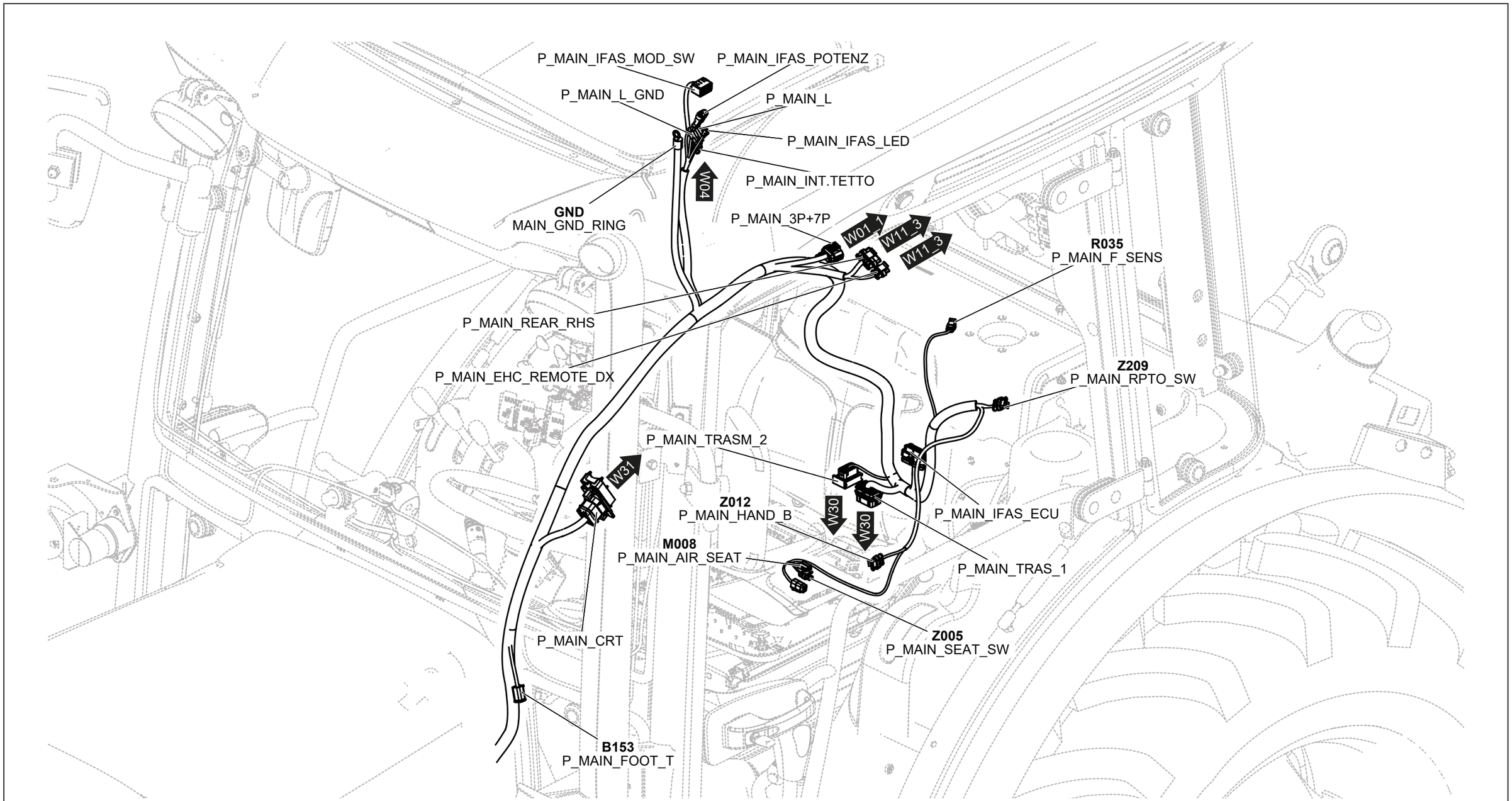

W01_VA_IN_566391_A_2_RH_20230306

### 9.2.2.2.4 W01 - MAIN WIRING HARNESS RH



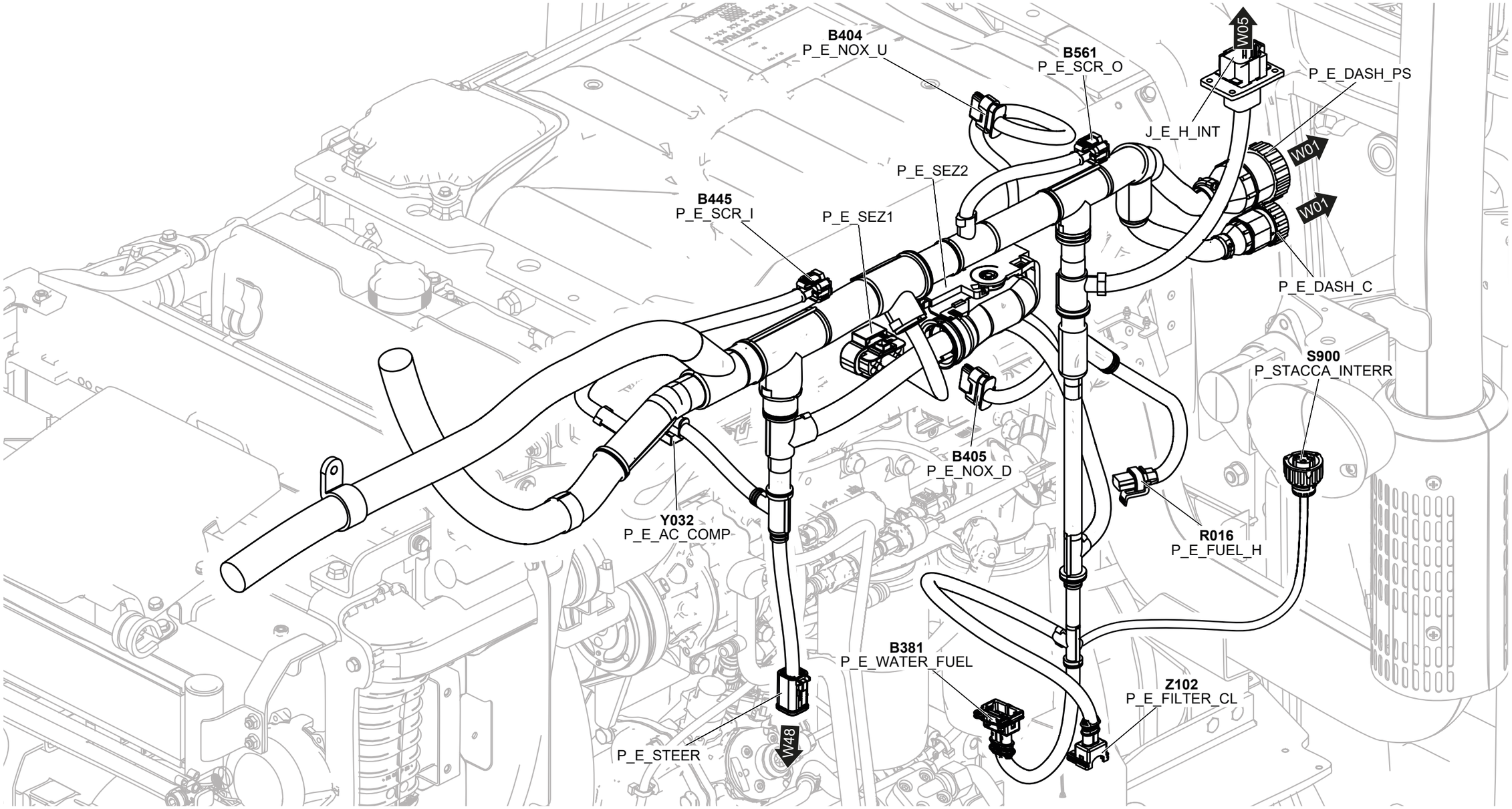

W01_VA_IN_566402_A_1_LH_20230306

### 9.2.2.2.5 W01_1 - REAR SOCKETS WIRING HARNESS

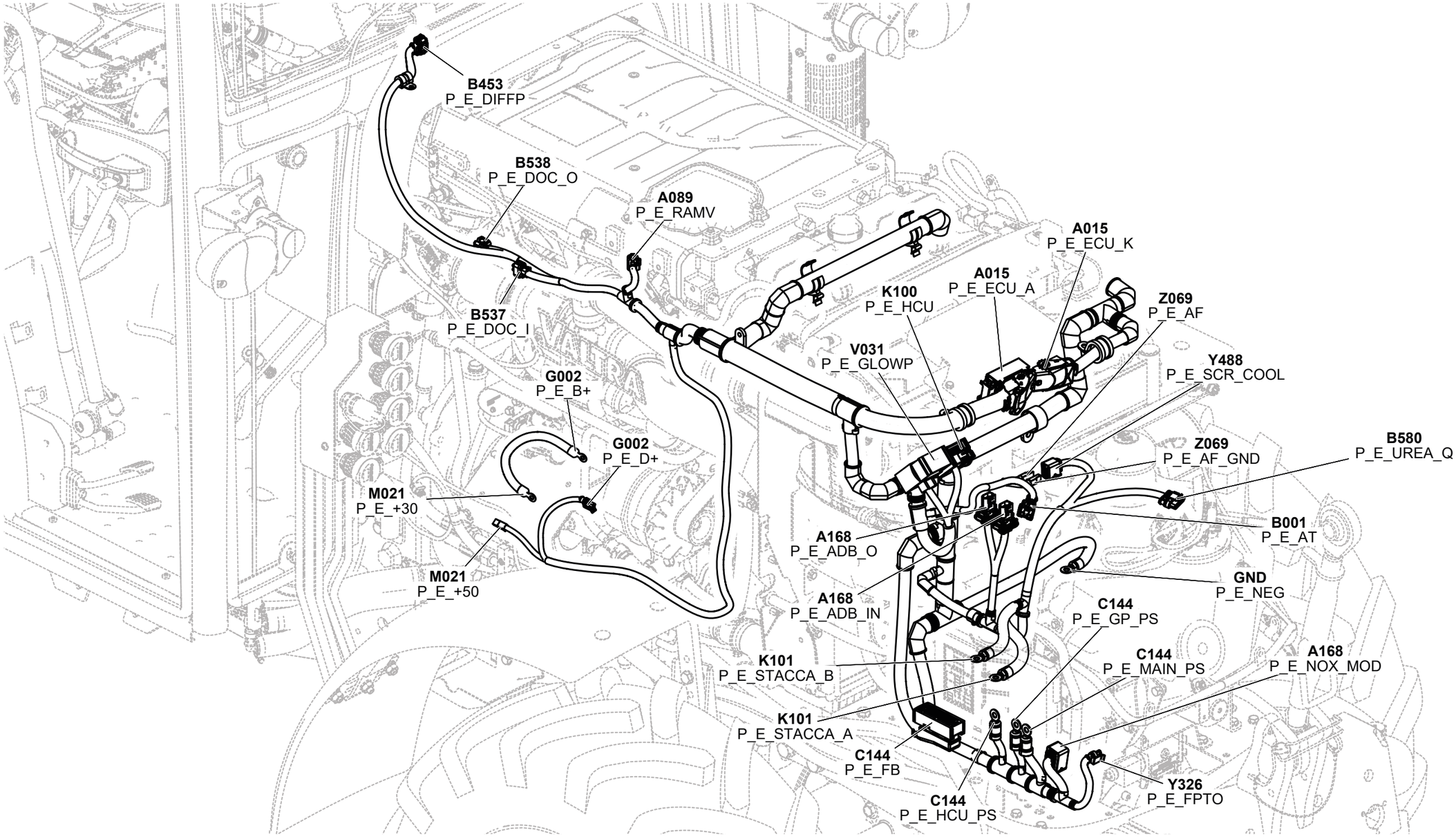



W01_VA_IN_566402_A_1_RH_20230306

### 9.2.2.2.6 W02 - ENGINE WIRING HARNESS LH

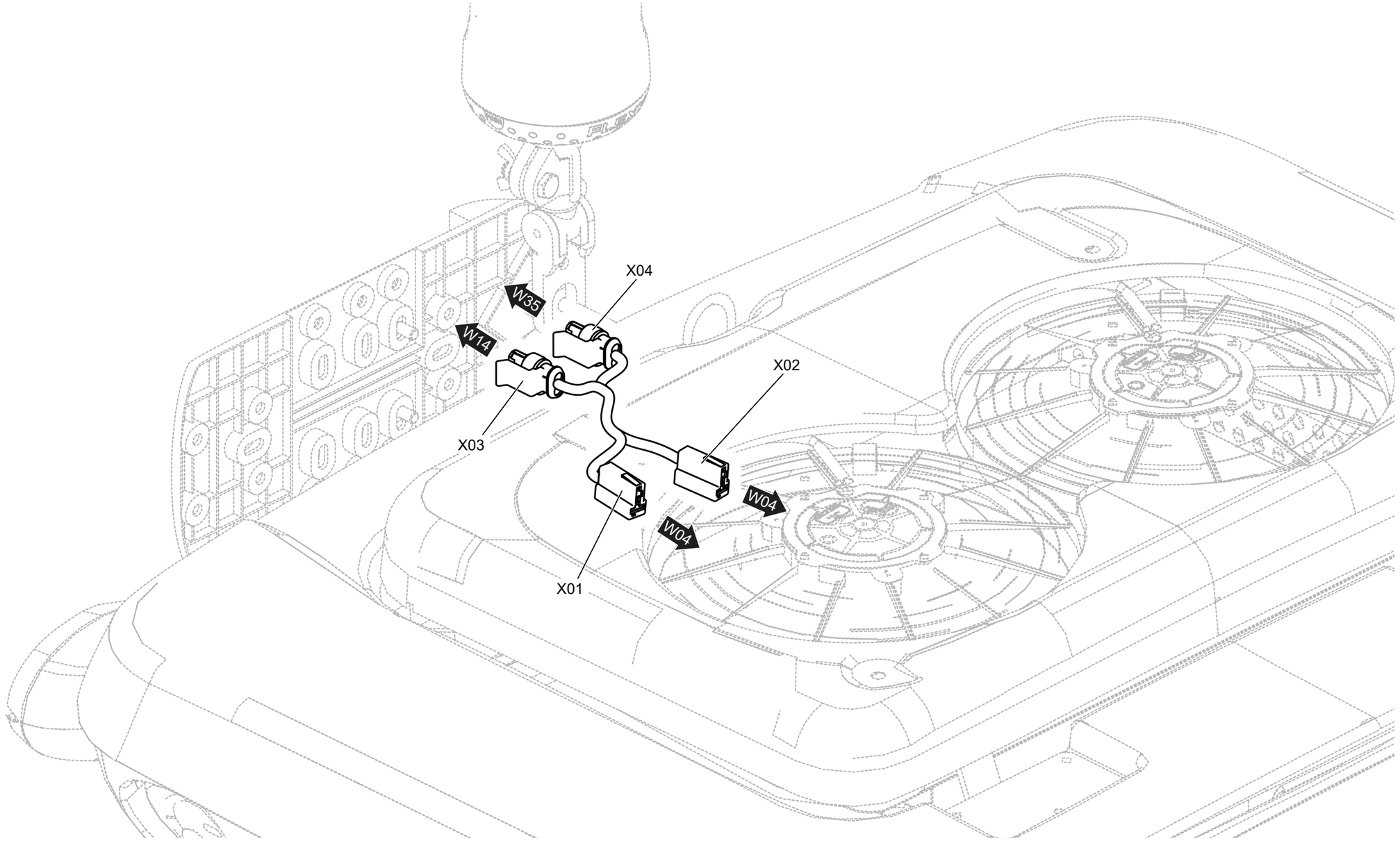



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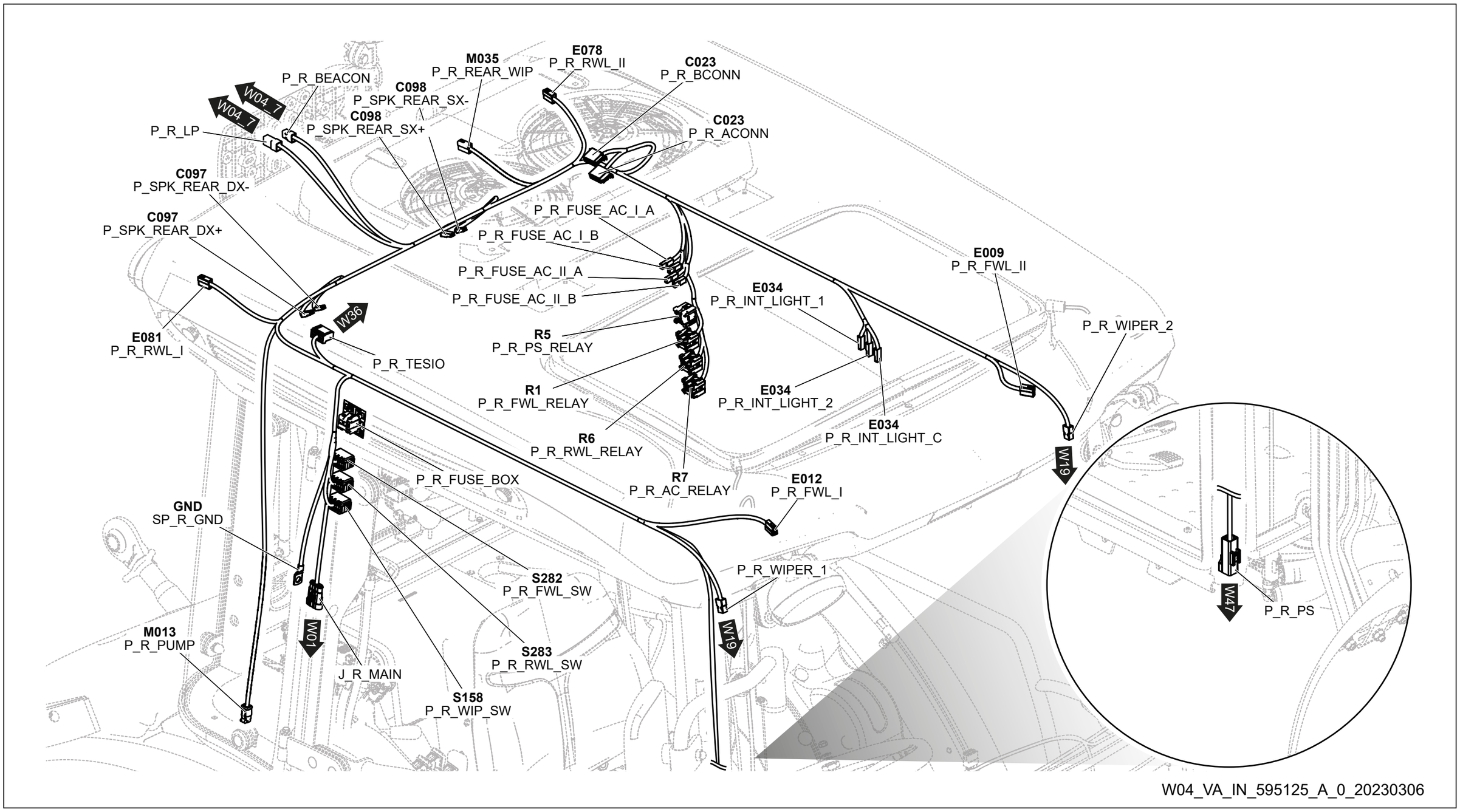

W02_VA_IN_566389_A_0_RH_20230306

### 9.2.2.2.8 W04 - CAB ROOF WIRING HARNESS

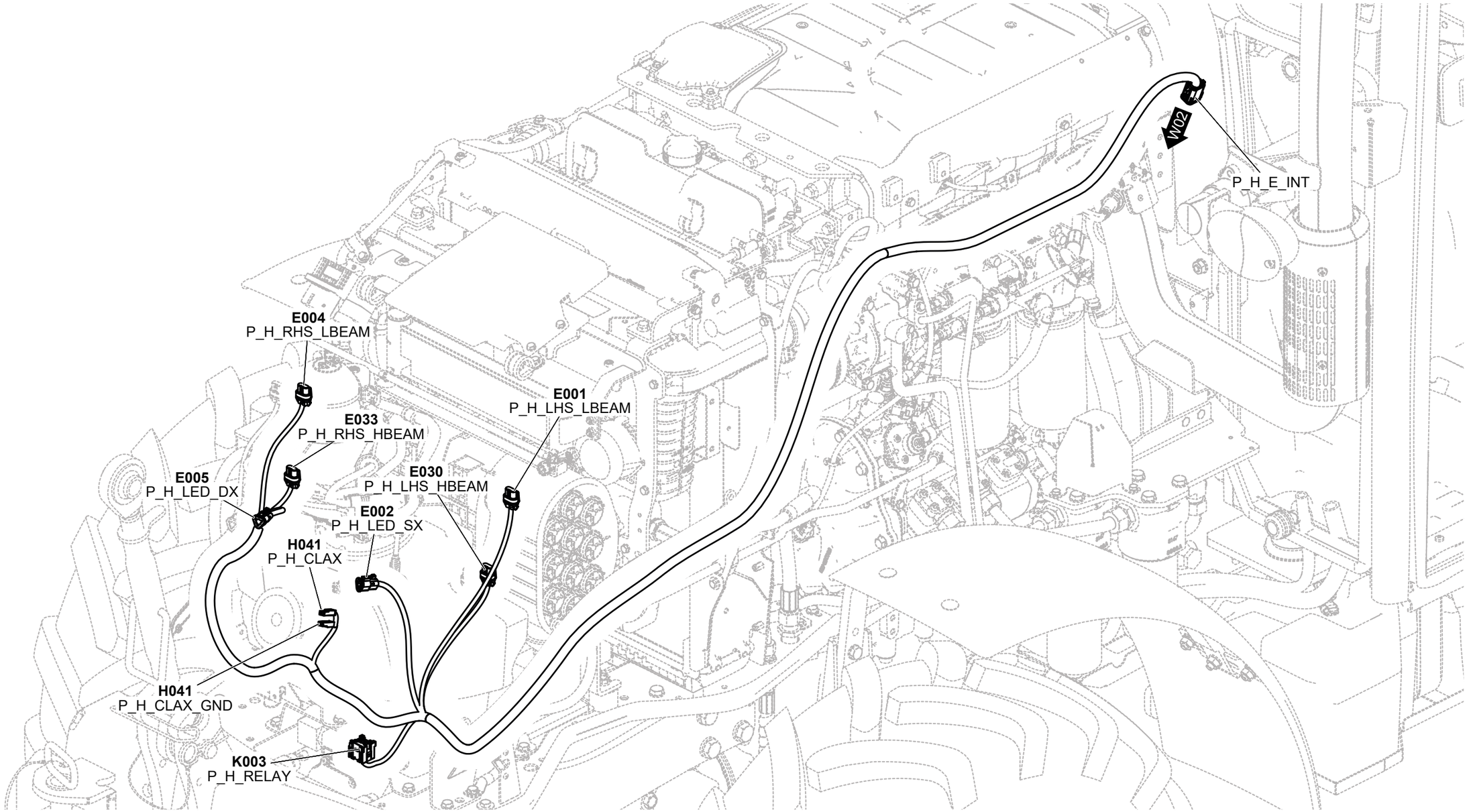



W04_7_VA_IN_211481_A_0_20230306

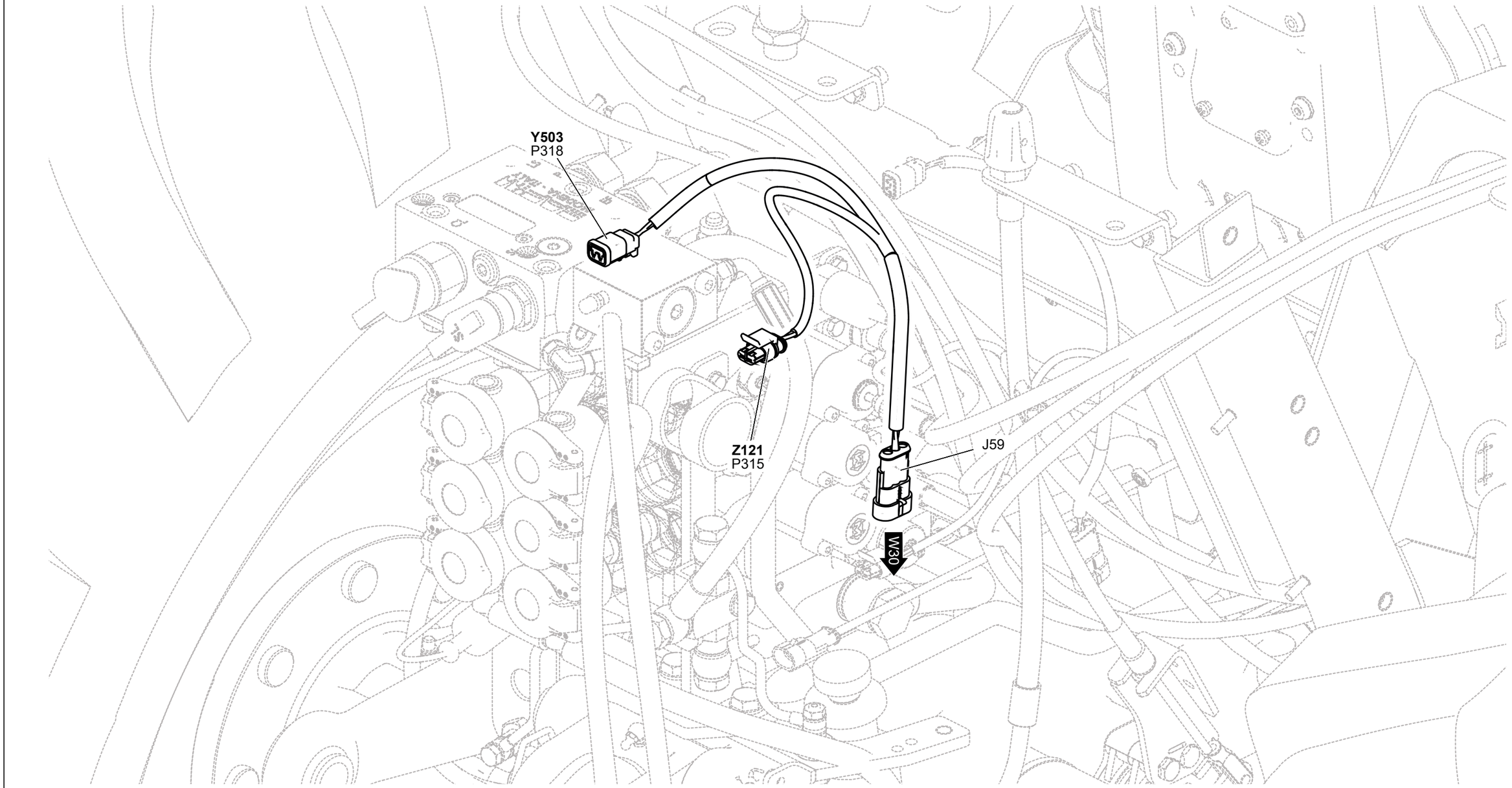
### 9.2.2.2.9 W04_7 - BEACON & LICENCE PLATE LIGHT WIRING HARNESS




W04_VA_IN_595125_A_0_20230306

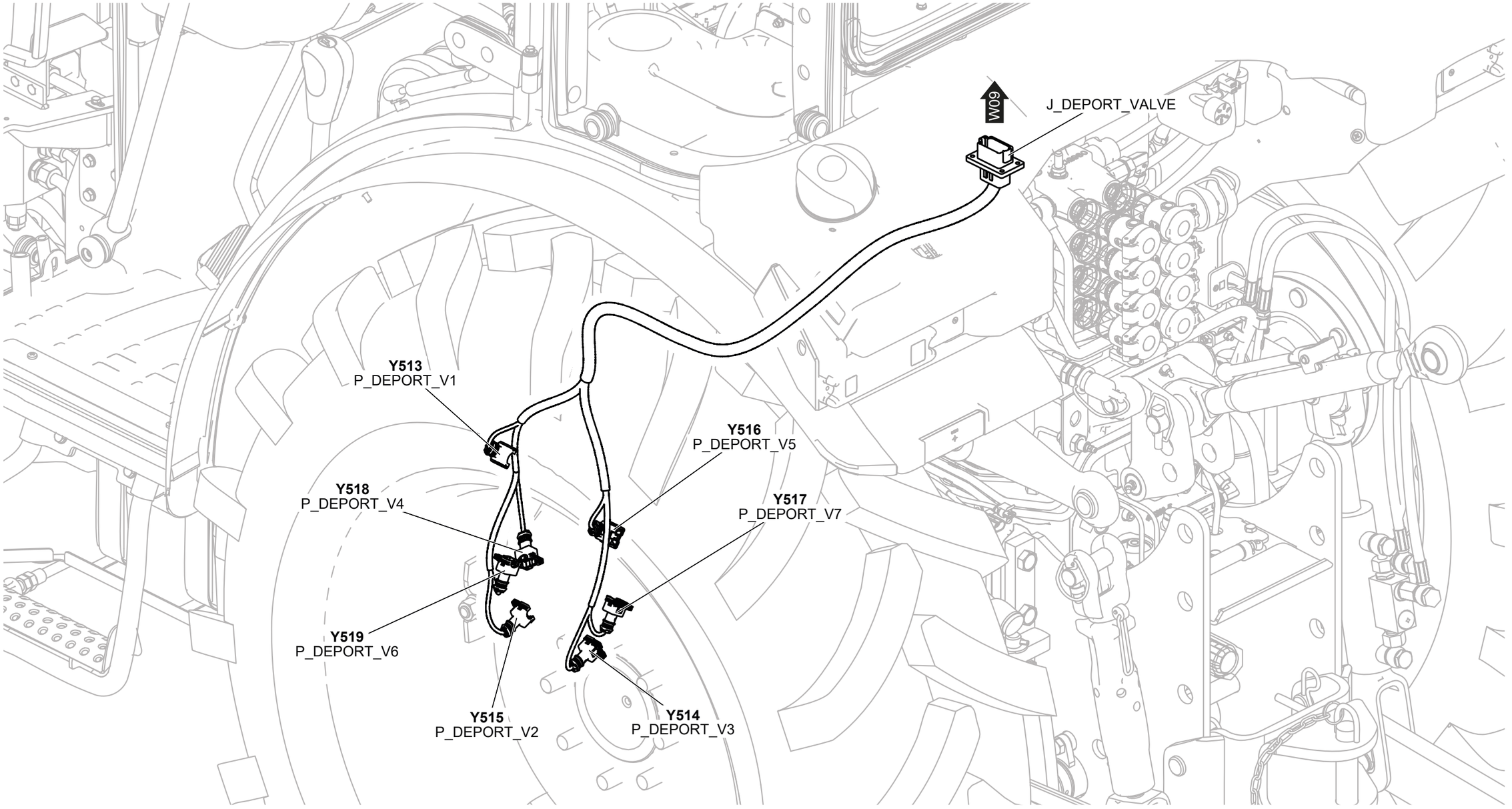



W05_VA_IN_599834_A_0_20230306

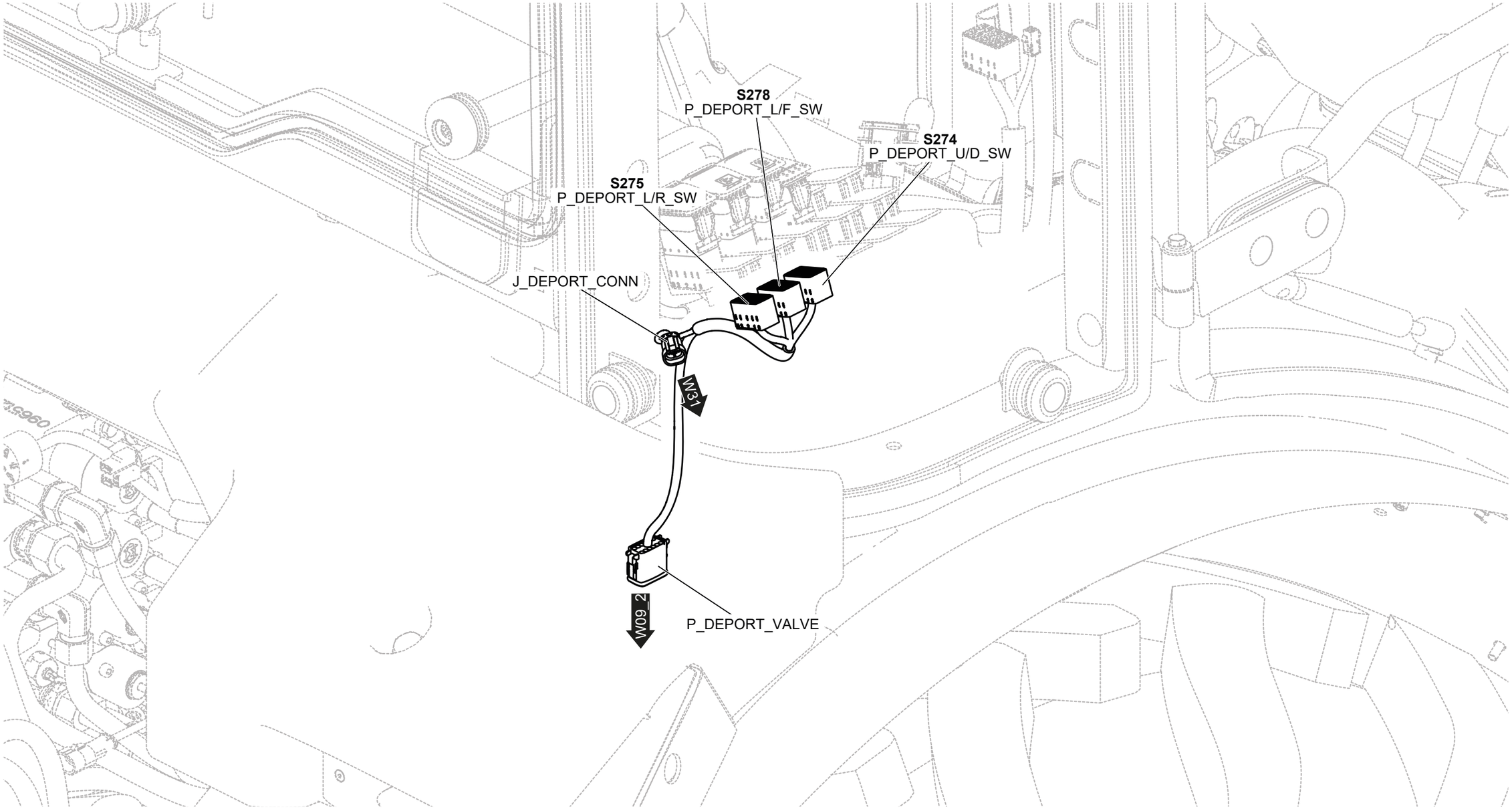



W06_VA_IN_522591_A_0_20230306

## 9.2.2.2.12 W09 - DEPORT CONTROLS WIRING HARNESS

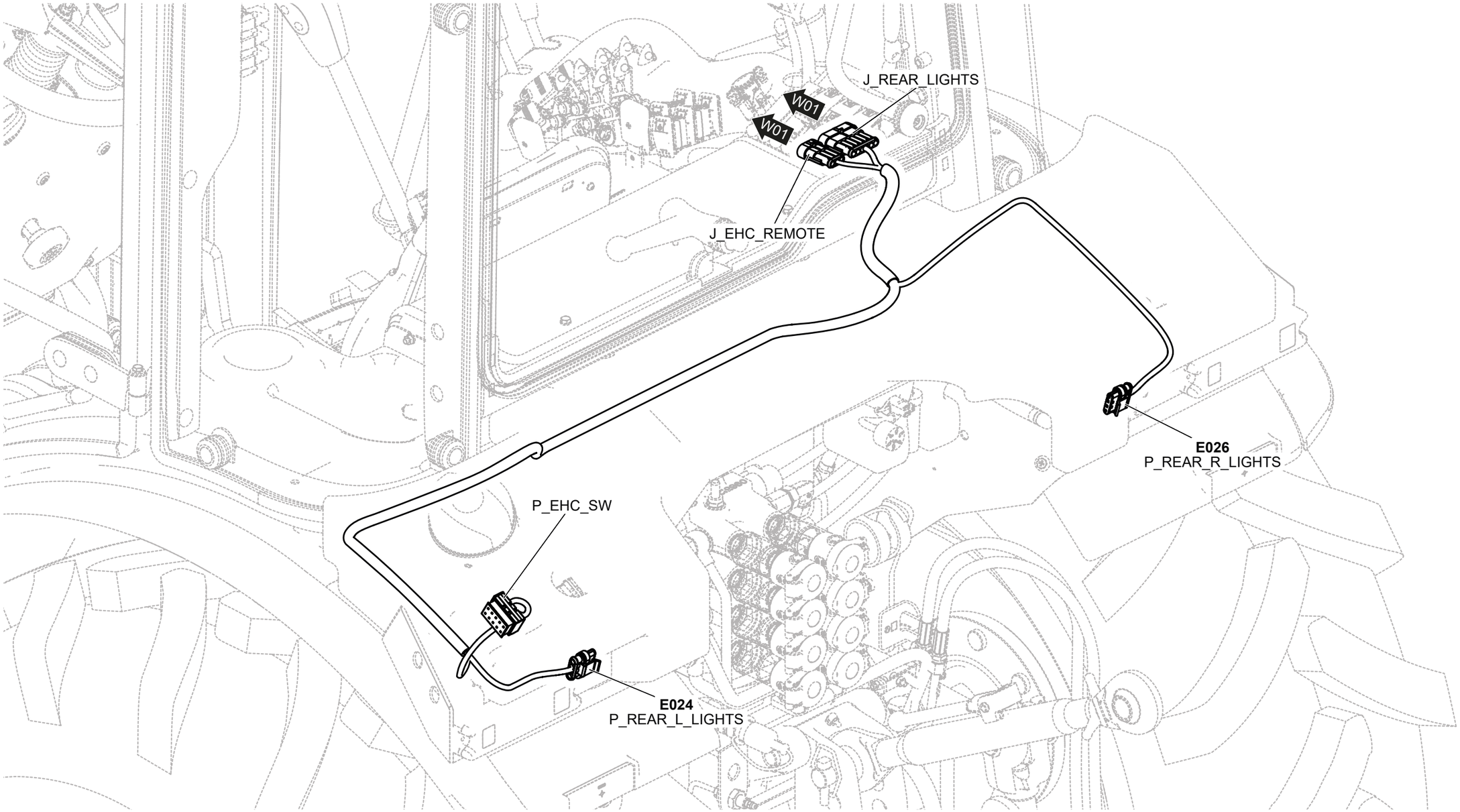



W09_2_VA_IN_569968_A_0_20230306



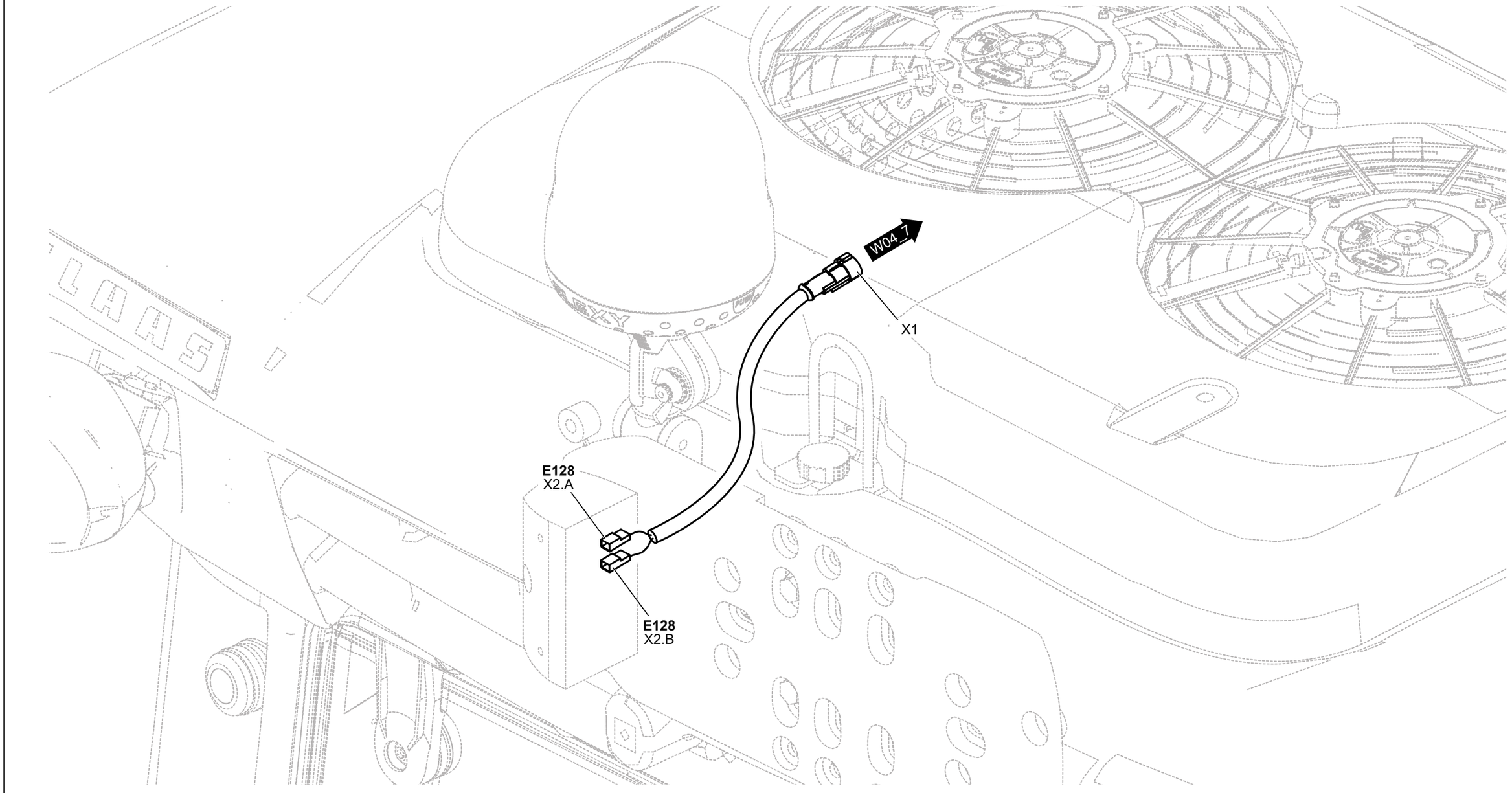

W09_VA_IN_569969_A_0_20230306

### 9.2.2.2.14 W11_3 - EHC REMOTE CONTROLS WIRING HARNESS



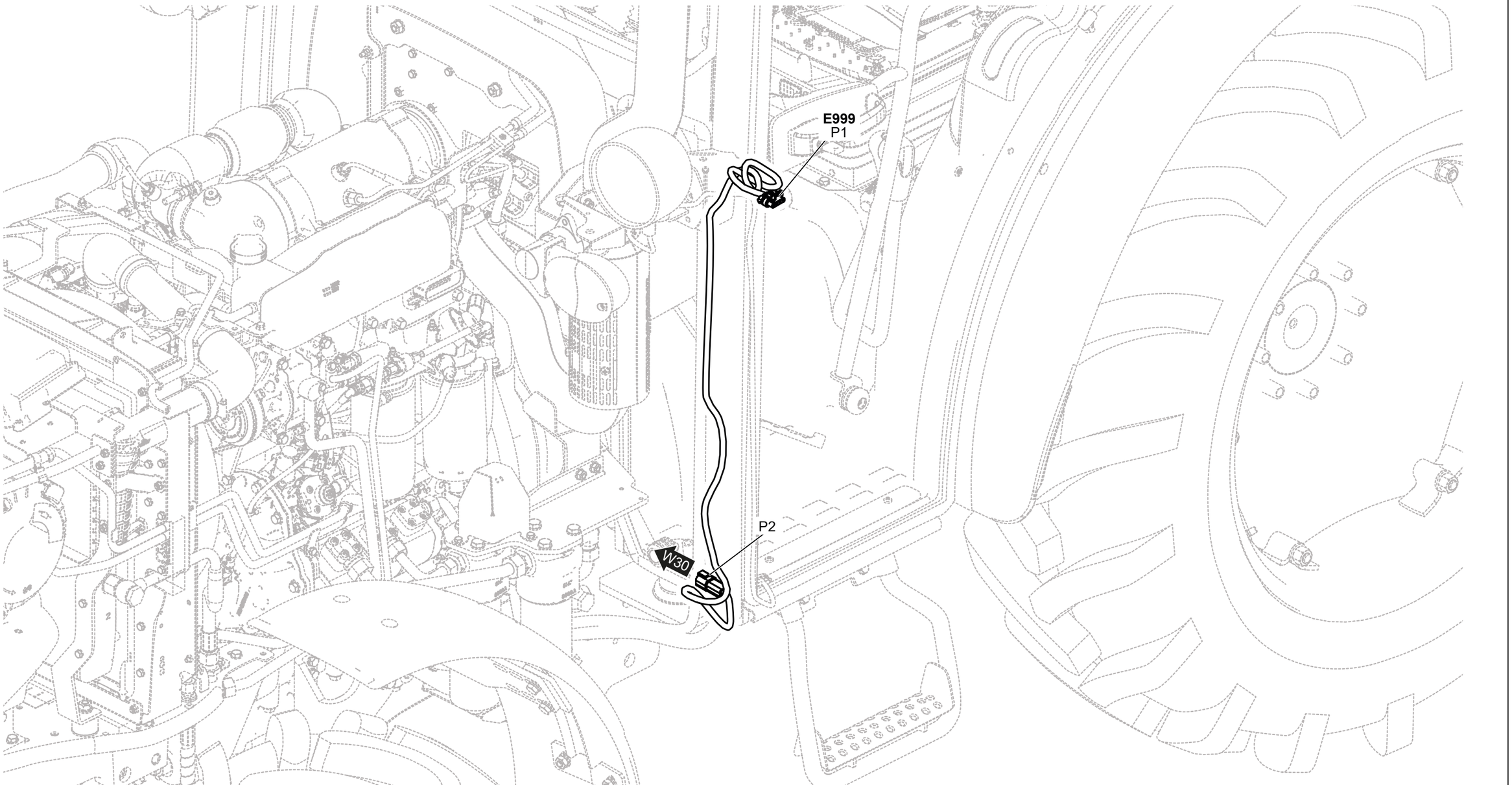

W11_3_VA_IN_569959_A_0_20230306

## 9.2.2.2.15 W14 - LICENCE PLATE LIGHT WIRING HARNESS



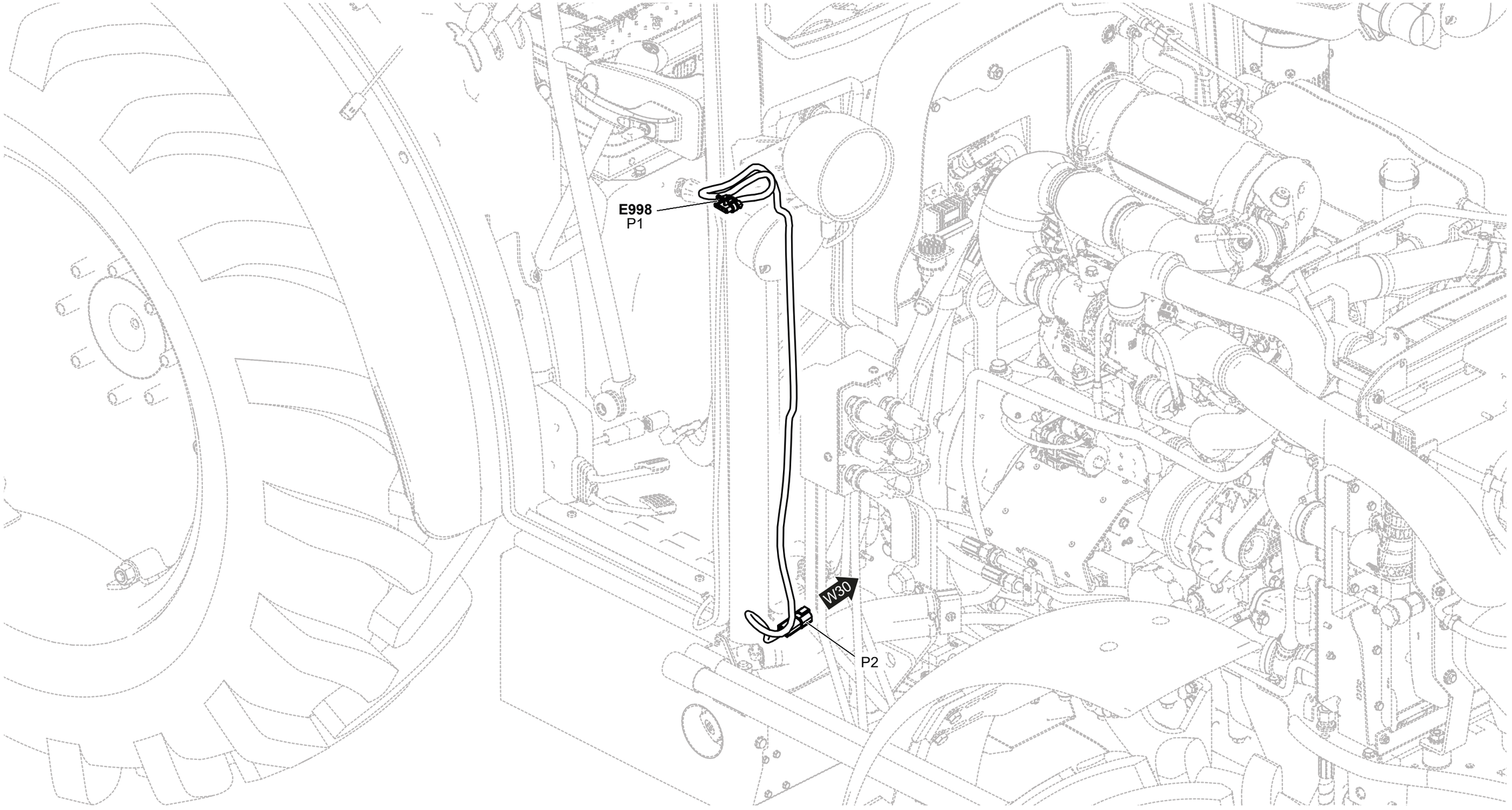

W14_VA_IN_389908_A_0_20230306

### 9.2.2.2.16 W16 - H4 LIGHT WIRING HARNESS LH



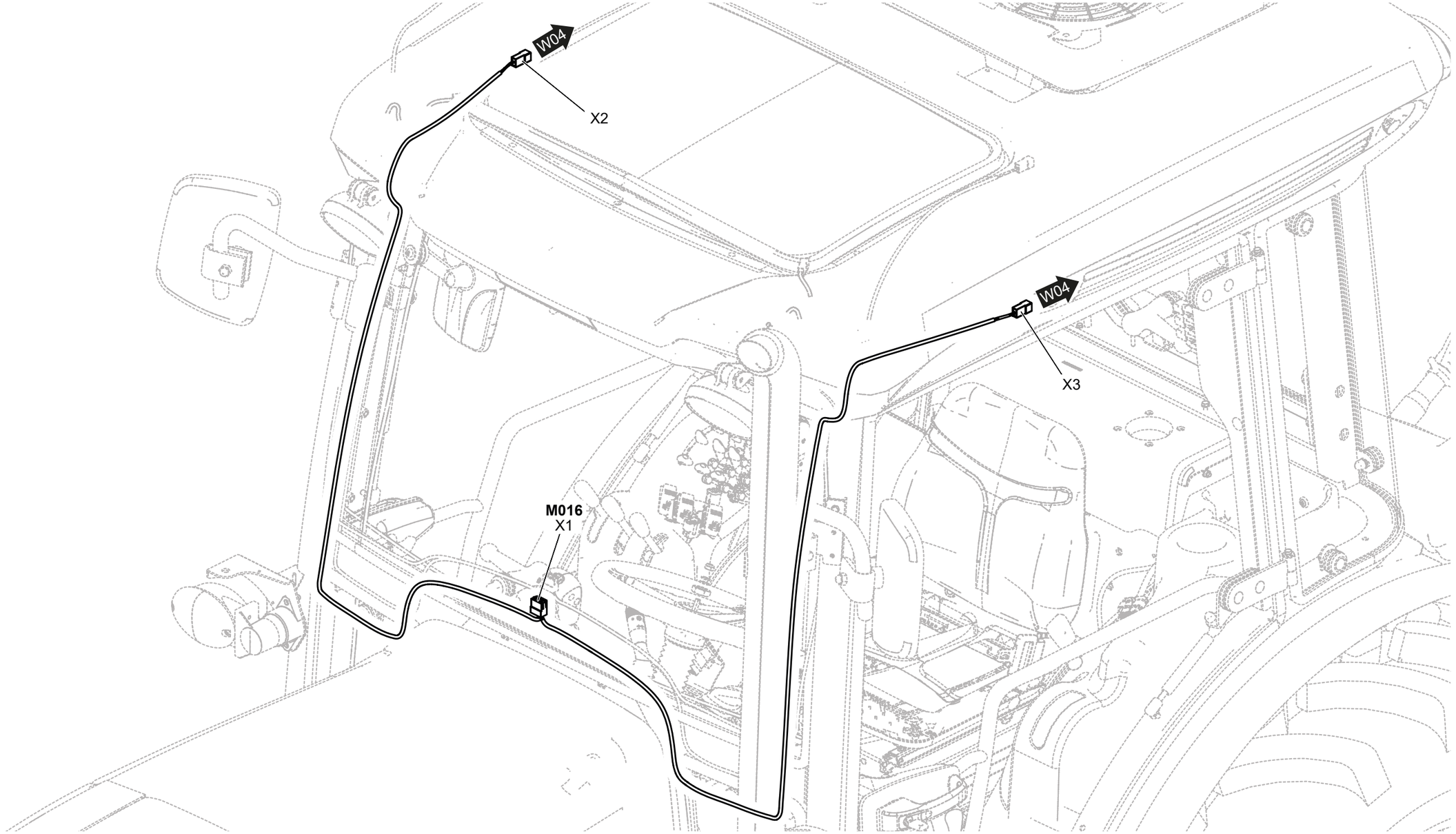

W16_LH_VA_IN_380631_A_0_20230306

### 9.2.2.2.17 W16 - H4 LIGHT WIRING HARNESS RH



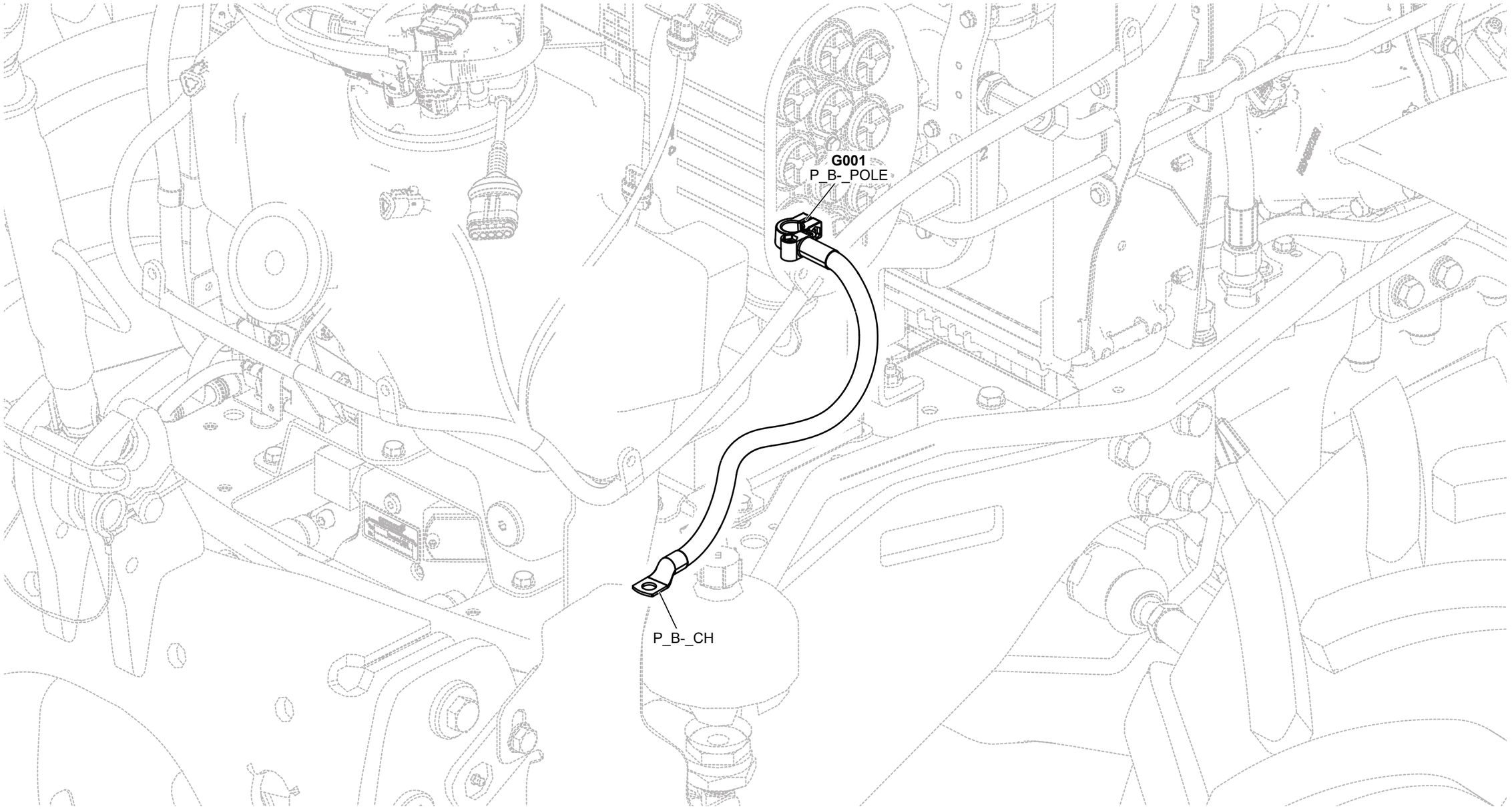

W16_RH_VA_IN_380631_A_0_20230306

### 9.2.2.2.18 W19 - FRONT WIPER MOTOR WIRING HARNESS



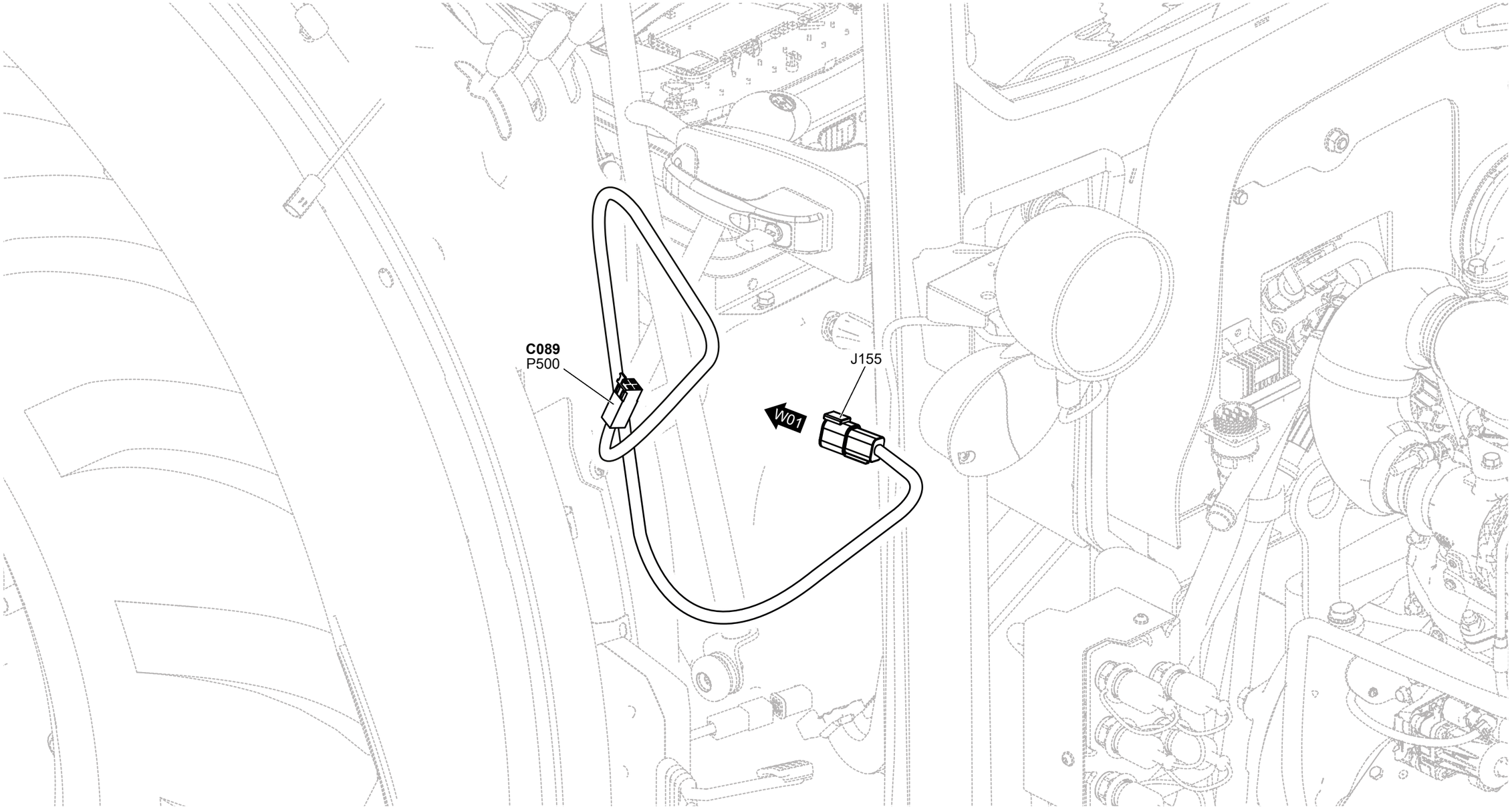

W19_VA_IN_201554_A_0_20230306

## 9.2.2.2.19 W22 - NEGATIVE BATTERY CABLE



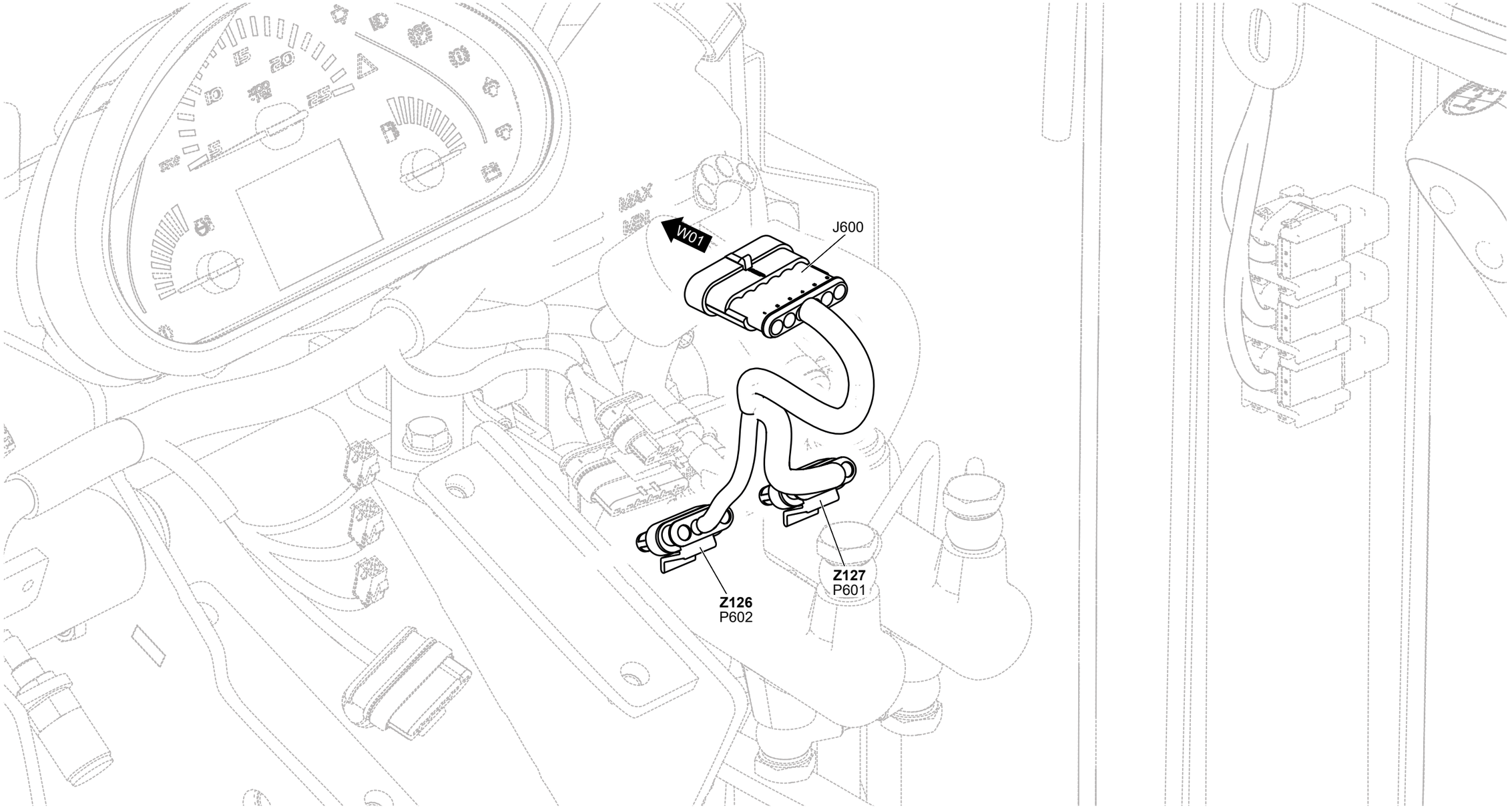

W22_VA_IN_527502_A_0_20230306

## 9.2.2.2.20 W25_1 - HI-LO ELECTRIC CABLE EXTENSION



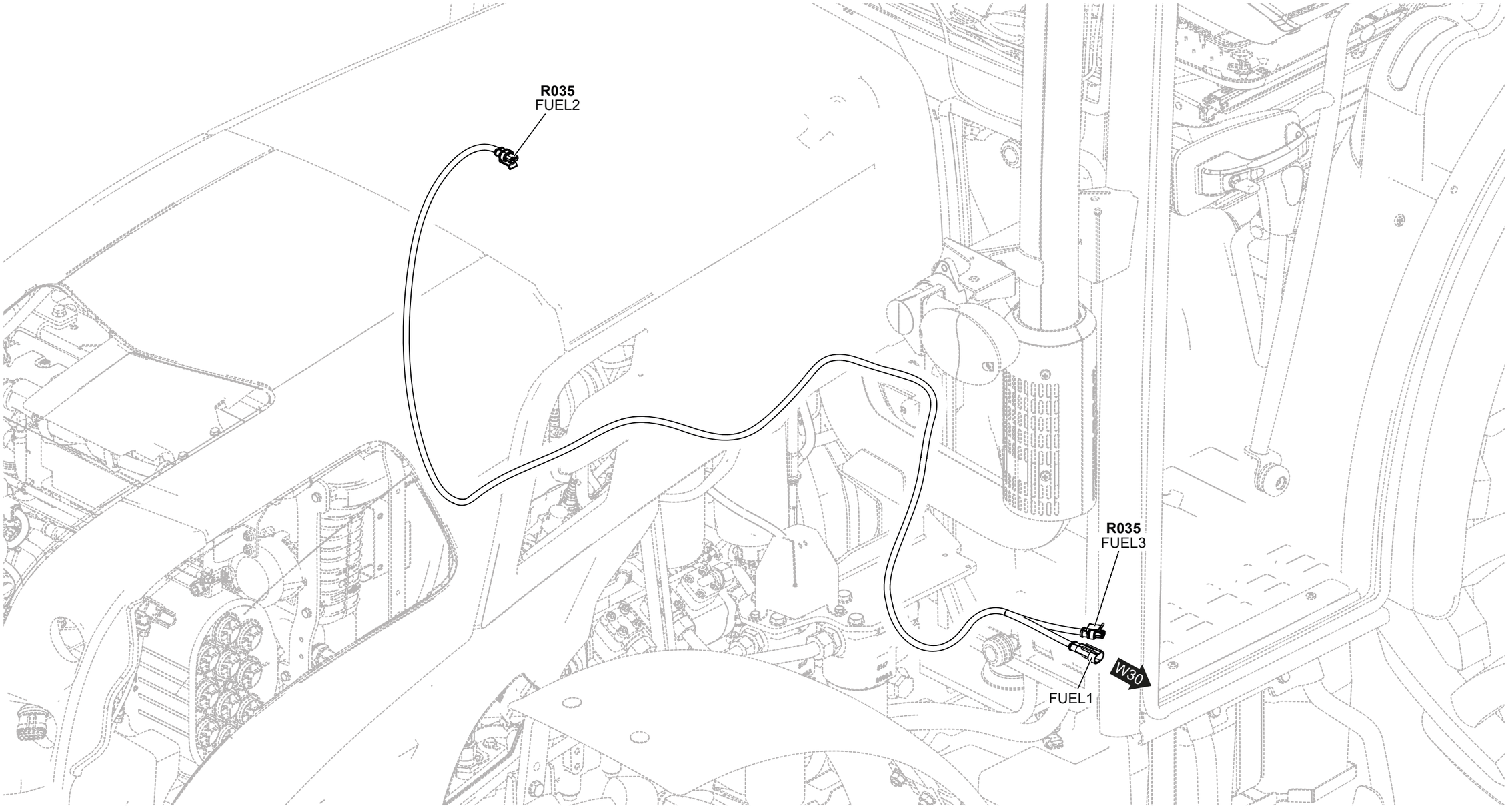

W25_1_VA_IN_473558_A_2_20230306

## 9.2.2.2.21 W29_1 - BRAKE SWITCHES WIRING HARNESS

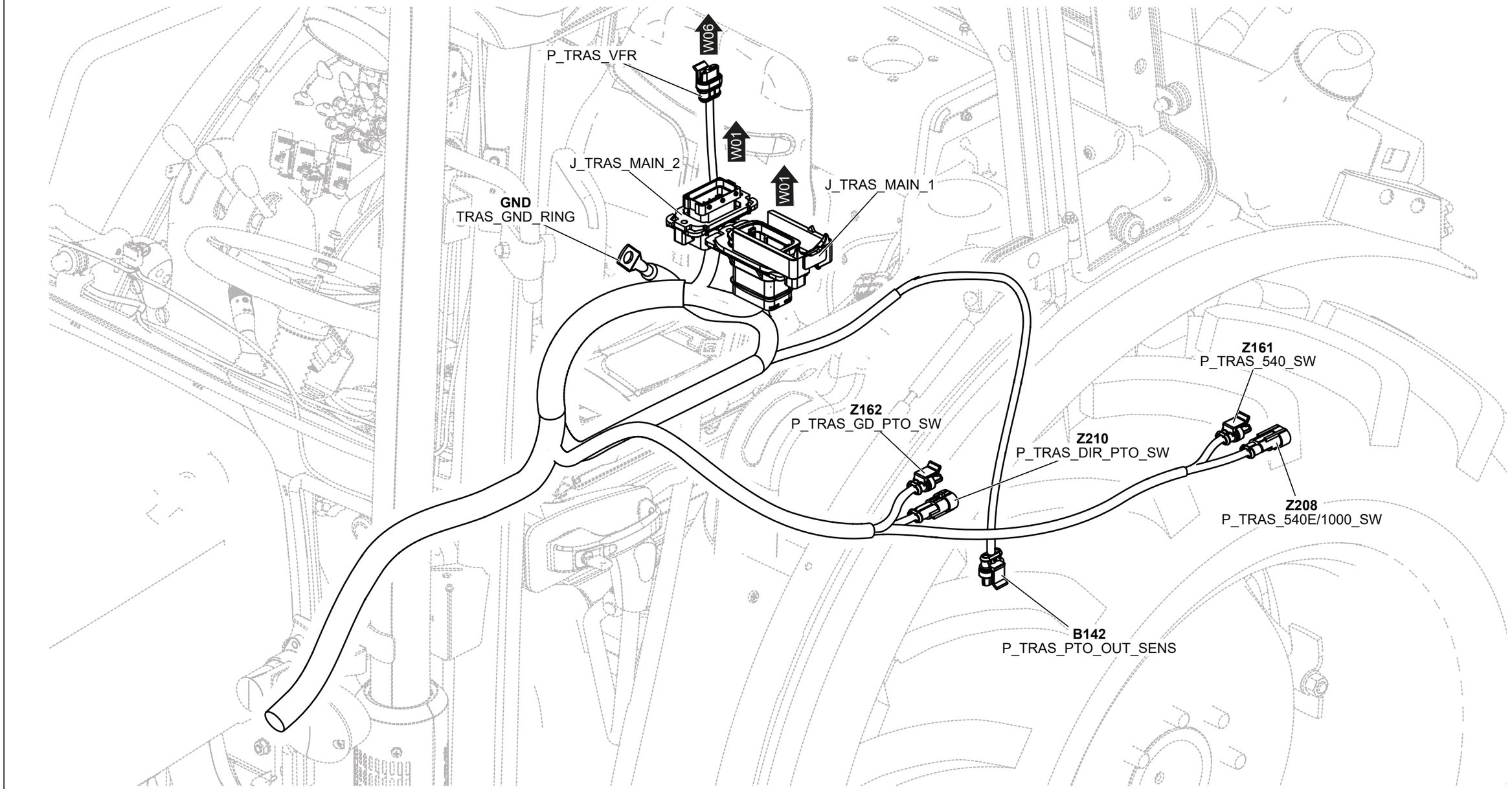



W29_1_VA_IN_464658_A_0_20230306

## 9.2.2.2.22 W30 - TRANSMISSION WIRING HARNESS LH

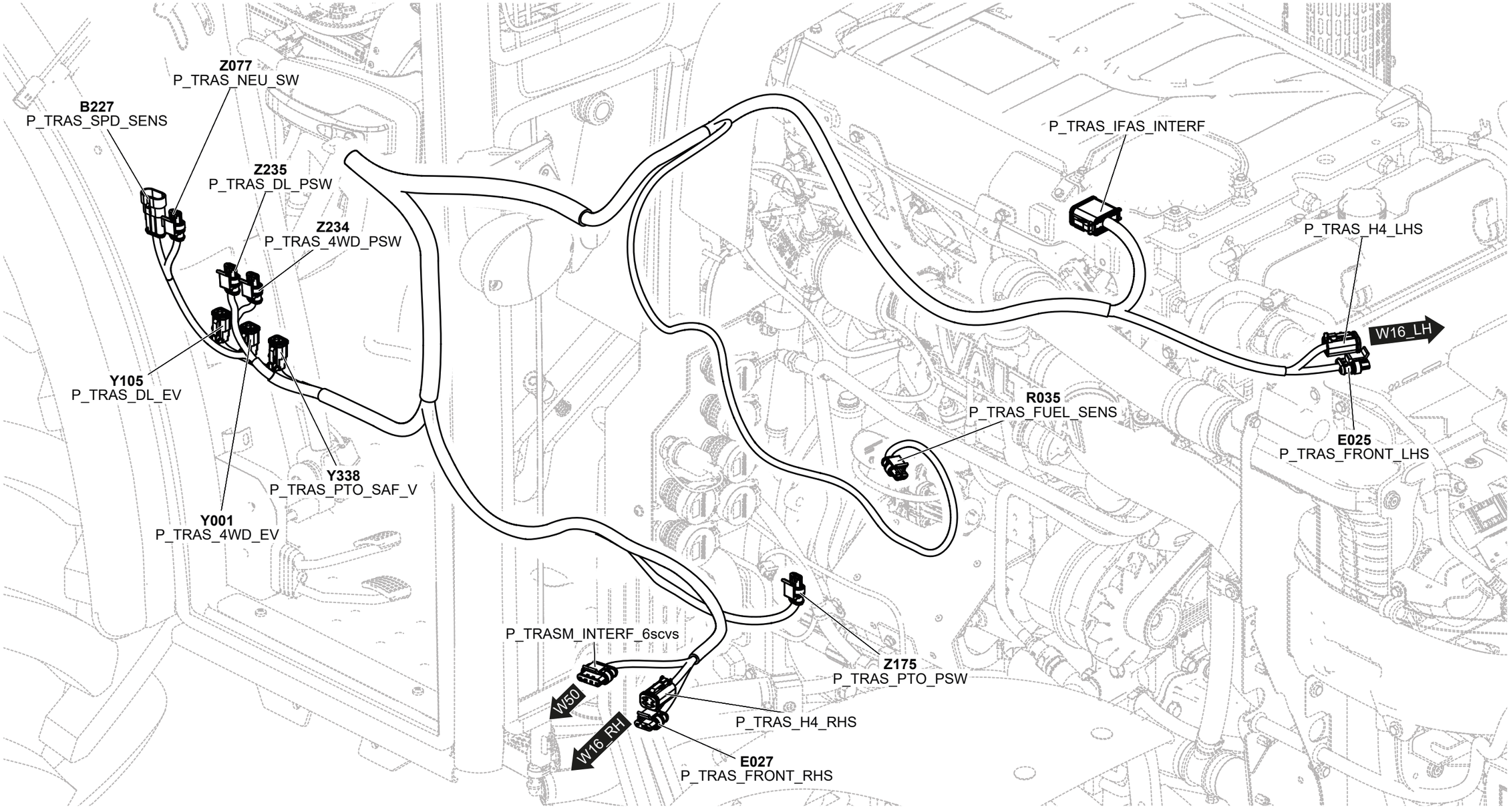



W30_2_VA_IN_597768_A_0_20230306

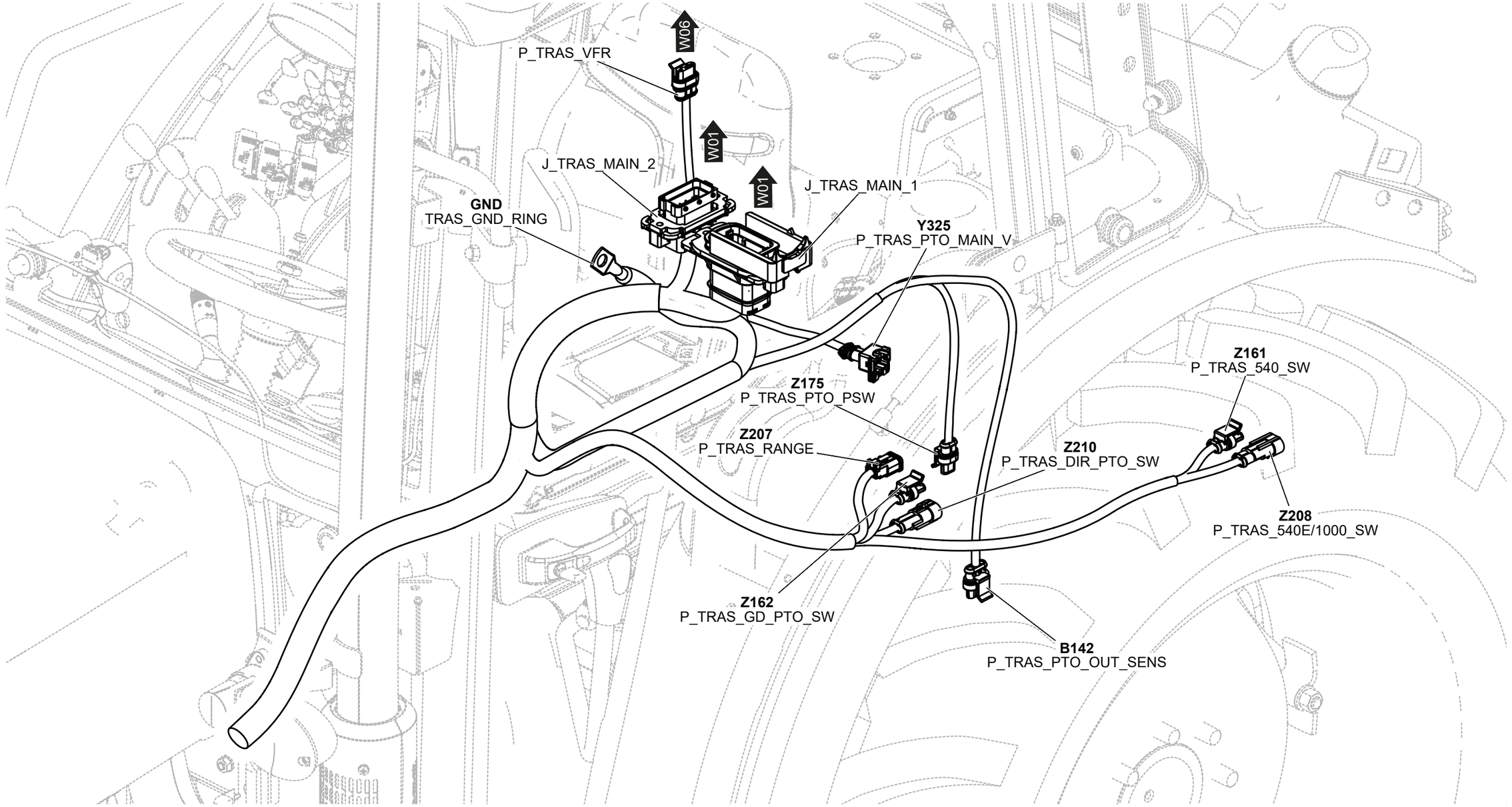



W30_VA_IN_569961_A_1_LH_20230306

### 9.2.2.2.24 W30 - TRANSMISSION WIRING HARNESS LH

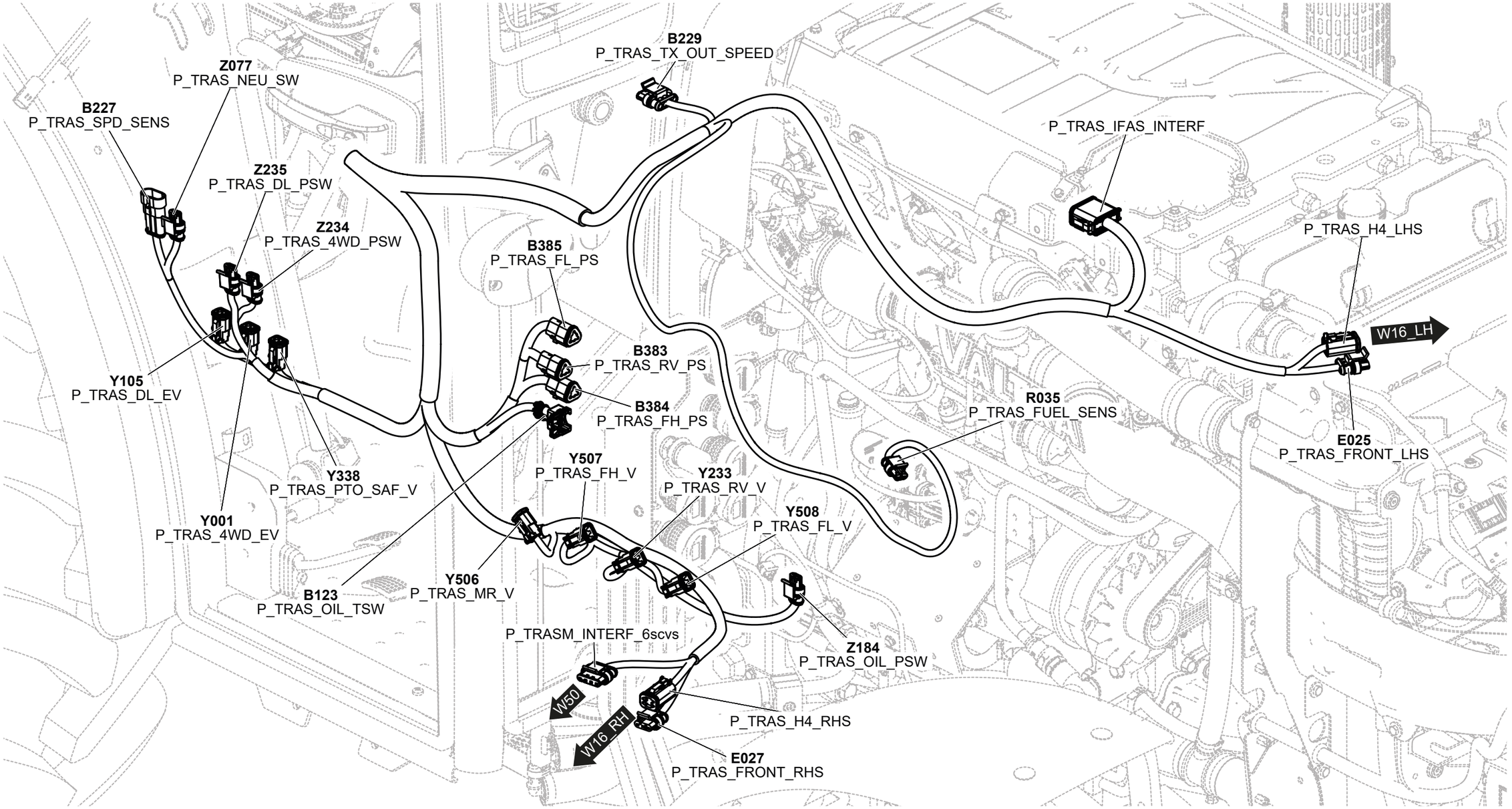



W30_VA_IN_569961_A_1_RH_20230306

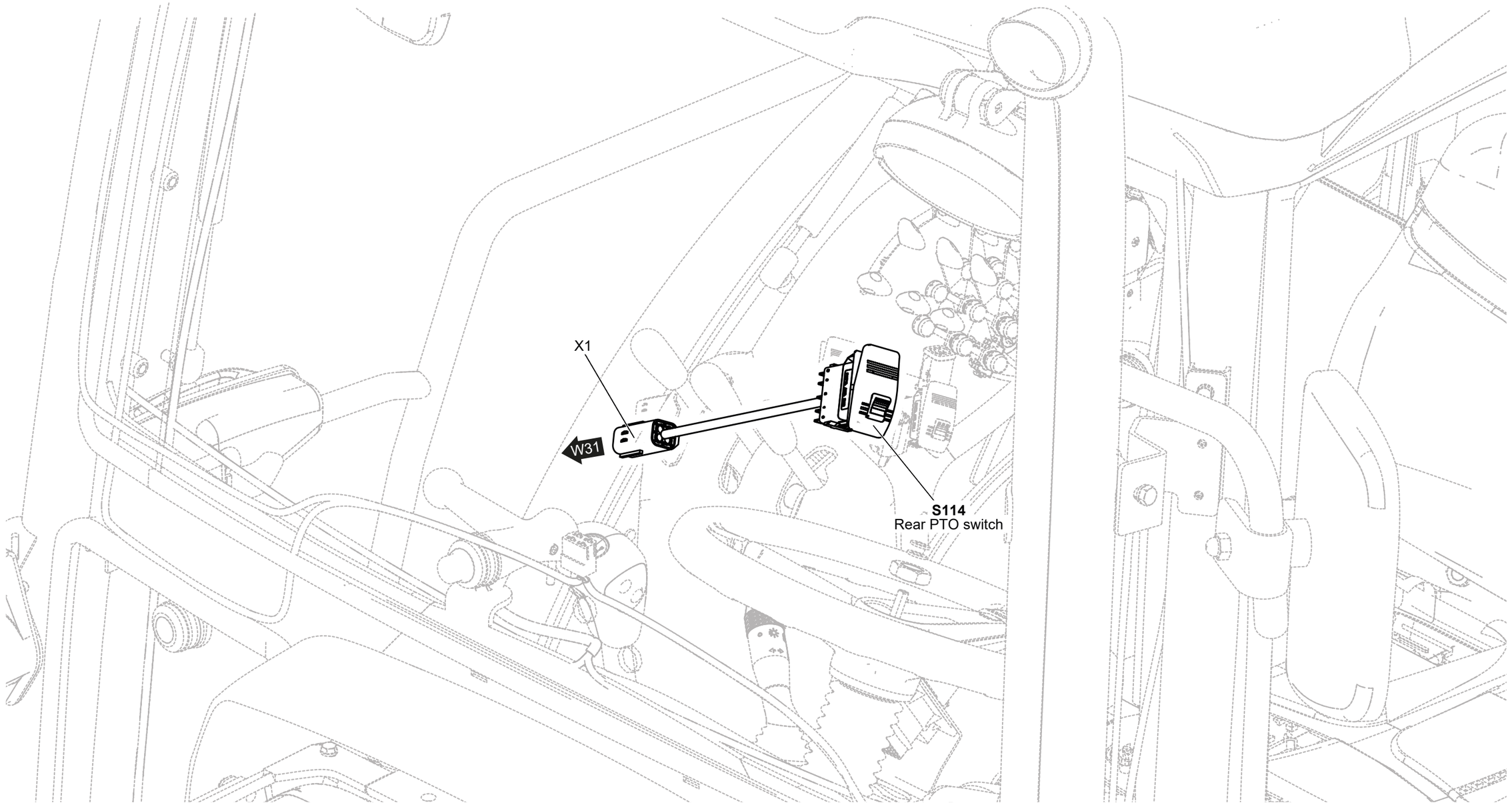



W30_VA_IN_582957_A_2_LH_20230306

### 9.2.2.2.26 W30_2 - FUEL LEVEL SENSOR WIRING HARNESS

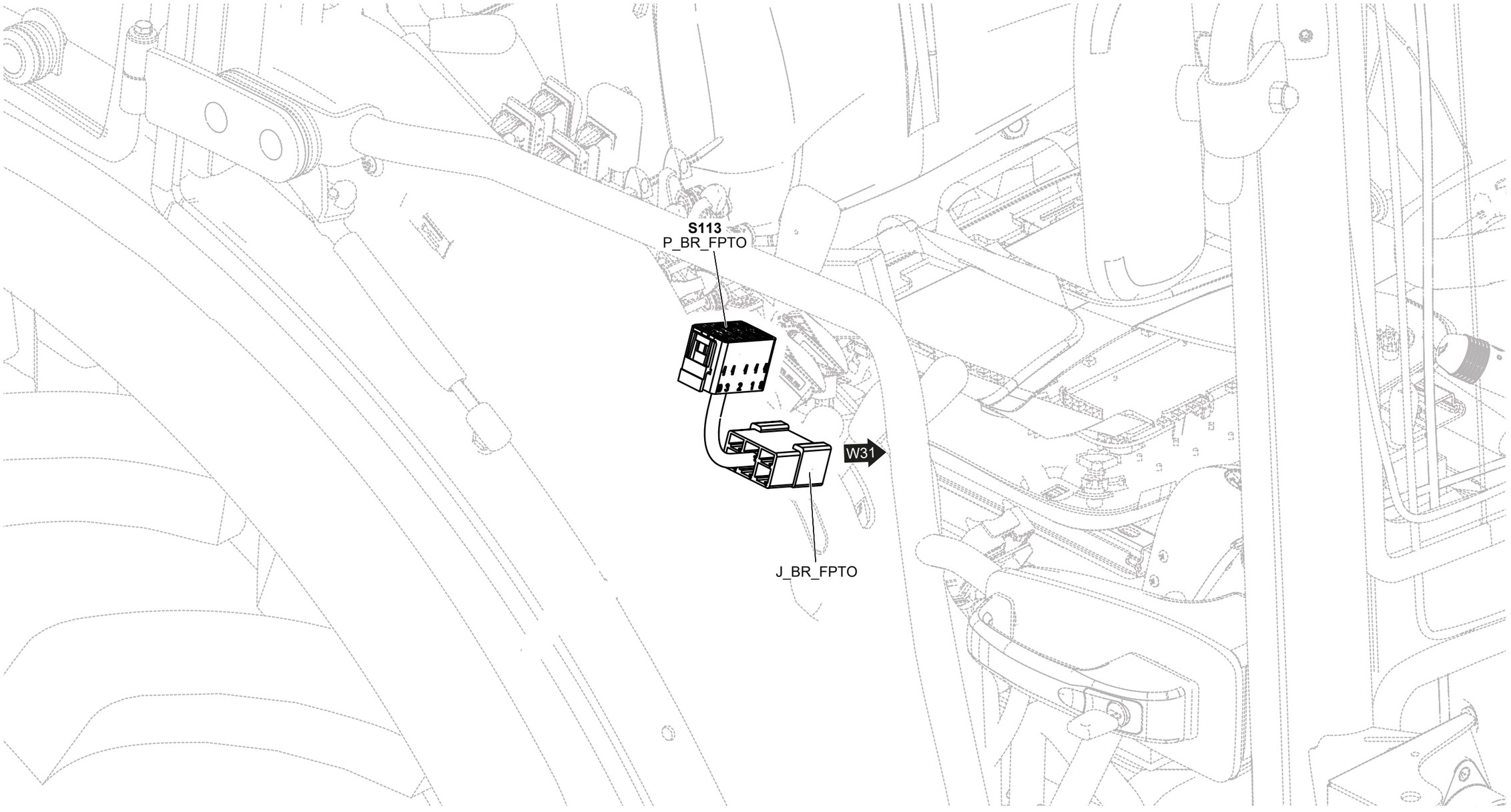



W30_VA_IN_582957_A_2_RH_20230306

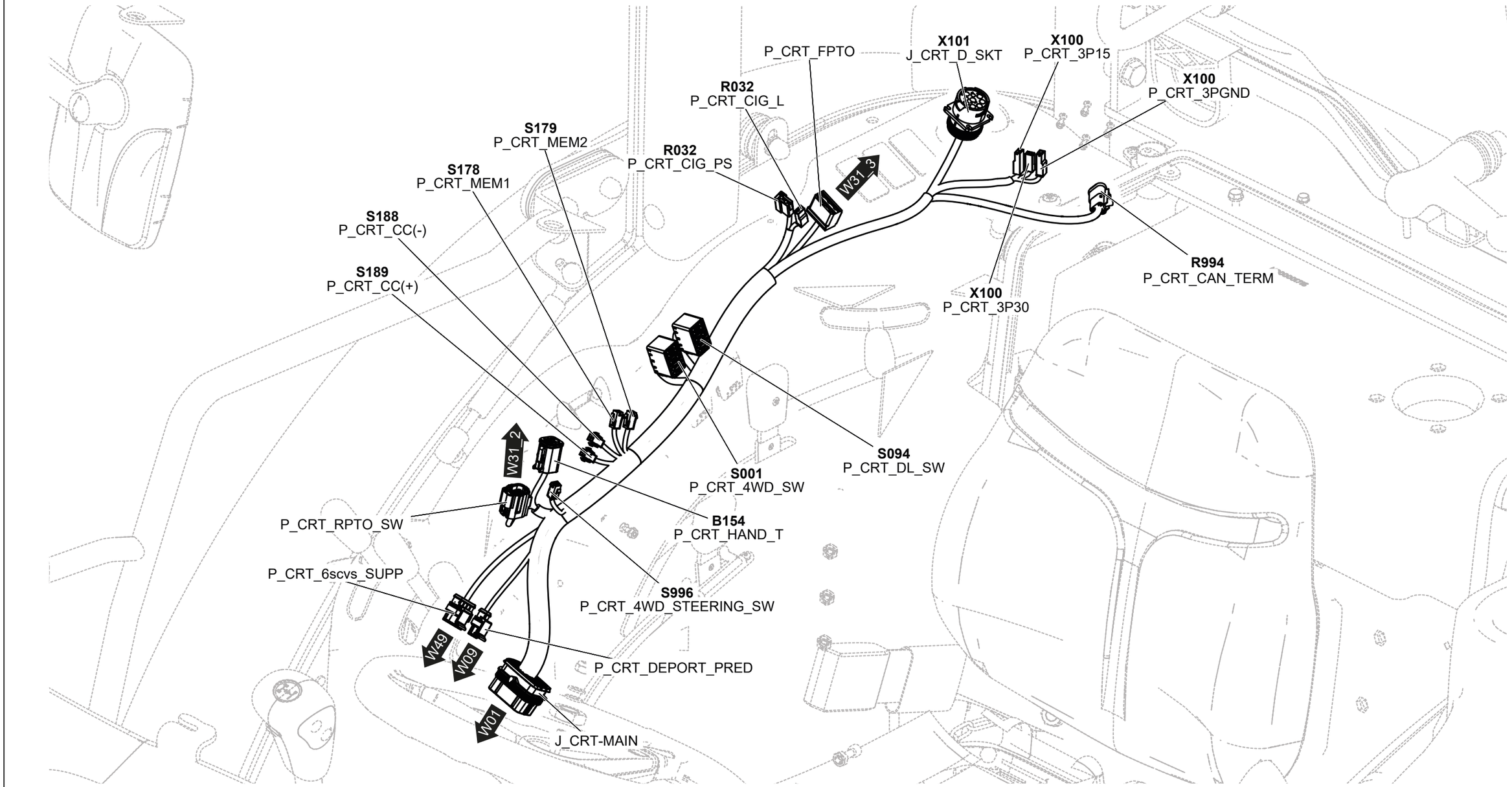



W31_2_VA_IN_397198_A_0_20230306

### 9.2.2.2.28 W31_2 - REAR PTO SWITCH WIRING HARNESS

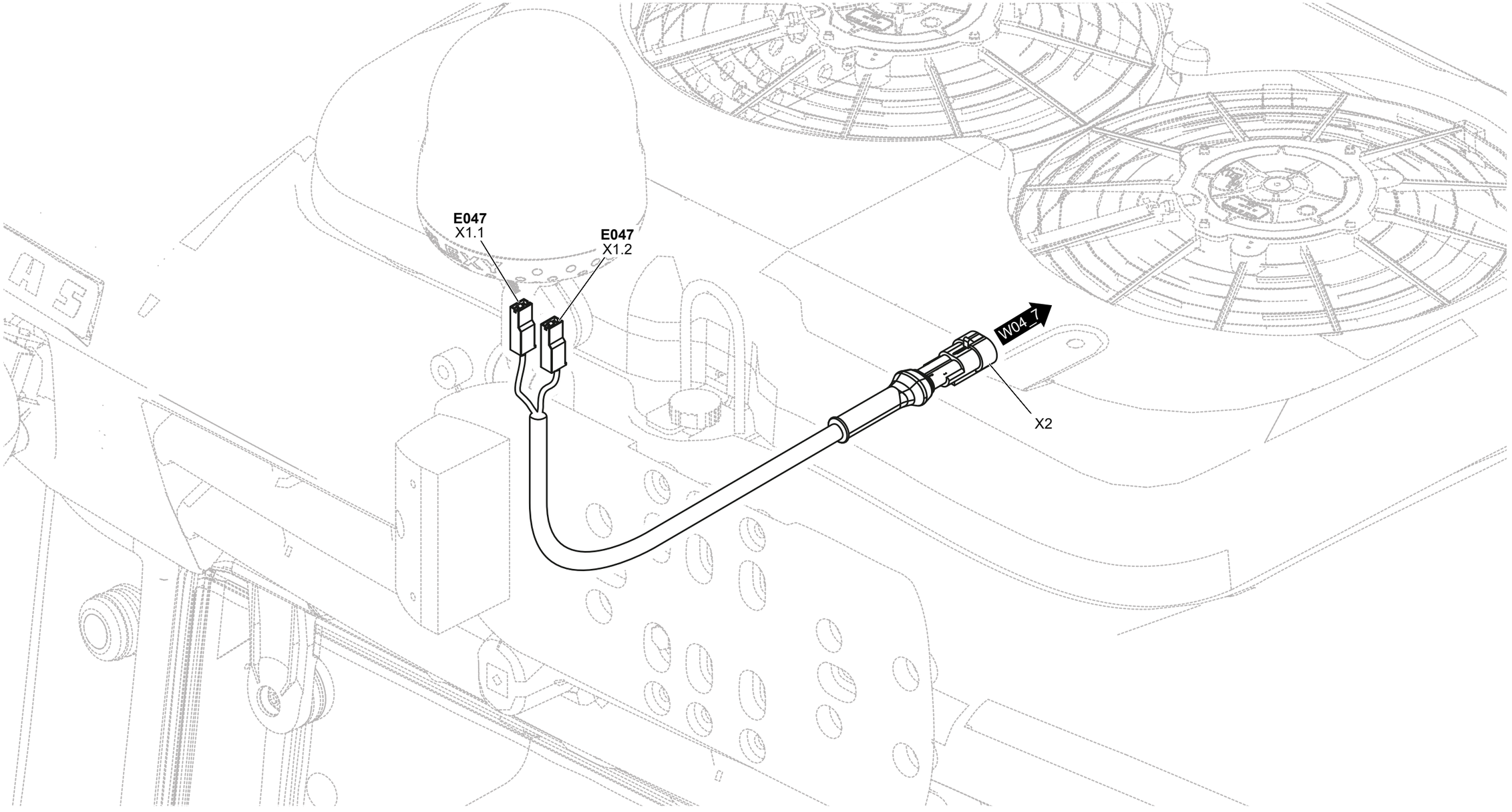



W31_3_VA_IN_599861_A_0_20230306



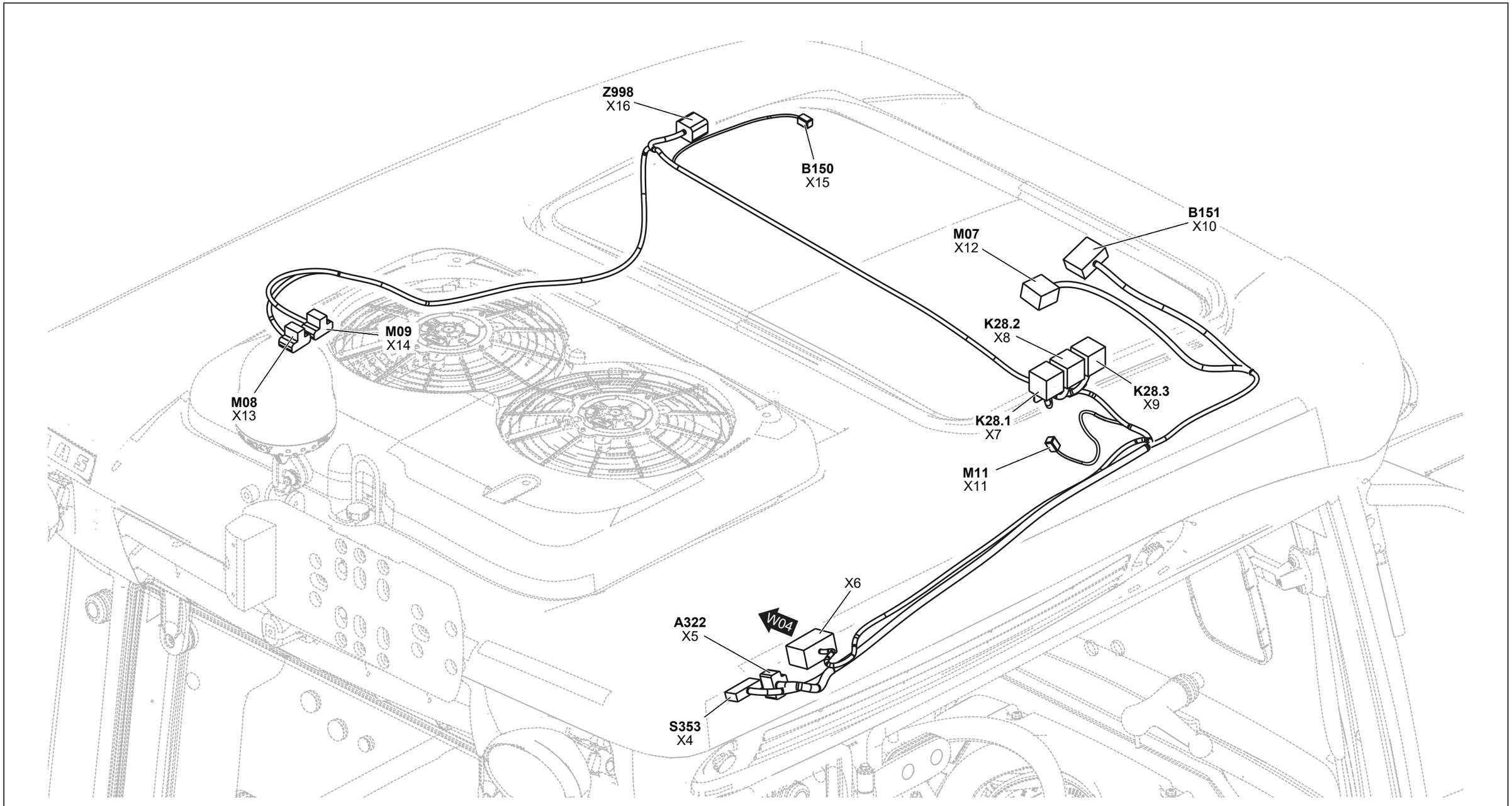

W31_VA_IN_566399_A_0_20230306

## 9.2.2.2.30 W35 - CAB BEACON LIGHT WIRING HARNESS

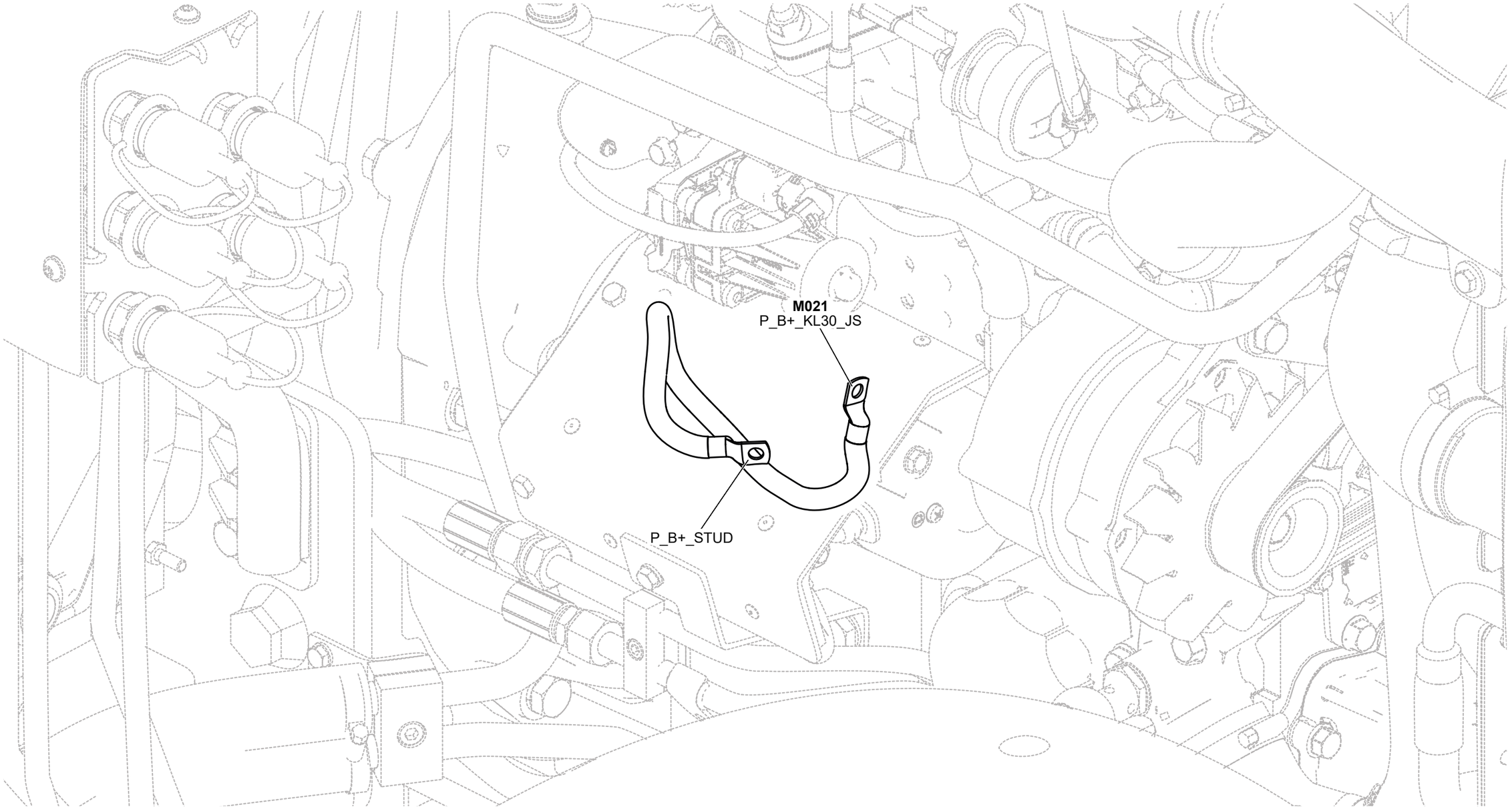



W35_VA_IN_485983_A_0_20230306

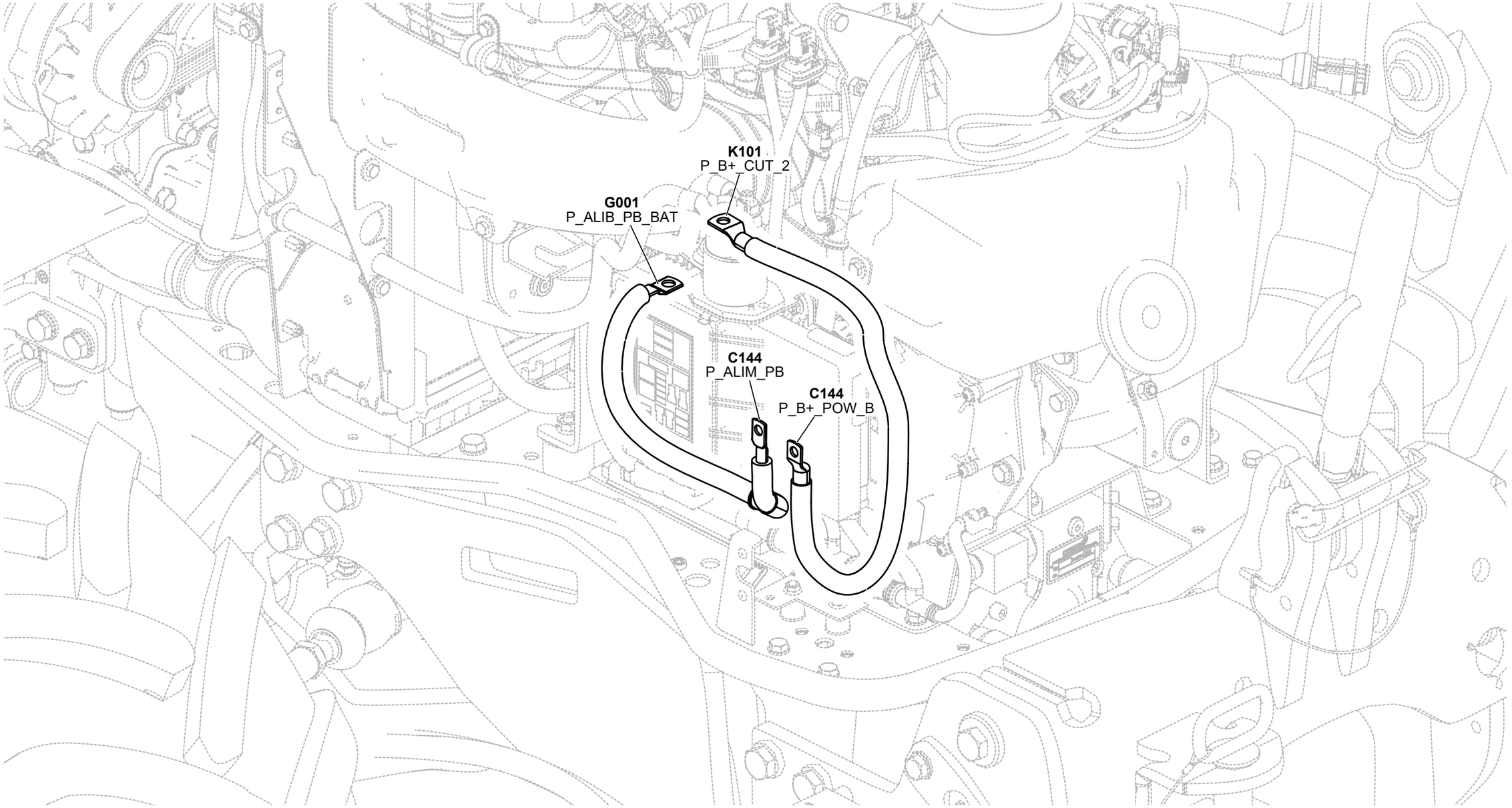
## 9.2.2.2.31 W36 - A/C SYSTEM WIRING HARNESS



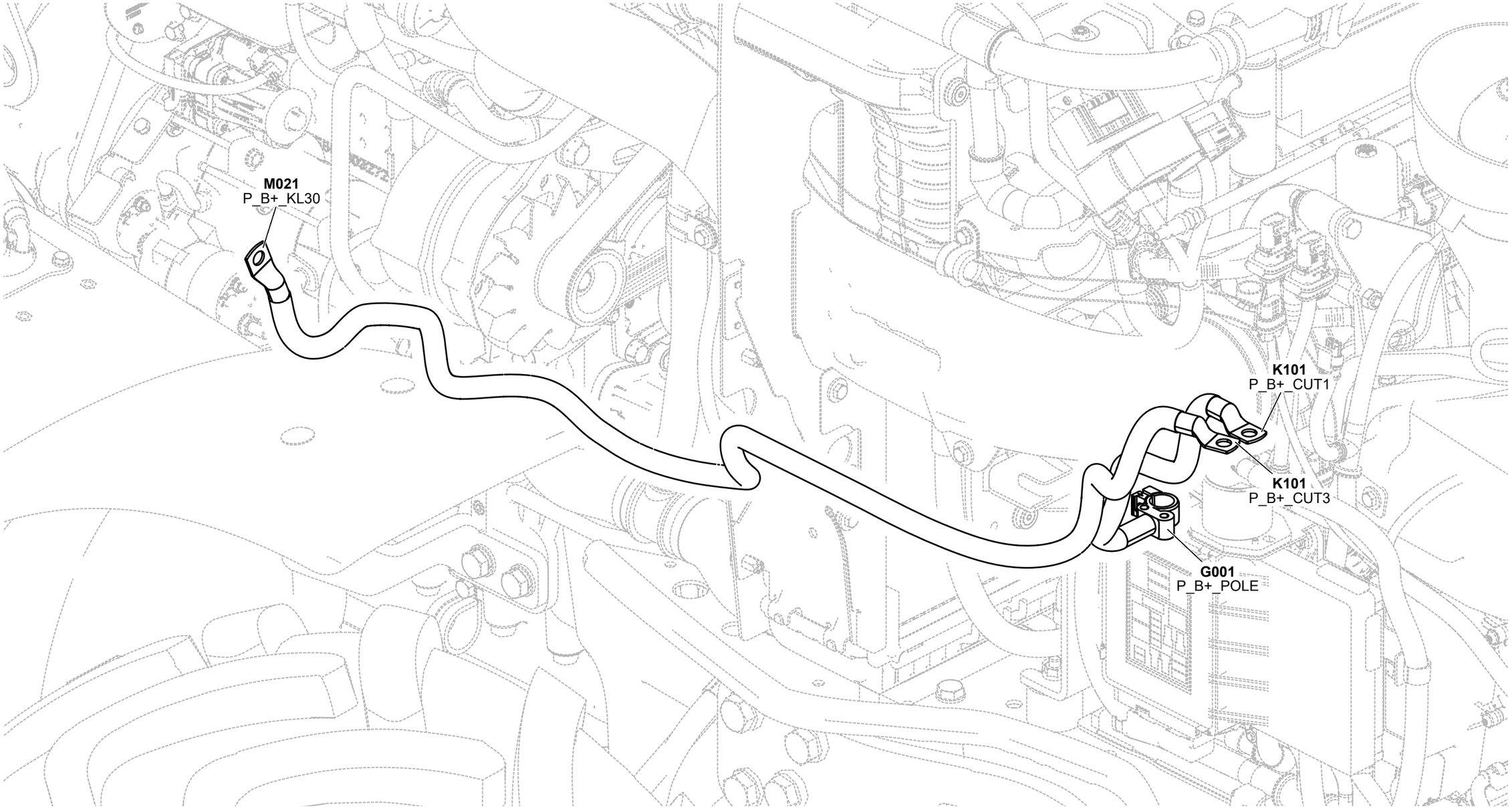

W36_VA_IN_211451_A_0_20230309




W45_2_VA_IN_552957_A_0_20230306

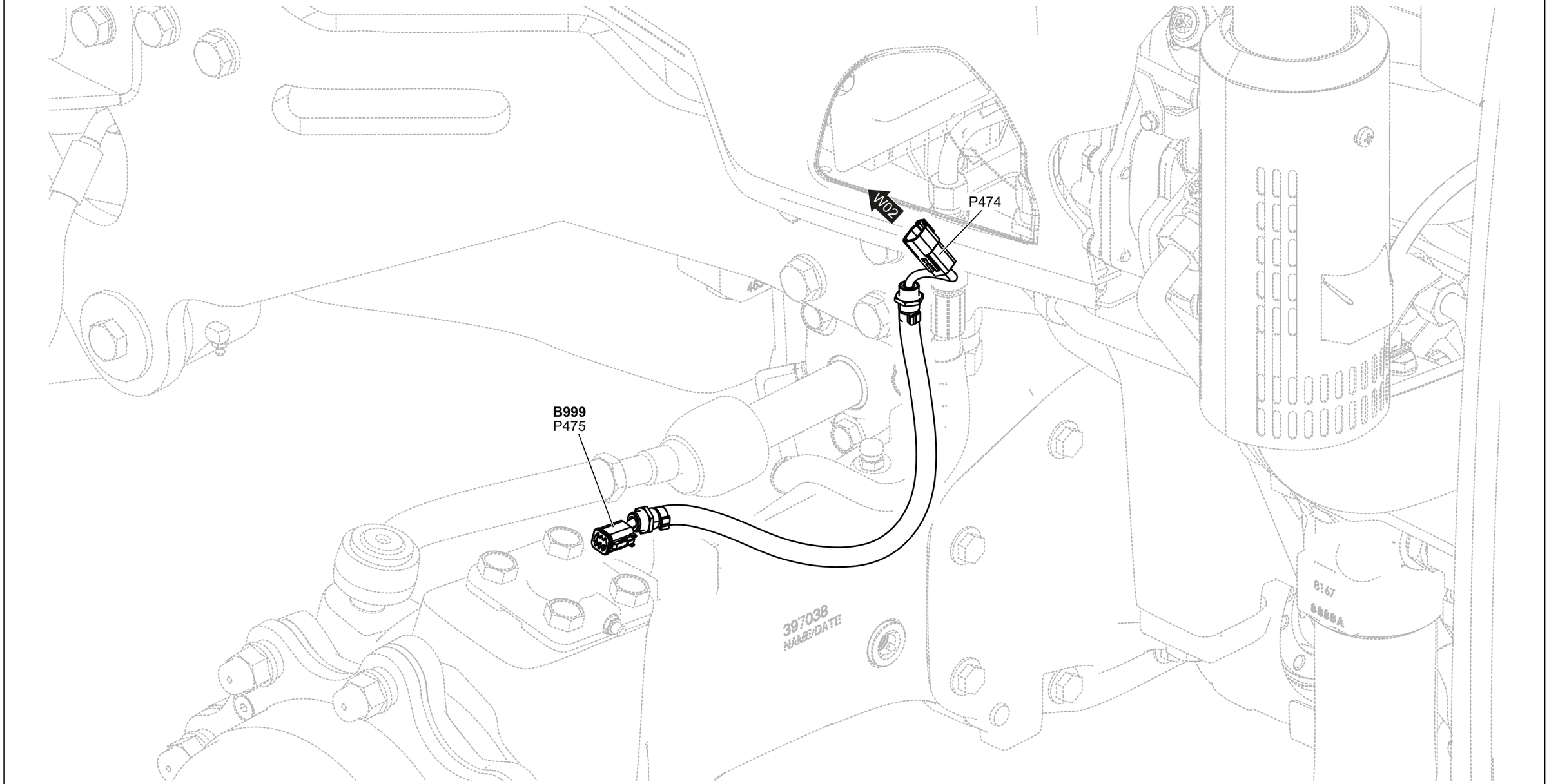



W45_VA_IN_565326_A_0_20230306




W45_1_VA_IN_565325_A_0_20230306

## 9.2.2.2.35 W48 - STEERING SENSOR WIRING HARNESS

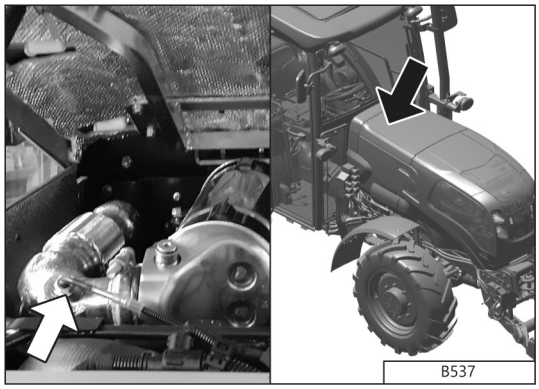



W48_VA_IN_471504_A_0_20230306

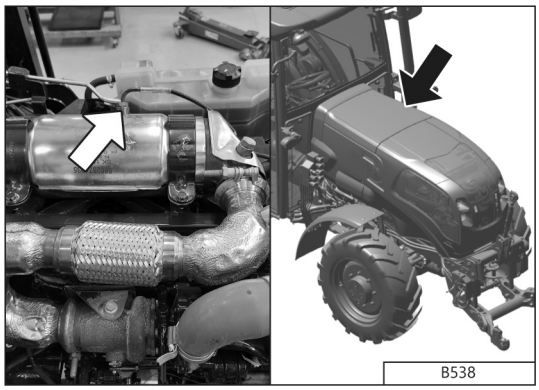
## 9.2.3. Component Locations

### 9.2.3.1 75Hp Models

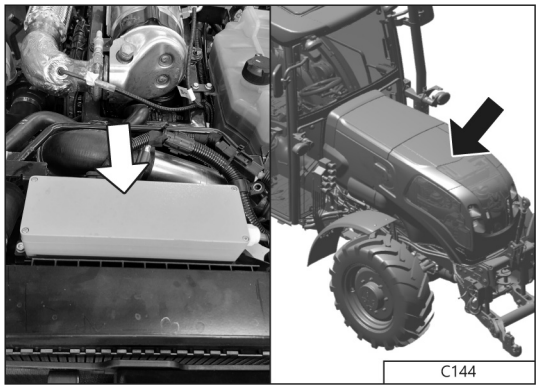
#### 9.2.3.1.1 B537 - DOC catalyser inlet temperature sensor (75hp)



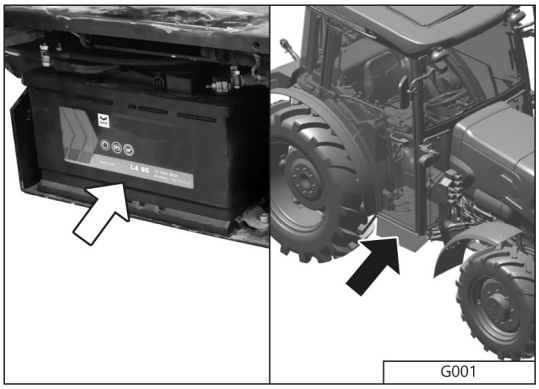

#### 9.2.3.1.2 B538 - DOC catalytic outlet temperature sensor (75hp)



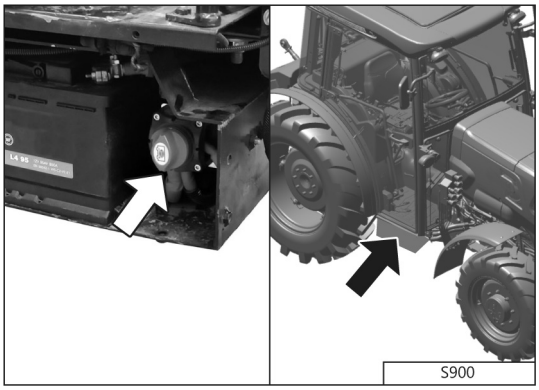

#### 9.2.3.1.3 C144 - Main fuse box (75hp)



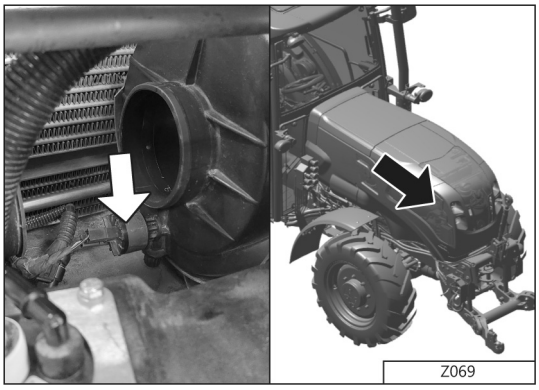

#### 9.2.3.1.4 G001 - Battery (75hp)



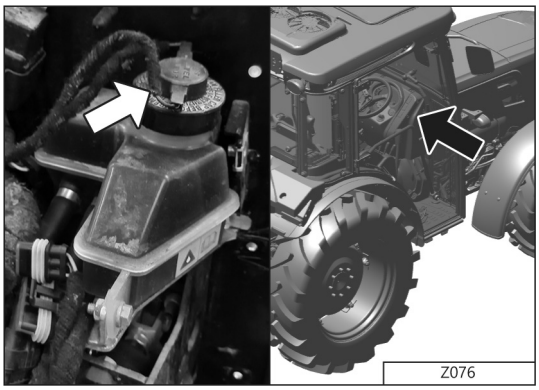

#### 9.2.3.1.5 S900 - Battery cut-off switch (75hp)




#### 9.2.3.1.6 Z069 - Air filter switch (75hp)

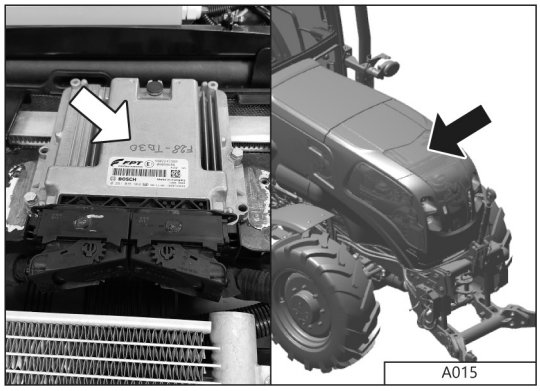



#### 9.2.3.1.7 Z076 - Brakes oil level switch (75hp)

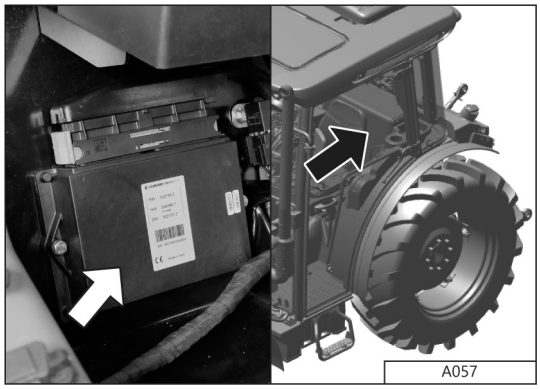


## 9.2.3.2 75Hp and 100Hp Models

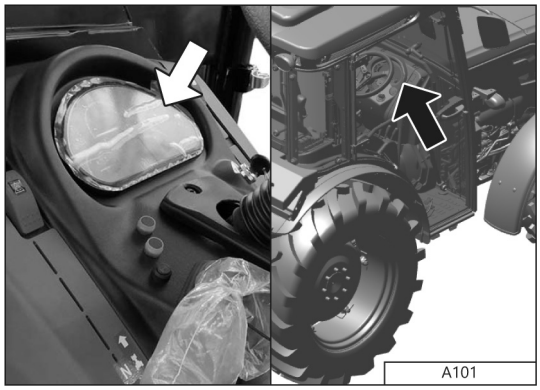
### 9.2.3.2.1 A015 - Engine control unit



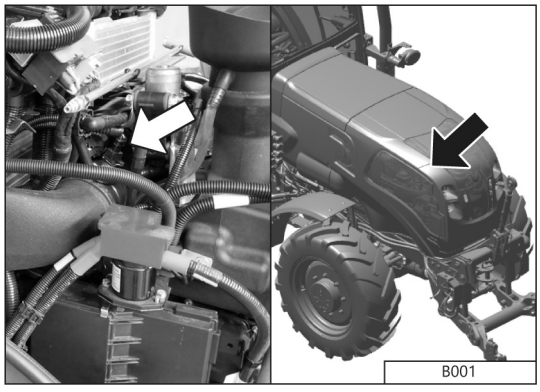

### 9.2.3.2.2 A057 - Transmission control unit



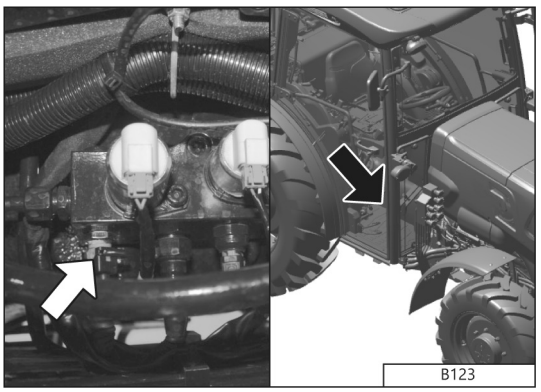

### 9.2.3.2.3 A101 - Instrument panel



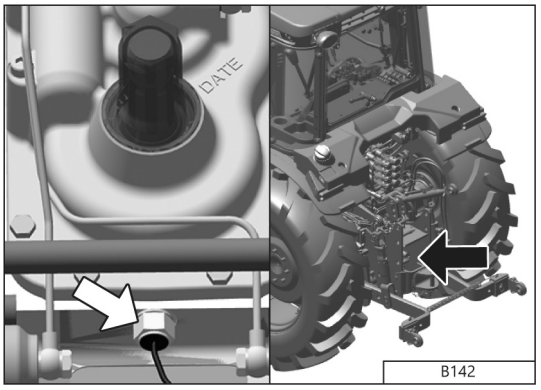

### 9.2.3.2.4 B001 - Air temperature sensor



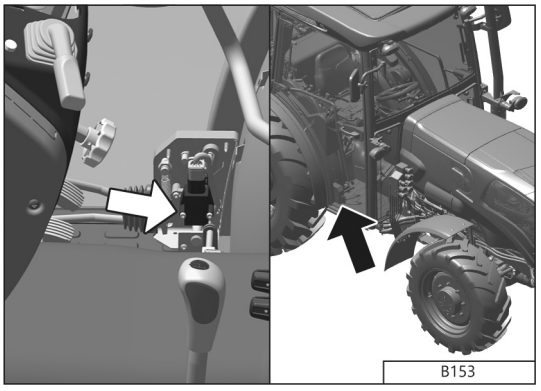

### 9.2.3.2.5 B123 - Transmission oil temperature sensor



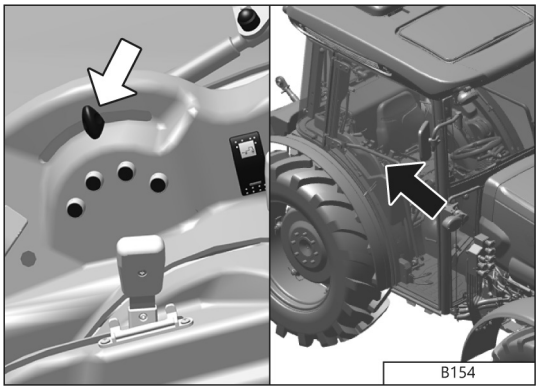

### 9.2.3.2.6 B142 - PTO shaft output sensor



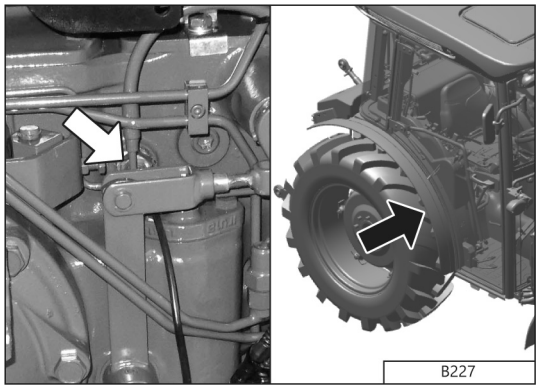

### 9.2.3.2.7 B153 - Foot throttle sensor



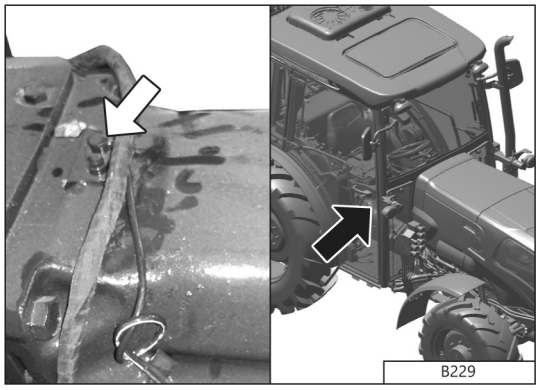

### 9.2.3.2.8 B154 - Hand throttle sensor



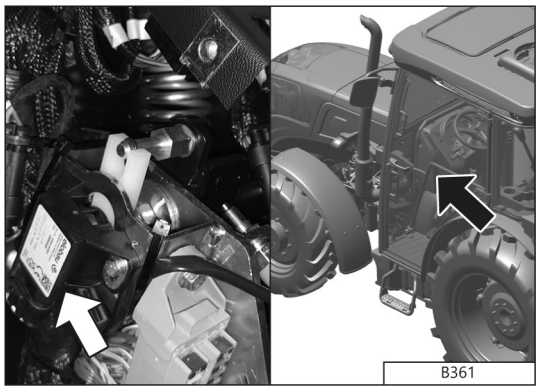
### 9.2.3.2.9 B227 - Speed Sensor



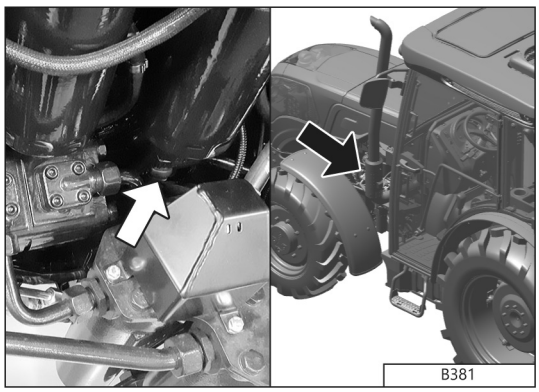

### 9.2.3.2.10 B229 - Transmission out speed signal



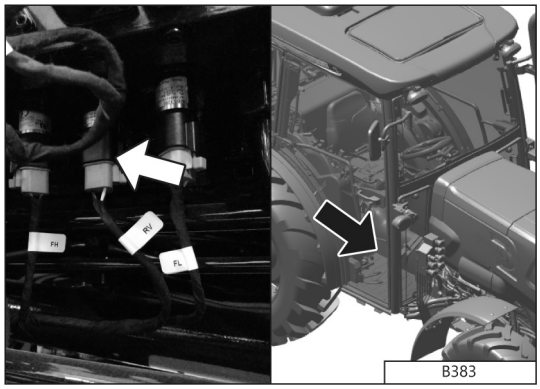

### 9.2.3.2.11 B361 - Clutch pedal position sensor



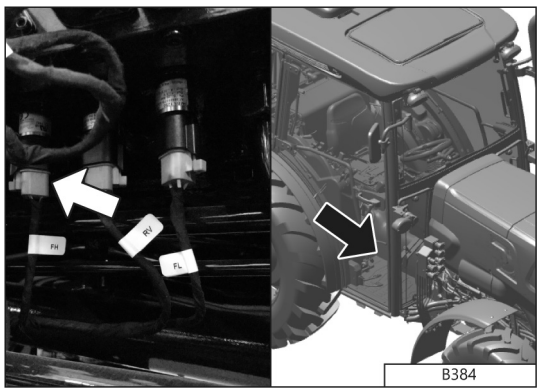

### 9.2.3.2.12 B381 - Water in fuel switch



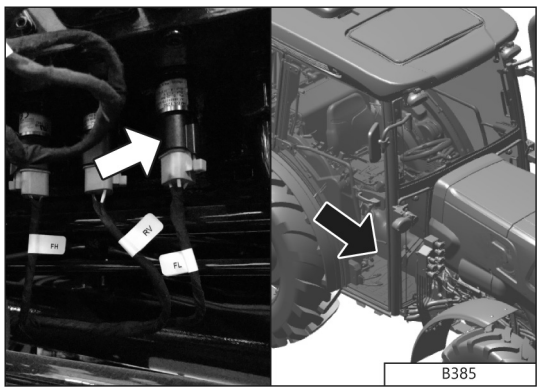

### 9.2.3.2.13 B383 - RV pressure sensor



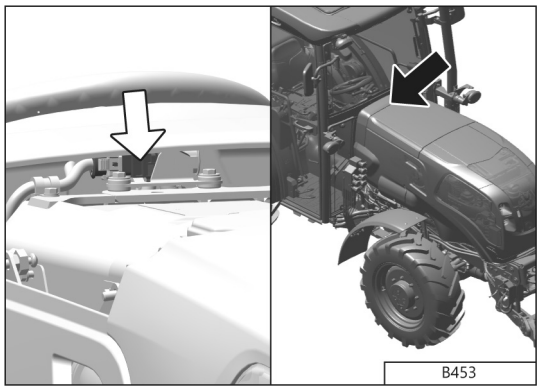

### 9.2.3.2.14 B384 - HI pressure sensor



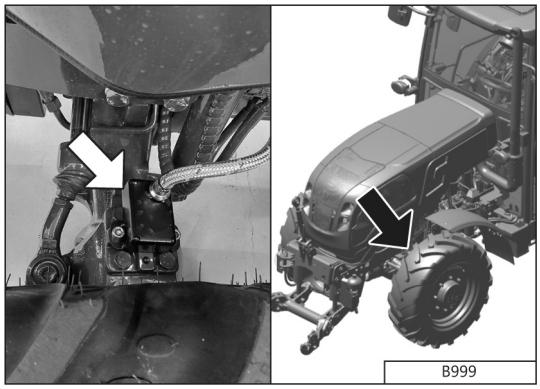

### 9.2.3.2.15 B385 - LO pressure sensor



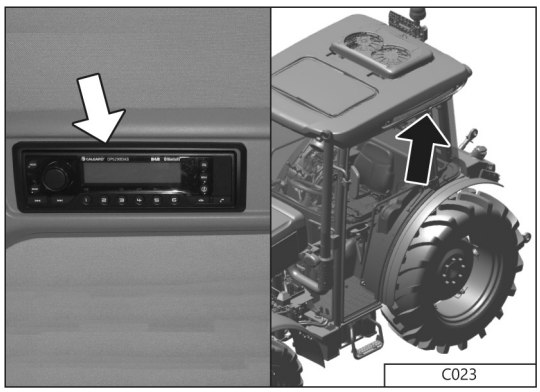

### 9.2.3.2.16 B453 - Delta pressure sensor



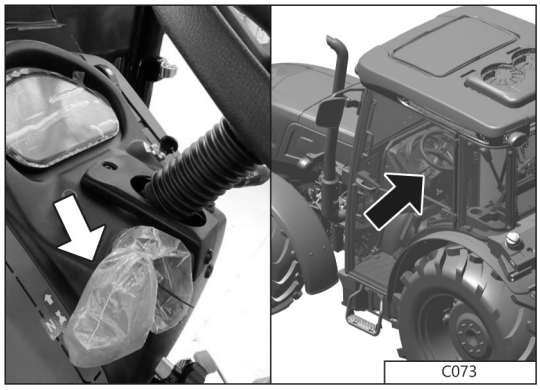
### 9.2.3.2.17 B999 - Steering angle sensor



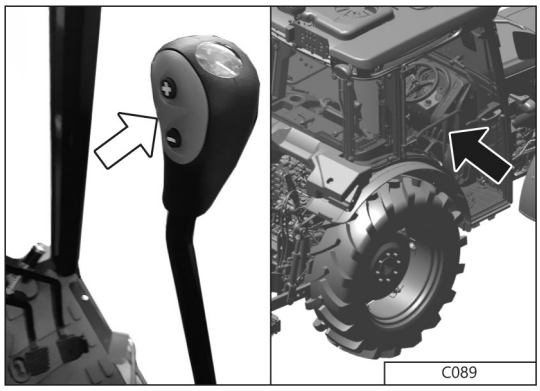

### 9.2.3.2.18 C023 - Radio



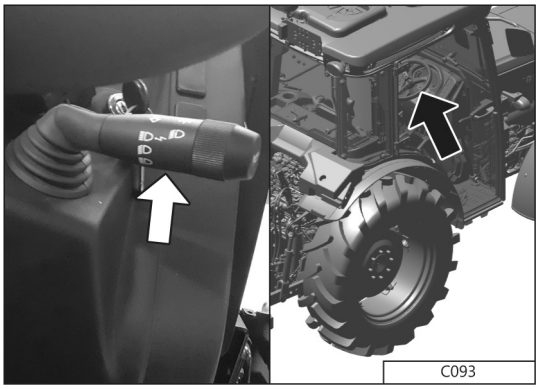

### 9.2.3.2.19 C073 - FNR lever



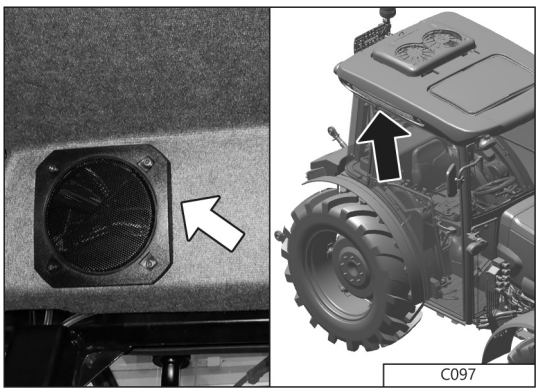

### 9.2.3.2.20 C089 - HI-LO switch



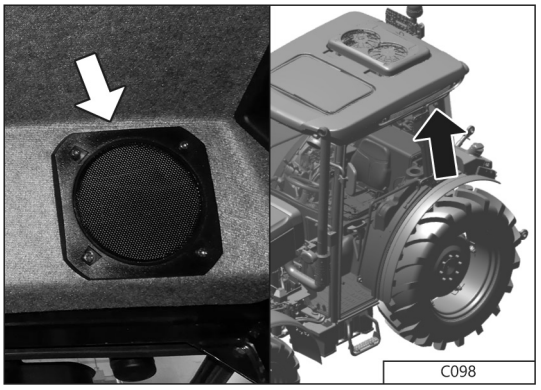

### 9.2.3.2.21 C093 - Blinker lever



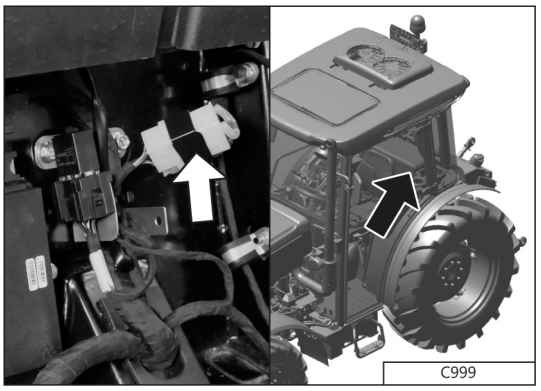

### 9.2.3.2.22 C097 - Right speaker



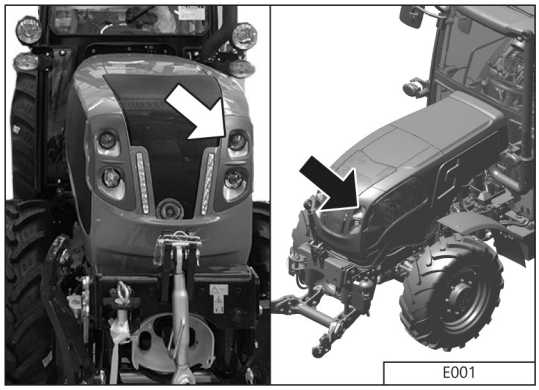

### 9.2.3.2.23 C098 - Left speaker



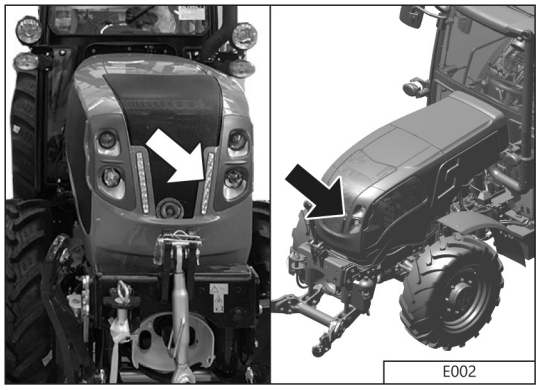

### 9.2.3.2.24 C999 - Filter LP



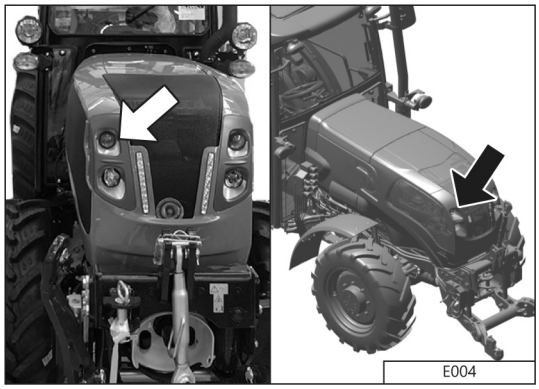
### 9.2.3.2.25 E001 - Front LH road light - Low beam



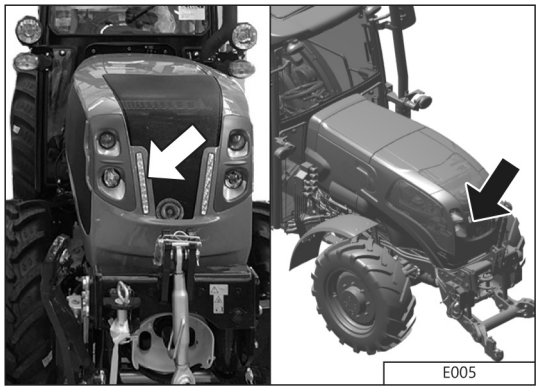

### 9.2.3.2.26 E002 - Front LH LED light



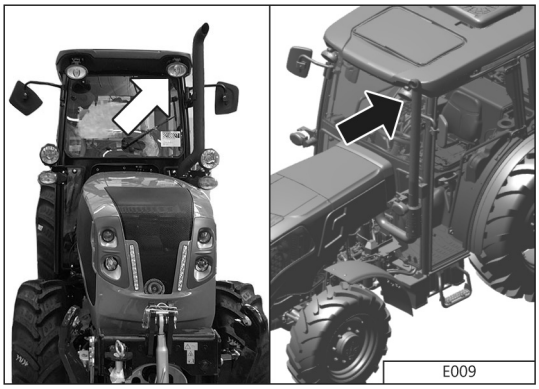

### 9.2.3.2.27 E004 - Front RH road light - Low beam



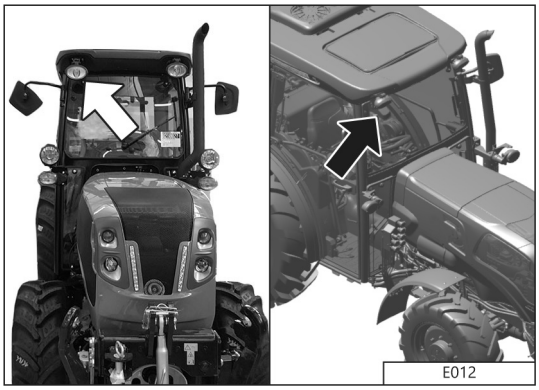

### 9.2.3.2.28 E005 - Front RH LED light



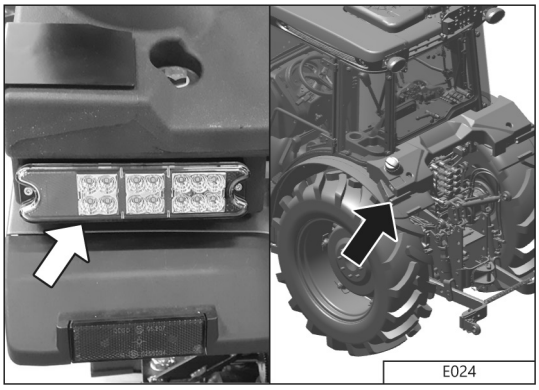

### 9.2.3.2.29 E009 - Front LH roof work light



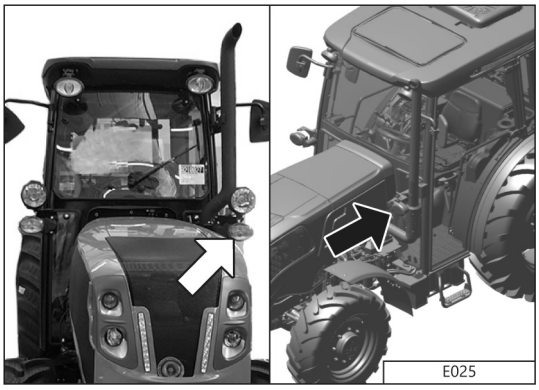

### 9.2.3.2.30 E012 - Front RH roof work light



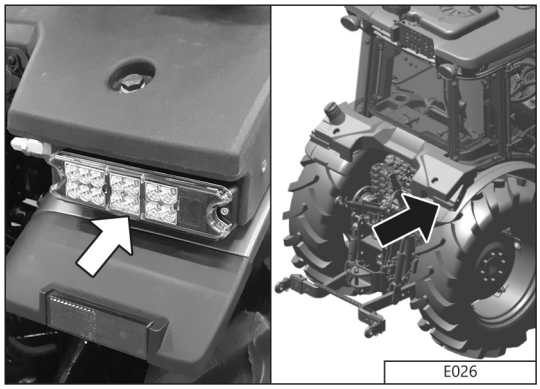

### 9.2.3.2.31 E024 - Rear LH road light



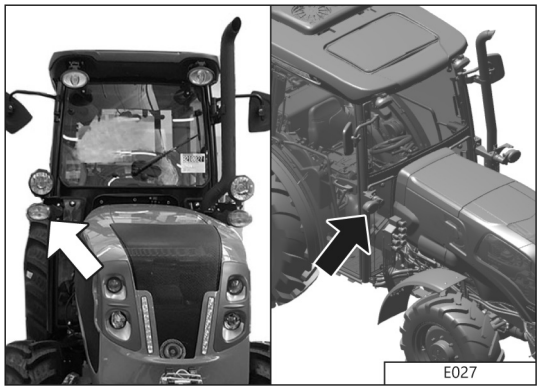

### 9.2.3.2.32 E025 - LHS front light



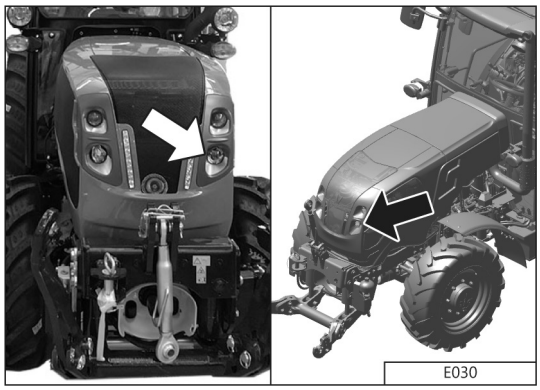
### 9.2.3.2.33 E026 - Rear RH road light



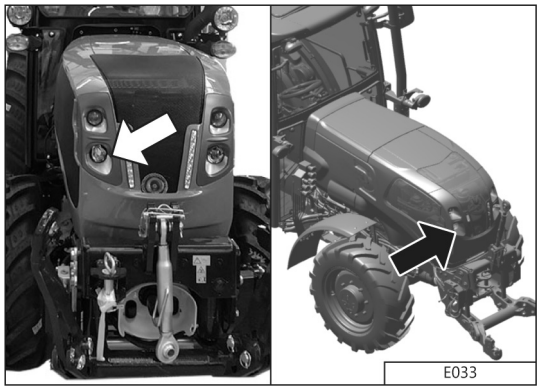

### 9.2.3.2.34 E027 - RHS front light



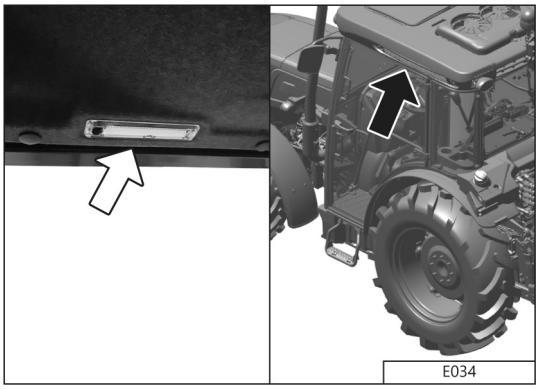

### 9.2.3.2.35 E030 - Front LH road light - High beam



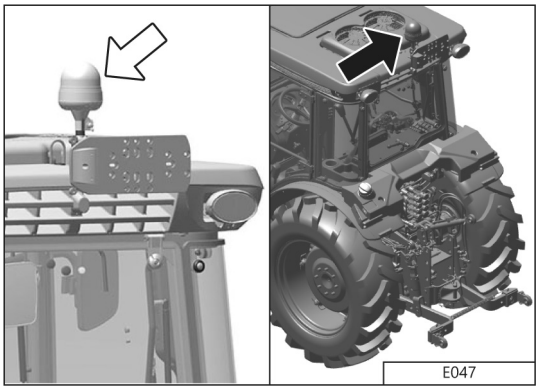

### 9.2.3.2.36 E033 - Front RH road light - High beam



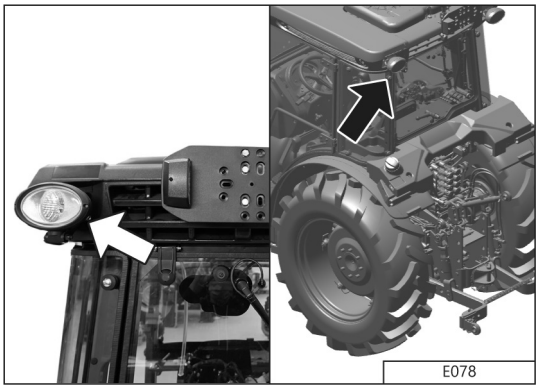

### 9.2.3.2.37 E034 - Internal light



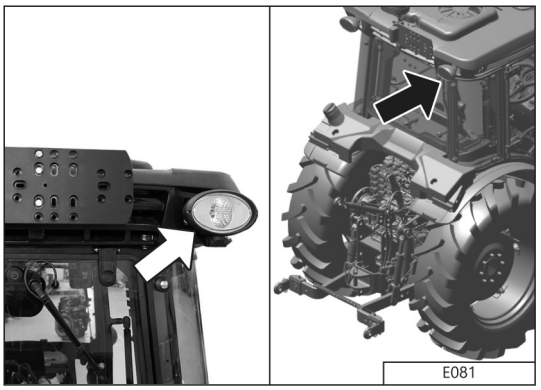

### 9.2.3.2.38 E047 - Beacon light



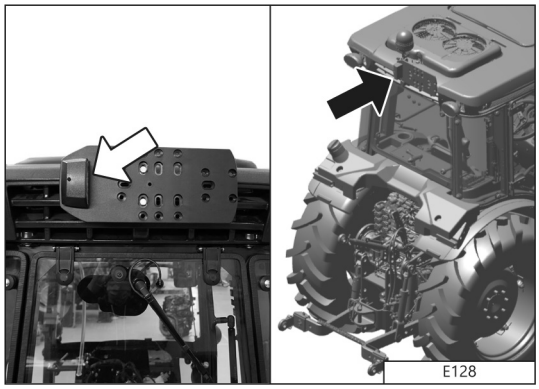

### 9.2.3.2.39 E078 - Rear LH roof work light



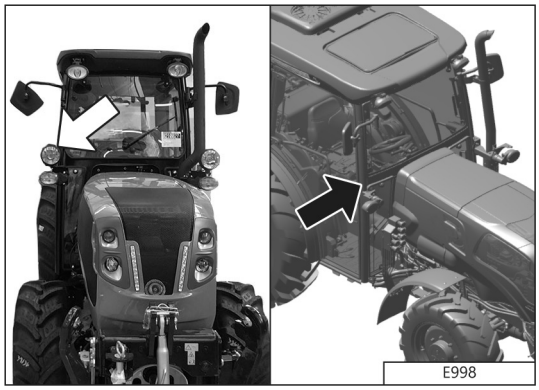

### 9.2.3.2.40 E081 - Rear RH roof work light



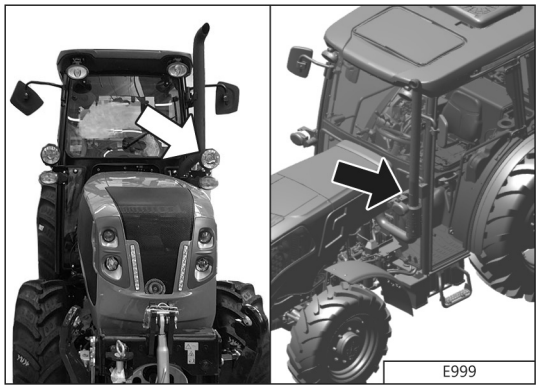
### 9.2.3.2.41 E128 - Licence plate light



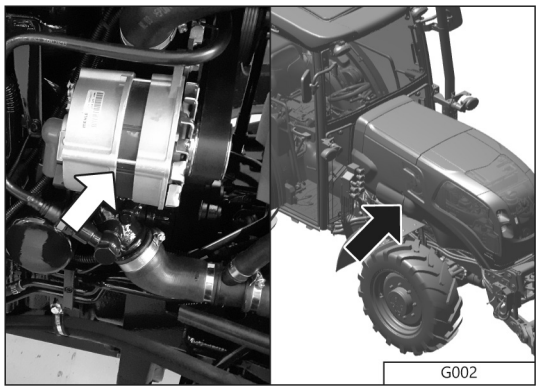

### 9.2.3.2.42 E998 - Front RH H4 light



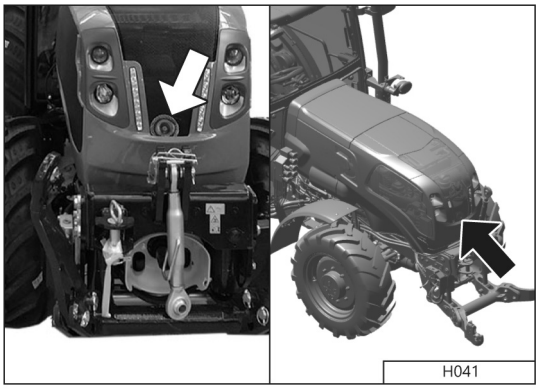

### 9.2.3.2.43 E999 - Front LH H4 light



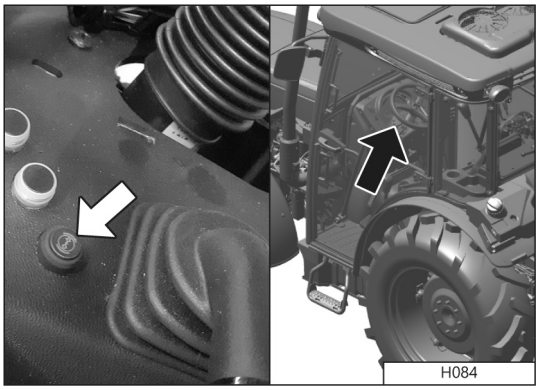

### 9.2.3.2.44 G002 - Alternator



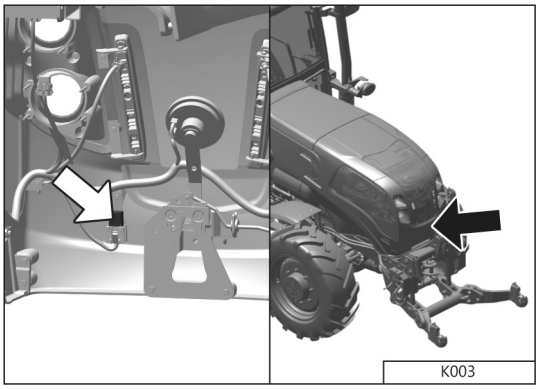

### 9.2.3.2.45 H041 - Claxon



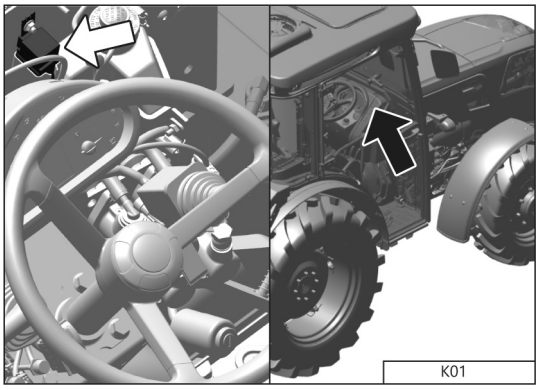

### 9.2.3.2.46 H084 - Trailer brake warning light



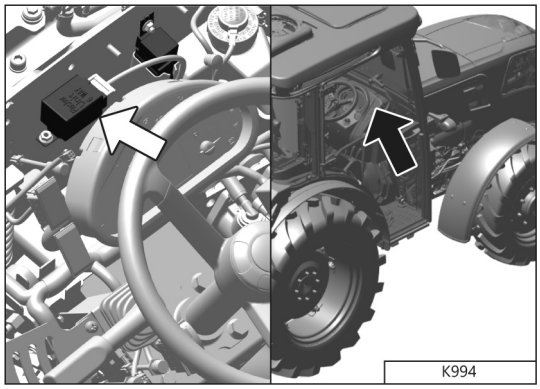

### 9.2.3.2.47 K003 - LED lights relay



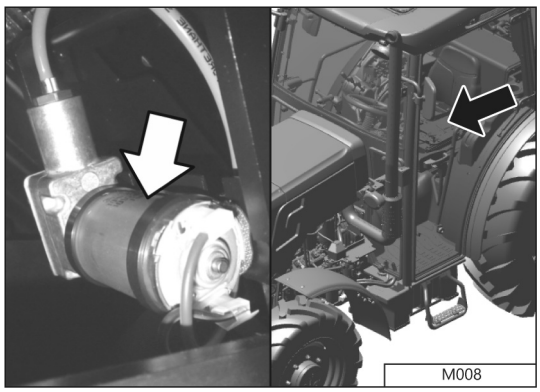

### 9.2.3.2.48 K01 - Starter relay



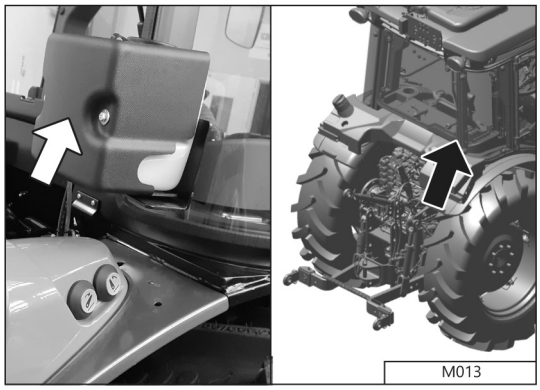
### 9.2.3.2.49 K994 - Flasher unit



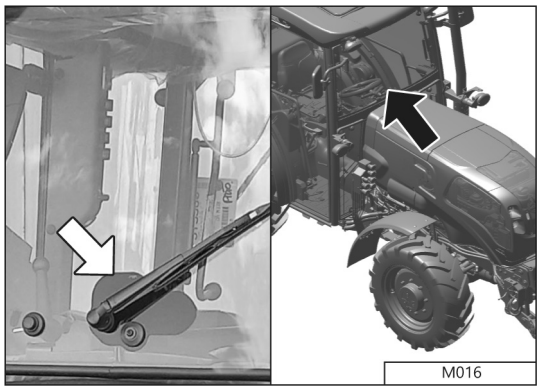

### 9.2.3.2.50 M008 - Air seat



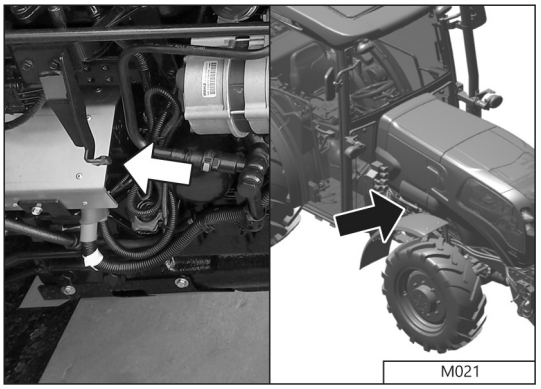

### 9.2.3.2.51 M013 - Wiper pump



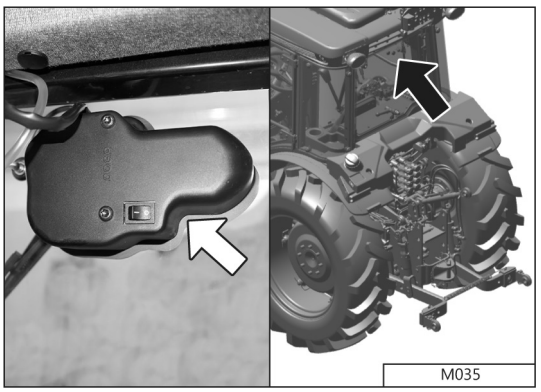

### 9.2.3.2.52 M016 - Front wiper motor



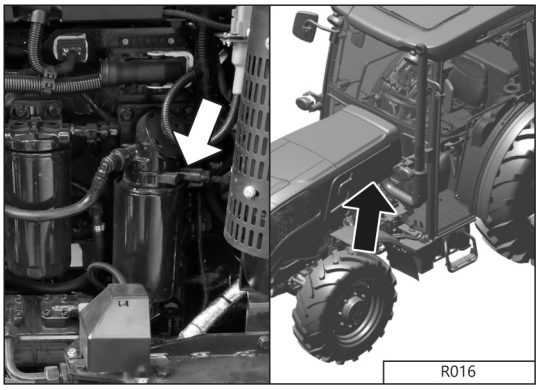

### 9.2.3.2.53 M021 - Starter motor



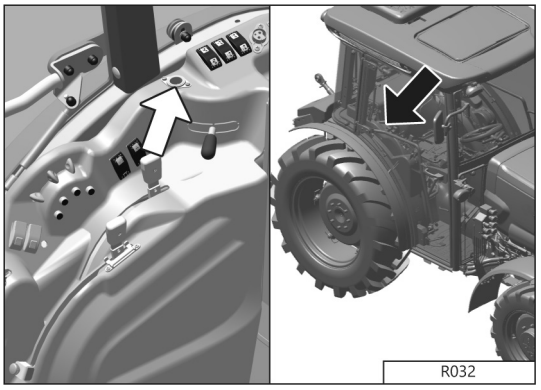

### 9.2.3.2.54 M035 - Rear wiper motor



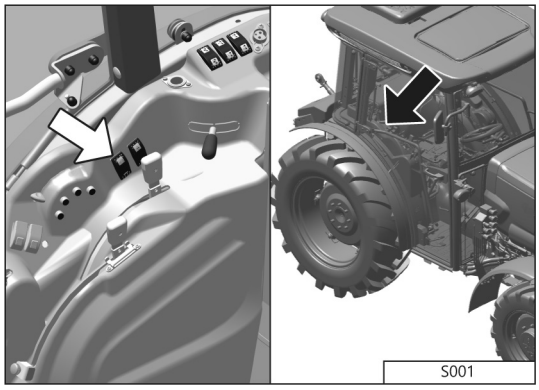

### 9.2.3.2.55 R016 - Fuel filter heating



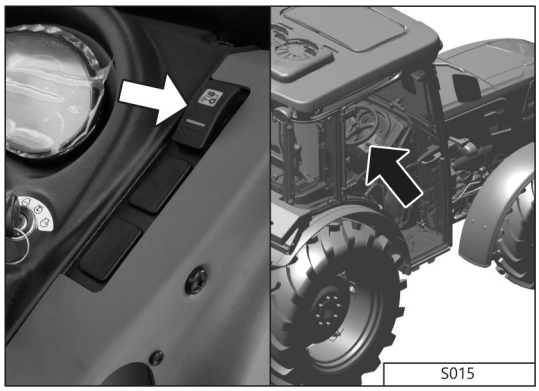

### 9.2.3.2.56 R032 - Cigarette lighter



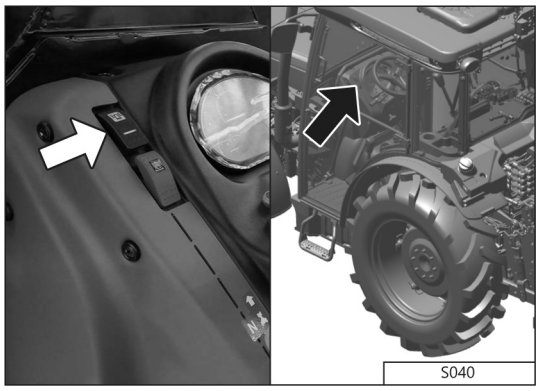
### 9.2.3.2.57 S001 - 4WD switch



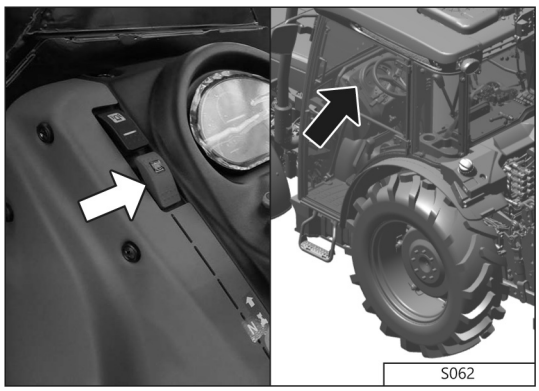

### 9.2.3.2.58 S015 - H4 lights switch



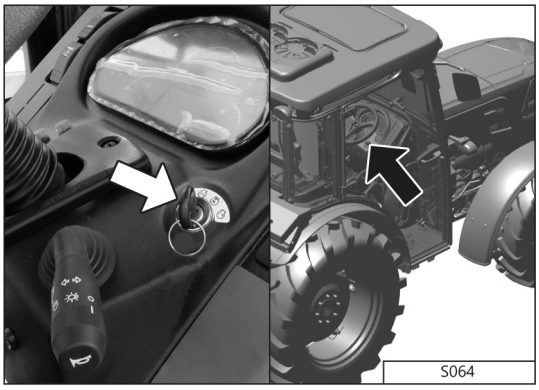

### 9.2.3.2.59 S040 - Beacon switch



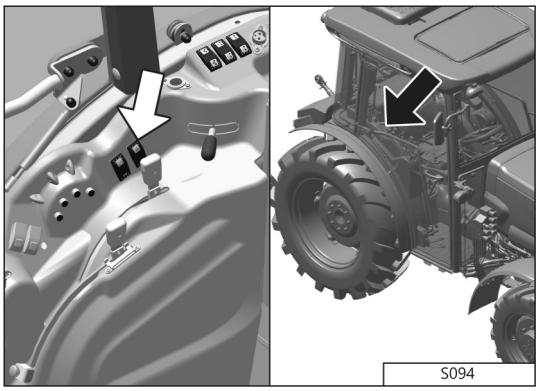

### 9.2.3.2.60 S062 - Hazard switch



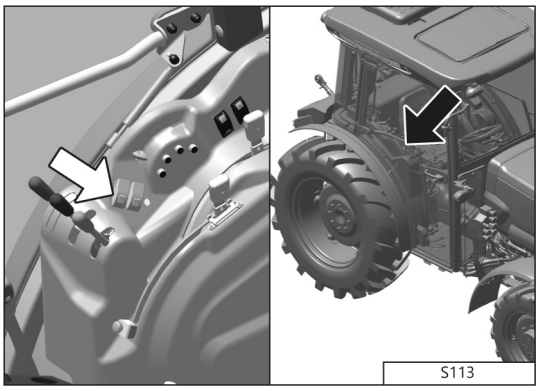

### 9.2.3.2.61 S064 - Ignition key switch



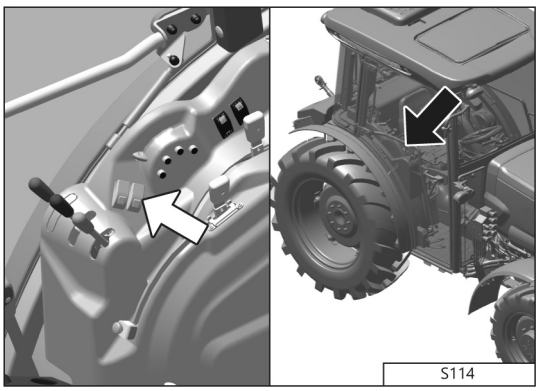

### 9.2.3.2.62 S094 - Diff-lock switch



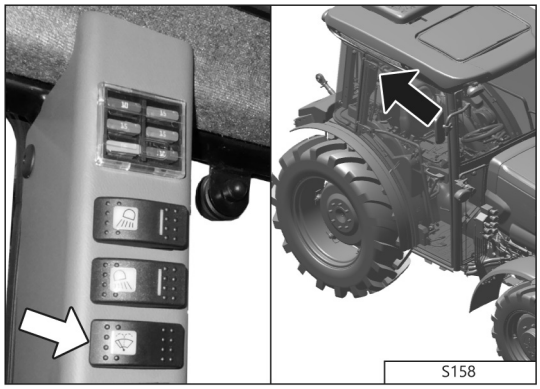

### 9.2.3.2.63 S113 - Front PTO switch



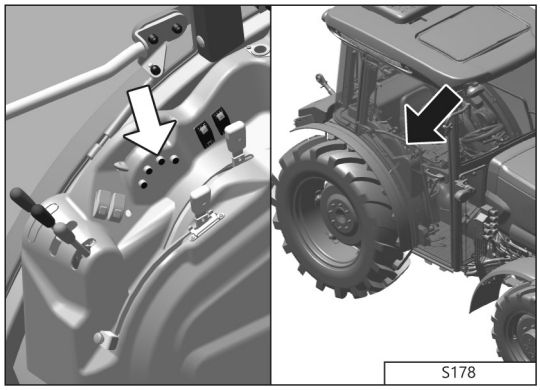

### 9.2.3.2.64 S114 - Rear PTO switch



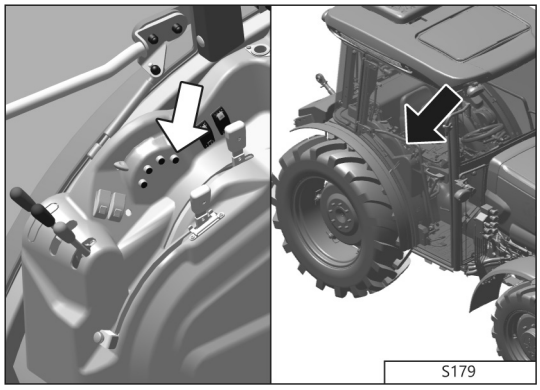
### 9.2.3.2.65 S158 - Front wiper switch



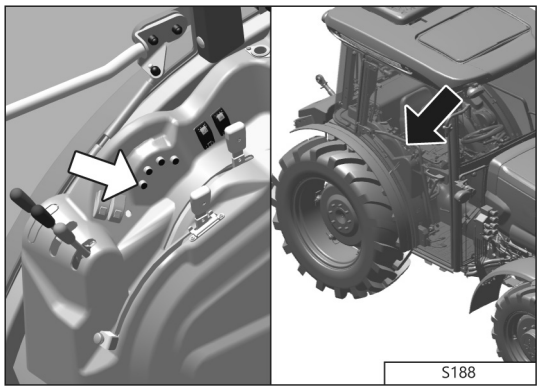

### 9.2.3.2.66 S178 - Cruise control MEM1



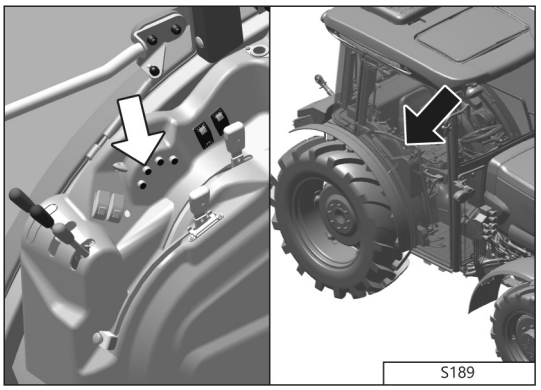

### 9.2.3.2.67 S179 - Cruise control MEM2



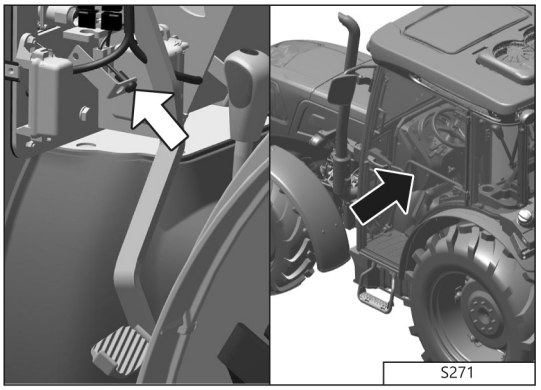

### 9.2.3.2.68 S188 - Cruise control UP



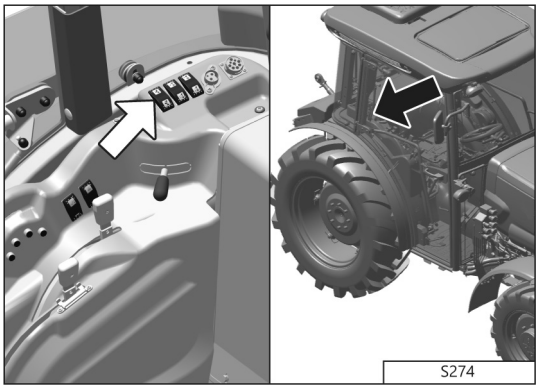

### 9.2.3.2.69 S189 - Cruise control DW



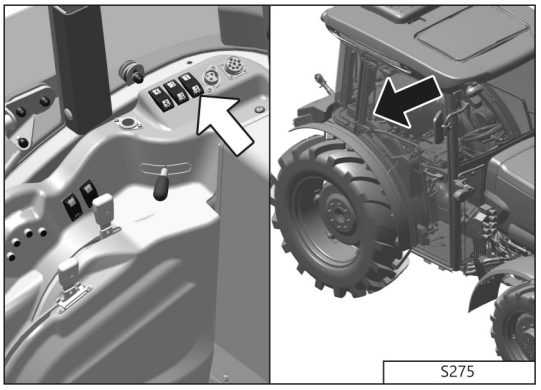

### 9.2.3.2.70 S271 - Calibration hidden button



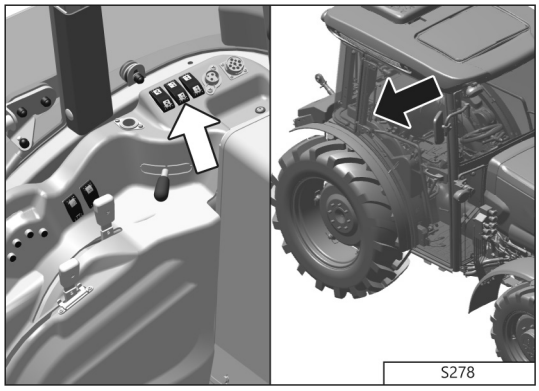

### 9.2.3.2.71 S274 - “DEPORT” Up/Down switch



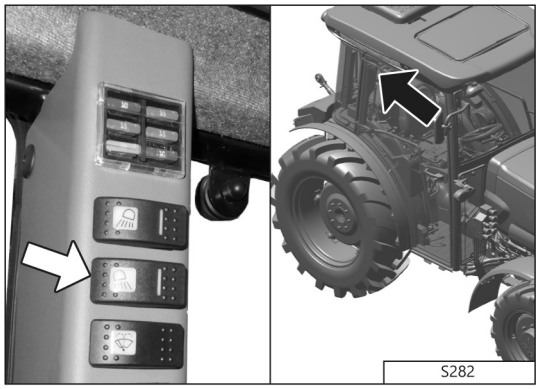

### 9.2.3.2.72 S275 - “DEPORT” Left/Right switch



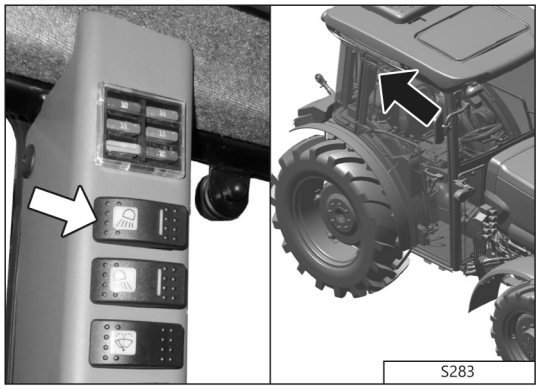
### 9.2.3.2.73 S278 - “DEPORT” Lock/Float switch



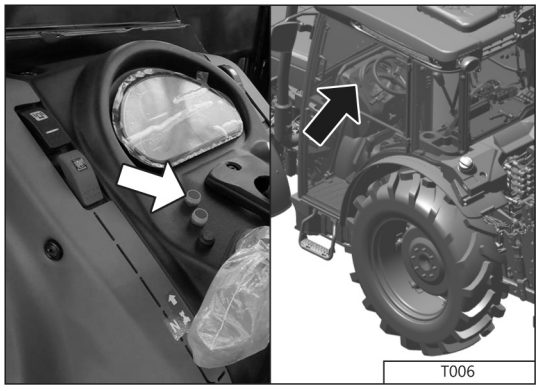

### 9.2.3.2.74 S282 - Front work lights switch



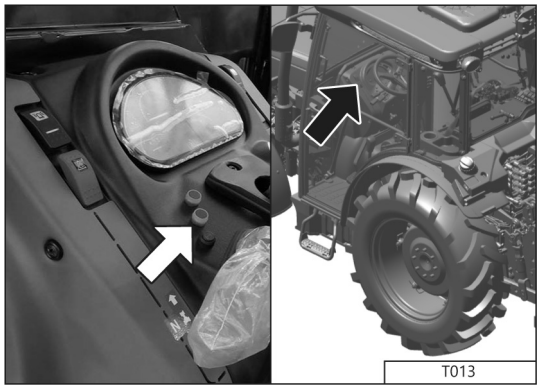

### 9.2.3.2.75 S283 - Rear work lights switch



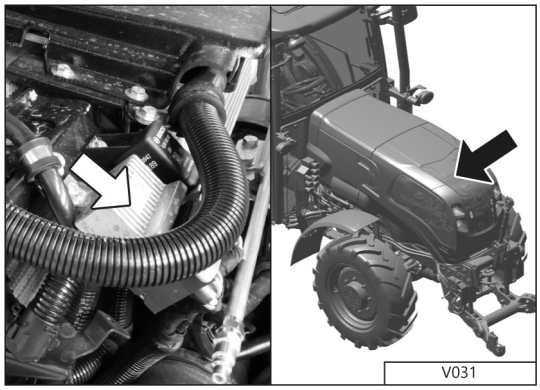

### 9.2.3.2.76 T006 - Button set



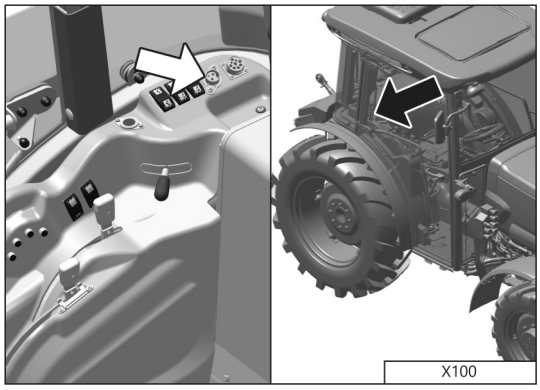

### 9.2.3.2.77 T013 - Button menu



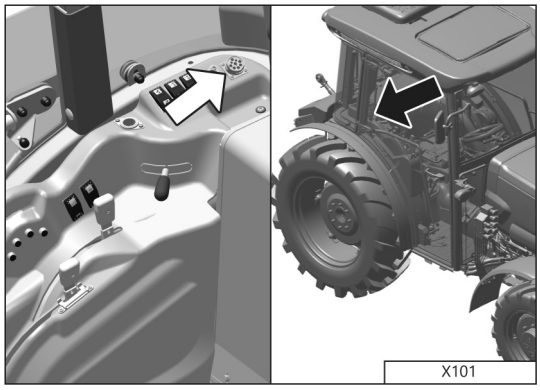

### 9.2.3.2.78 V031 - Glow plug ECU



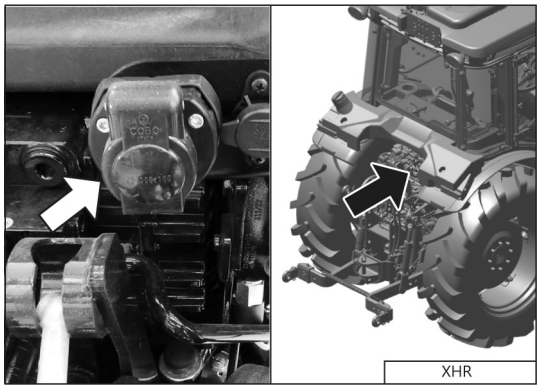

### 9.2.3.2.79 X100 - 3 pole socket



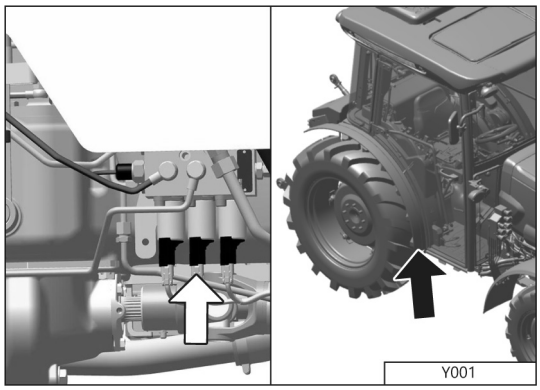

### 9.2.3.2.80 X101 - Diagnostic socket



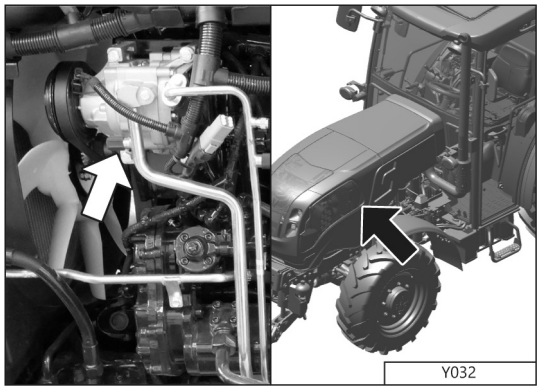
### 9.2.3.2.81 XHR - Rear trailer socket



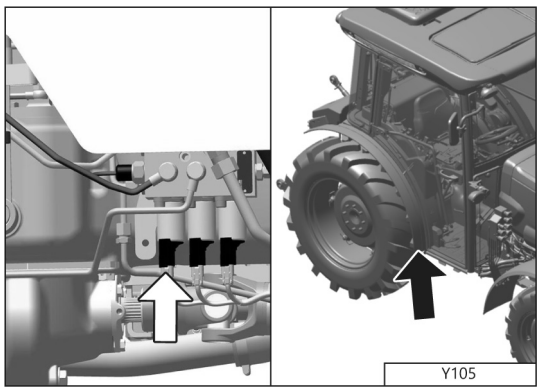

### 9.2.3.2.82 Y001 - 4WD solenoid valve



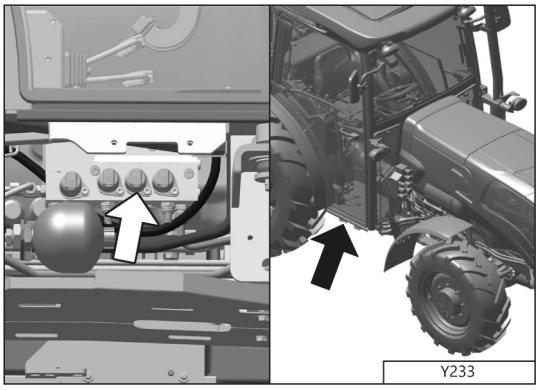

### 9.2.3.2.83 Y032 - A/C compressor clutch



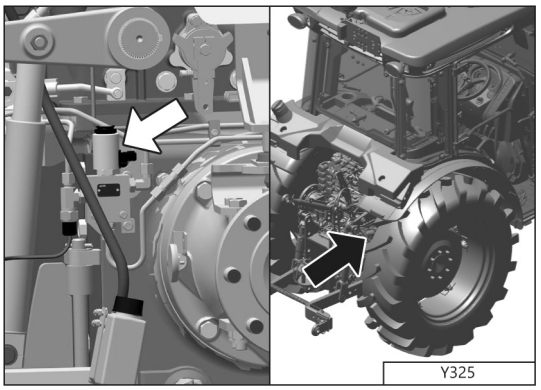

### 9.2.3.2.84 Y105 - Diff-lock solenoid valve



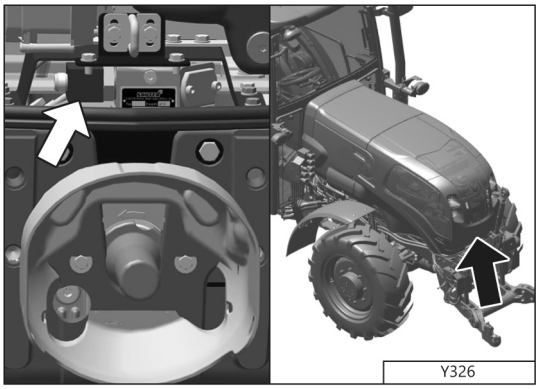

### 9.2.3.2.85 Y233 - RV solenoid valve



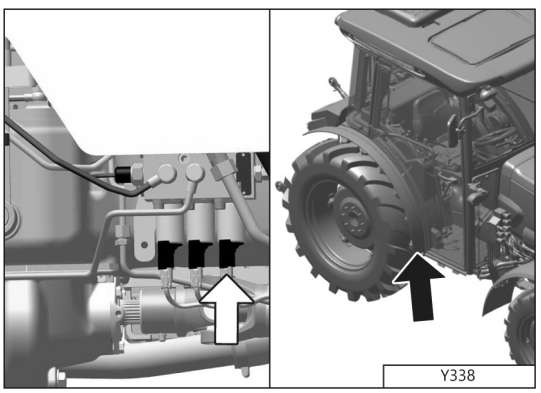

### 9.2.3.2.86 Y325 - PTO main valve connection



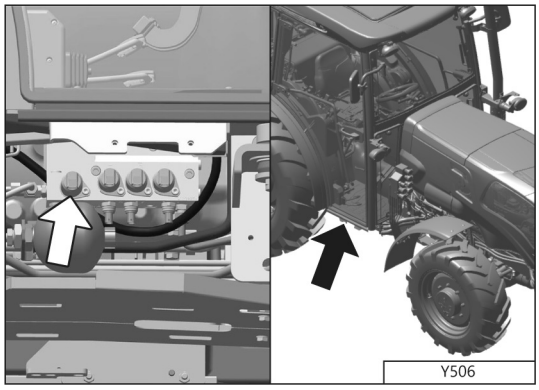

### 9.2.3.2.87 Y326 - Front PTO solenoid valve



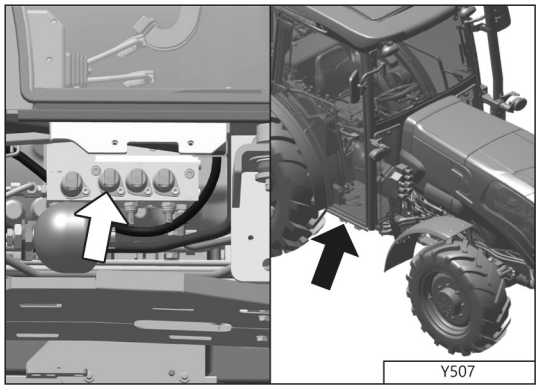

### 9.2.3.2.88 Y338 - PTO priority solenoid valve



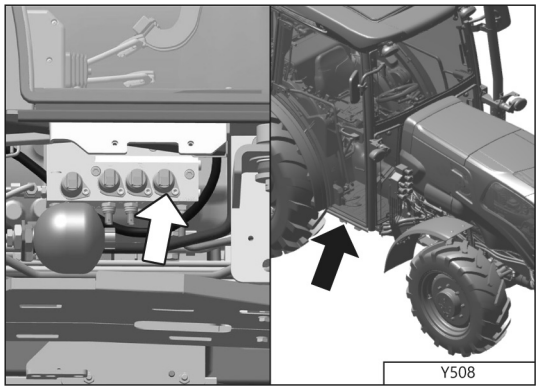
### 9.2.3.2.89 Y506 - Main ring solenoid valve



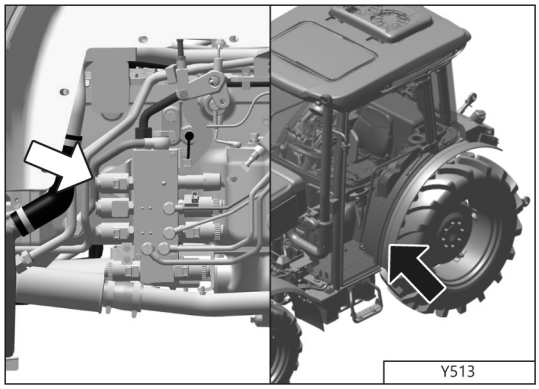

### 9.2.3.2.90 Y507 - FH solenoid valve



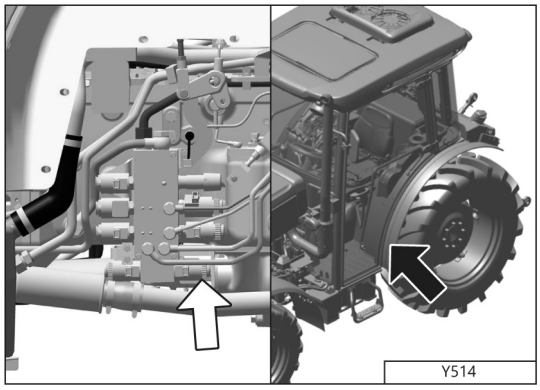

### 9.2.3.2.91 Y508 - FL solenoid valve



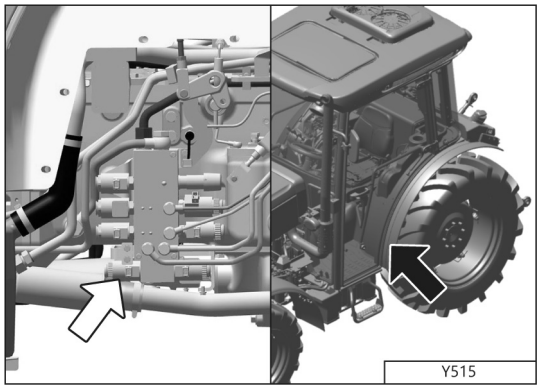

### 9.2.3.2.92 Y513 - Deport solenoid valve 1



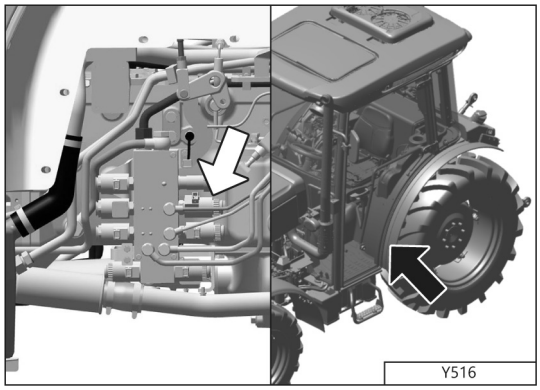

### 9.2.3.2.93 Y514 - Deport solenoid valve 3



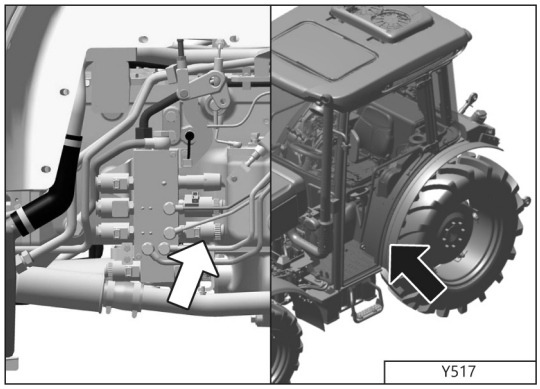

### 9.2.3.2.94 Y515 - Deport solenoid valve 2



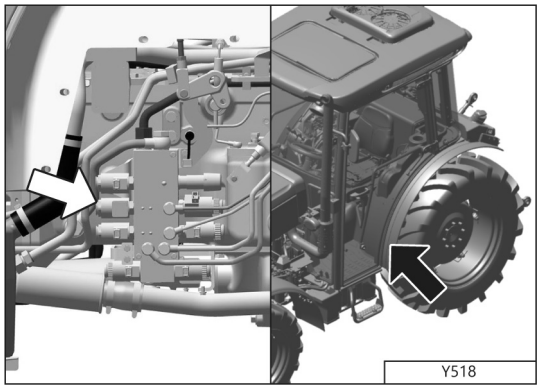

### 9.2.3.2.95 Y516 - Deport solenoid valve 5



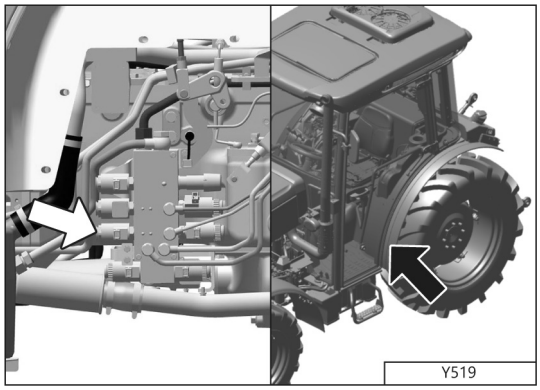

### 9.2.3.2.96 Y517 - Deport solenoid valve 7



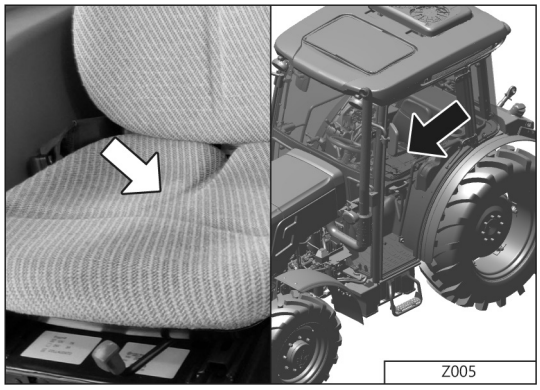
### 9.2.3.2.97 Y518 - Deport solenoid valve 4



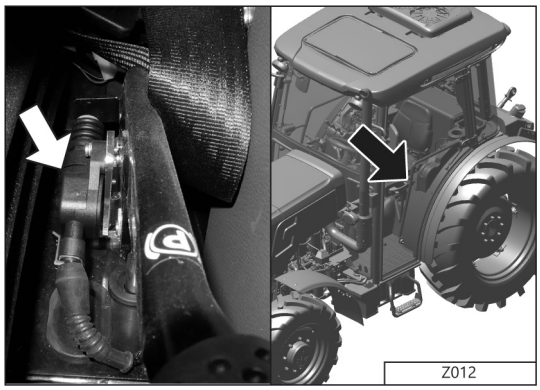

### 9.2.3.2.98 Y519 - Deport solenoid valve 6



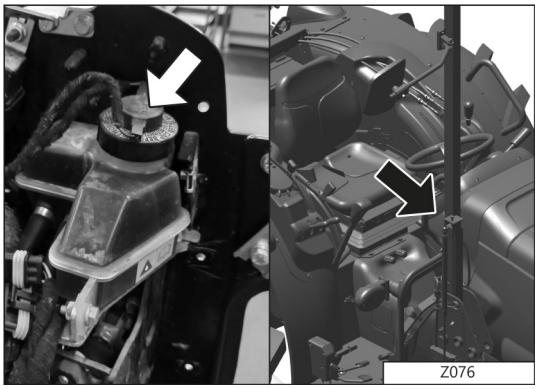

### 9.2.3.2.99 Z005 - Seat switch



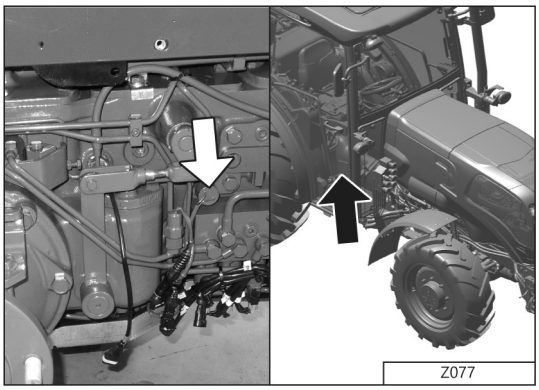

### 9.2.3.2.100 Z012 - Hand brake switch



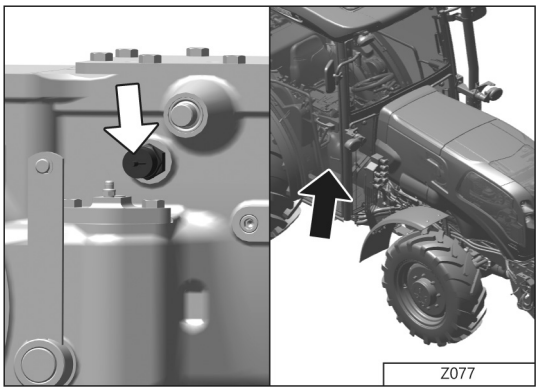

### 9.2.3.2.101 Z076 - Brakes oil level switch



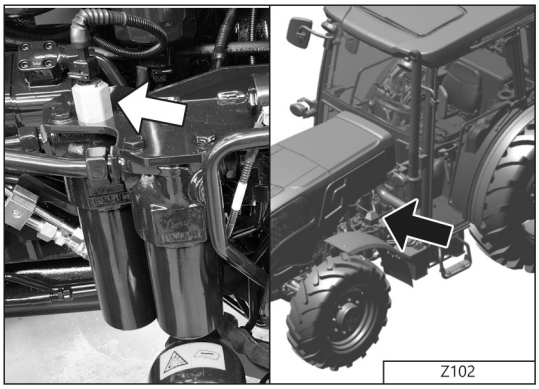

### 9.2.3.2.102 Z077 - Neutral start switch (Mechanical Reverse)



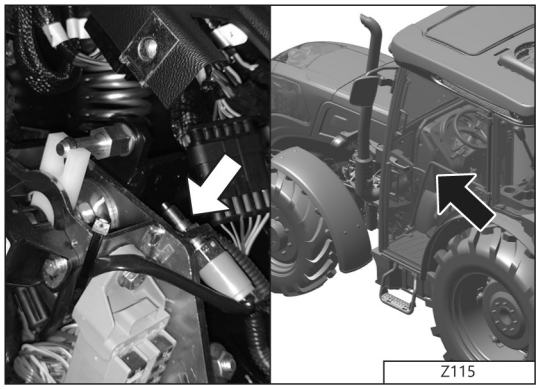

### 9.2.3.2.103 Z077 - Neutral start switch (Power Reverse)



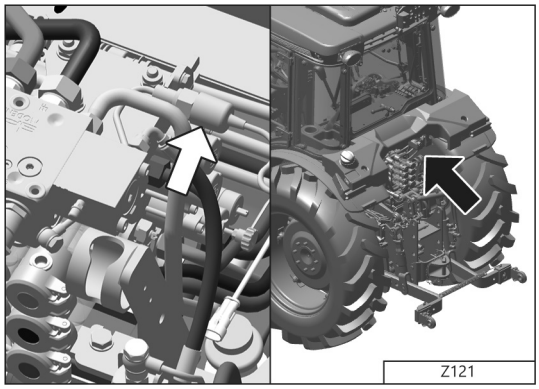

### 9.2.3.2.104 Z102 - Transmission oil filter clogged switch



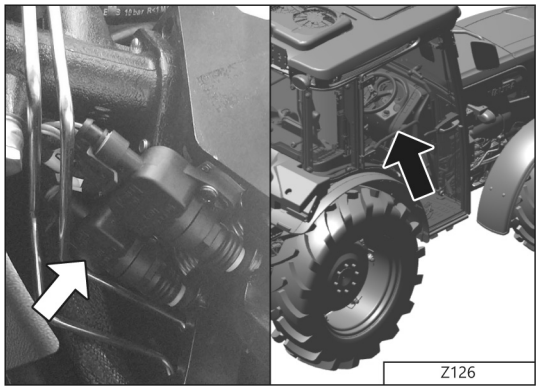
### 9.2.3.2.105 Z115 - End stroke switch



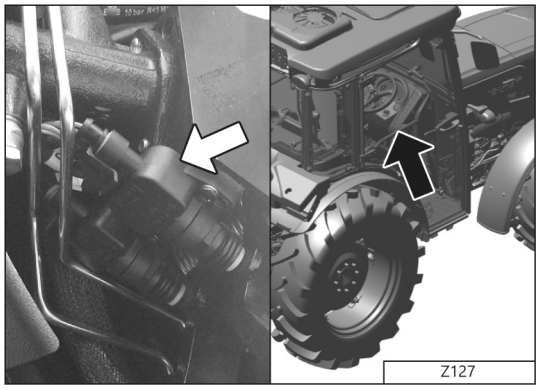

### 9.2.3.2.106 Z121 - Trailer brake pressure sensor



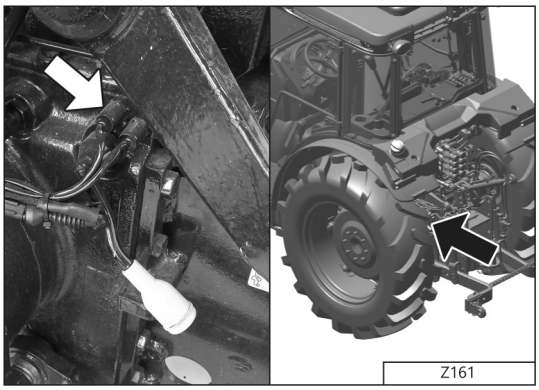

### 9.2.3.2.107 Z126 - LHS brake pedal switch



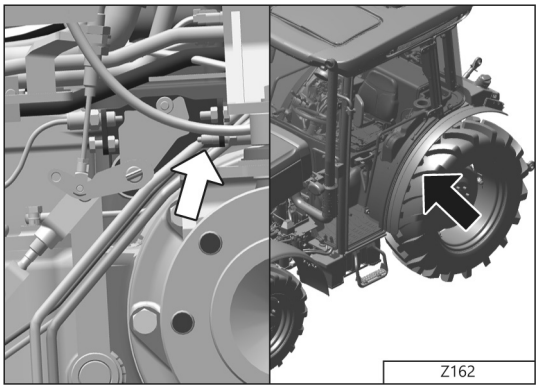

### 9.2.3.2.108 Z127 - RHS brake pedal switch



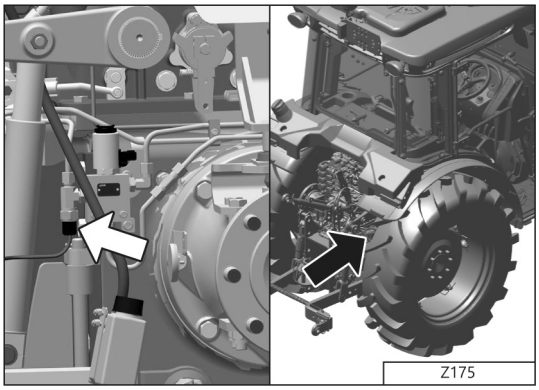

### 9.2.3.2.109 Z161 - 540 PTO speed selector switch



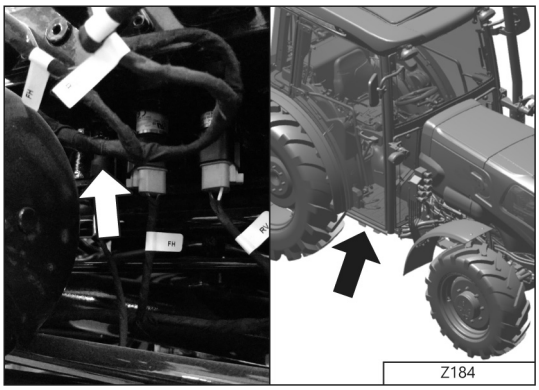

### 9.2.3.2.110 Z162 - GD PTO selector switch



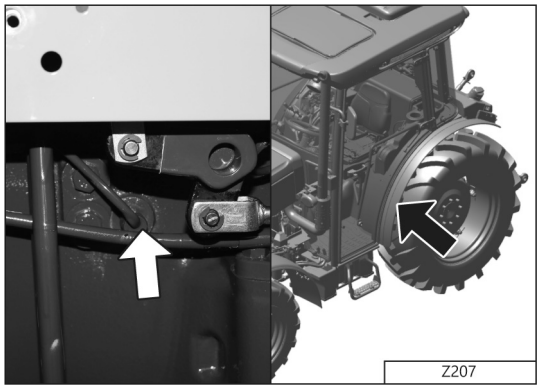

### 9.2.3.2.111 Z175 - PTO pressure switch



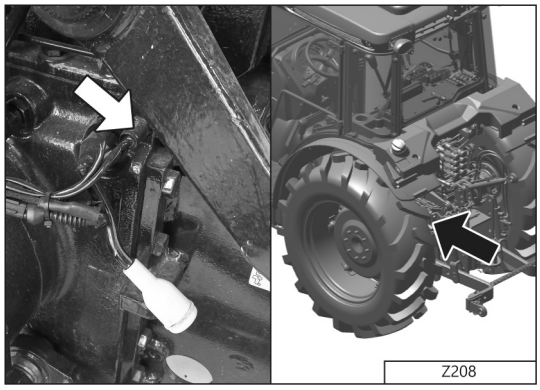

### 9.2.3.2.112 Z184 - Transmission oil pressure switch



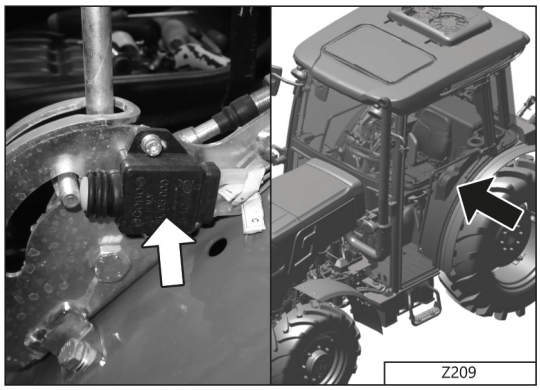
### 9.2.3.2.113 Z207 - Ranges switch



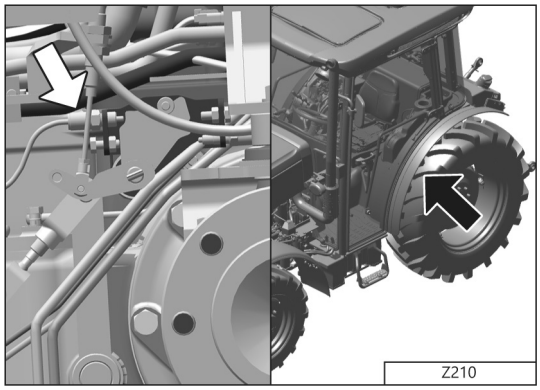

### 9.2.3.2.114 Z208 - 540E/1000 PTO speed selector switch



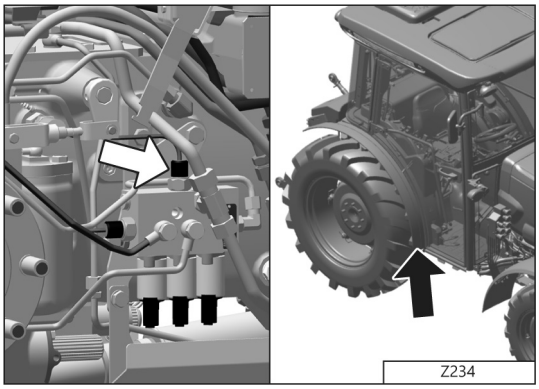

### 9.2.3.2.115 Z209 - Mechanical PTO switch



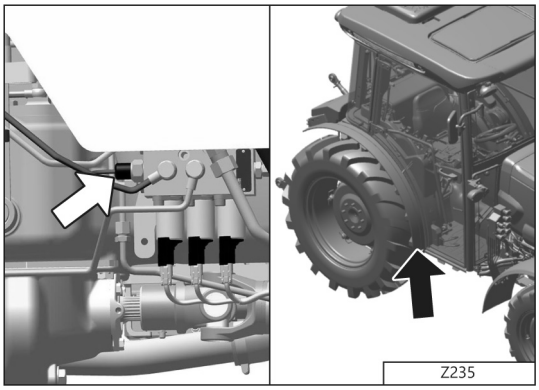

### 9.2.3.2.116 Z210 - DIR PTO selector switch




### 9.2.3.2.117 Z234 - 4WD pressure switch

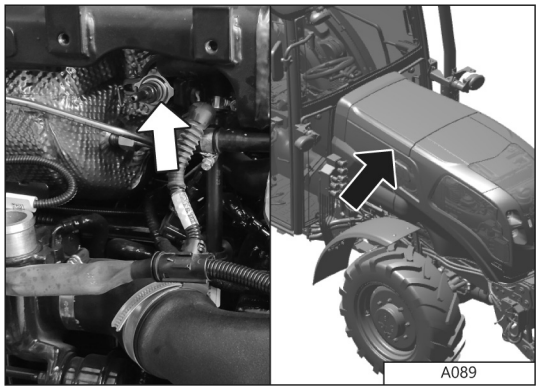



### 9.2.3.2.118 Z235 - Diff-lock pressure switch

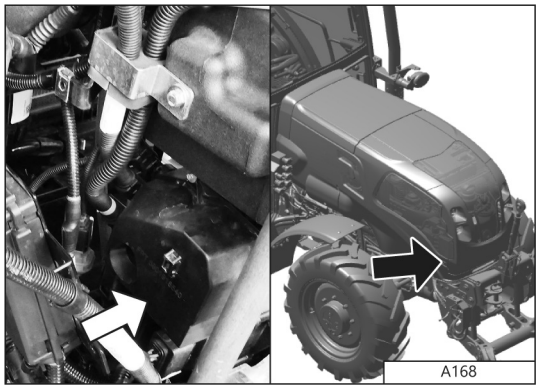


## 9.2.3.3 100Hp Models

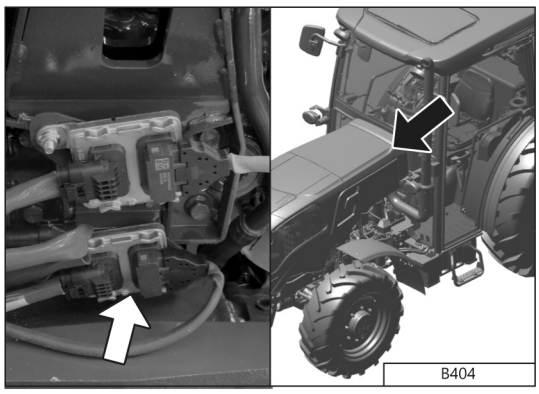
### 9.2.3.3.1 A089 - (100Hp)



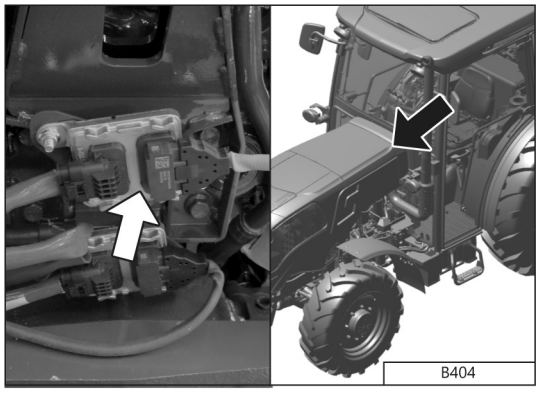

### 9.2.3.3.2 A168 - (100Hp)



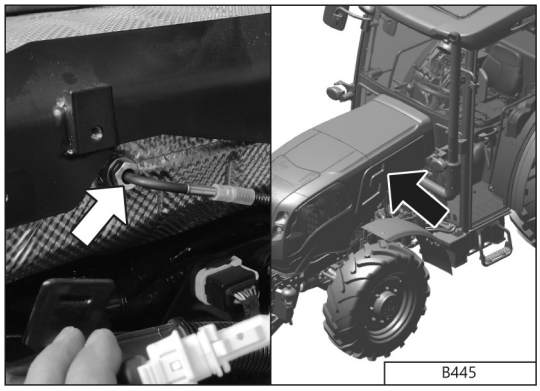

### 9.2.3.3.3 B404 - (100Hp)



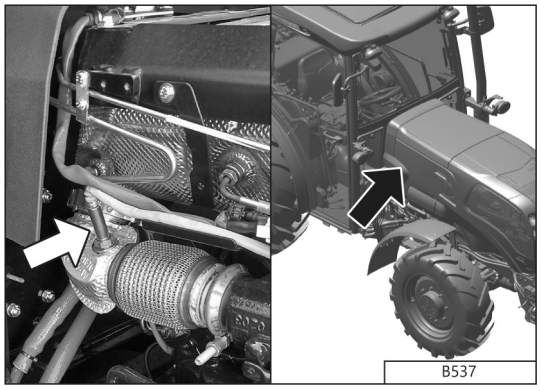

### 9.2.3.3.4 B405 - (100Hp)



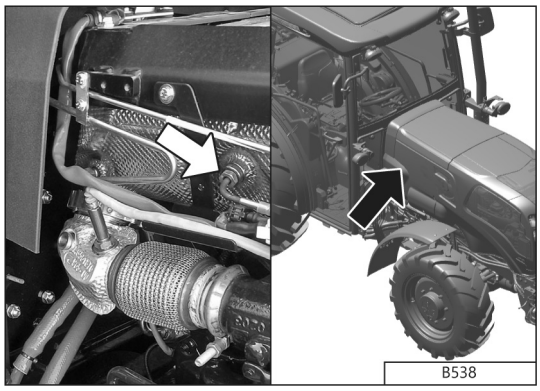

### 9.2.3.3.5 B445 - (100Hp)



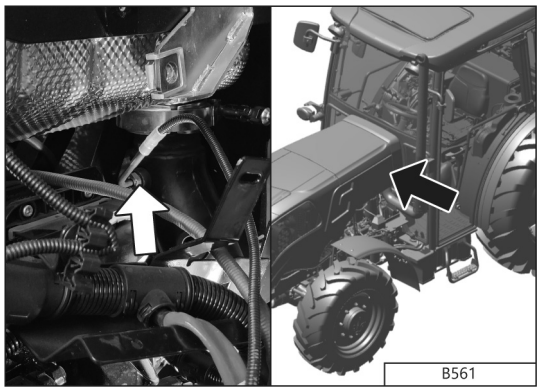

### 9.2.3.3.6 B537 - (100Hp)



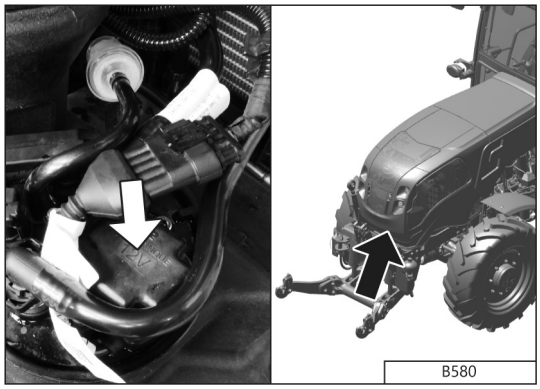

### 9.2.3.3.7 B538 - (100Hp)



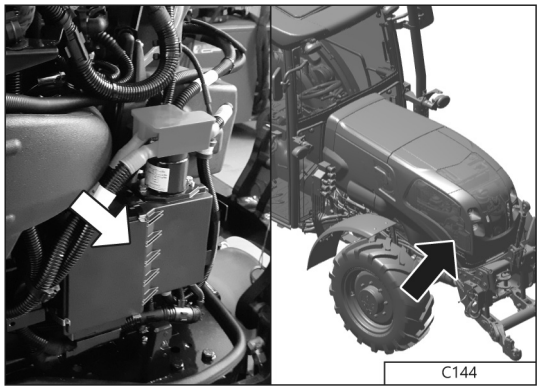

### 9.2.3.3.8 B561 - (100Hp)



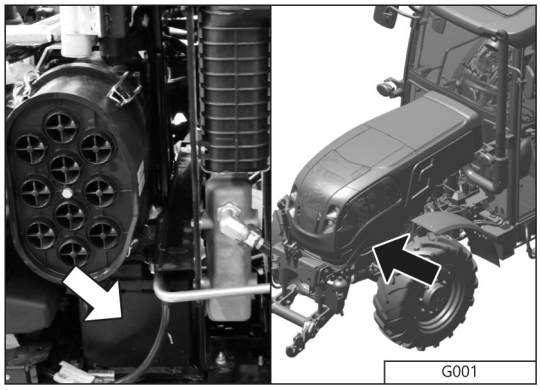
### 9.2.3.3.9 B580 - (100Hp)



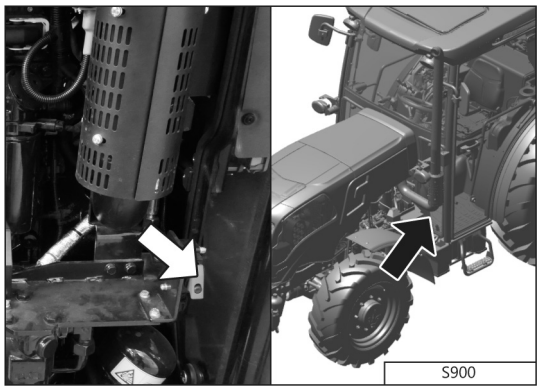

### 9.2.3.3.10 C144 - (100Hp)



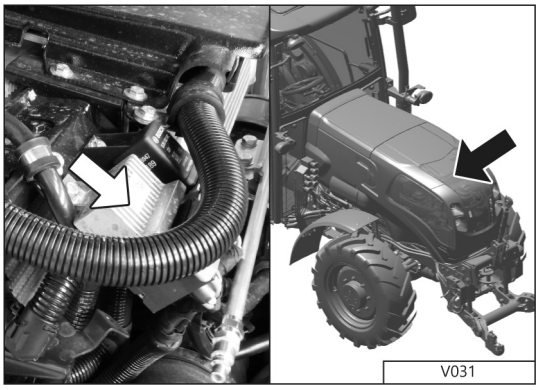

### 9.2.3.3.11 G001 - (100Hp)



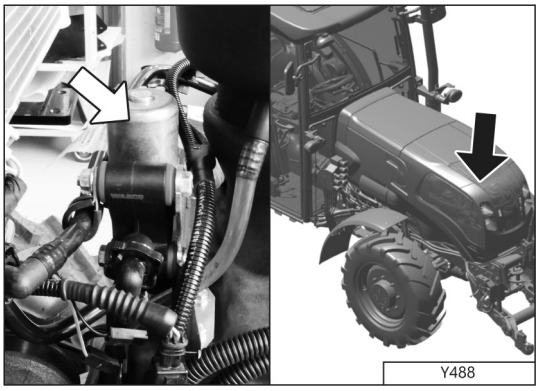

### 9.2.3.3.12 S900 - (100Hp)



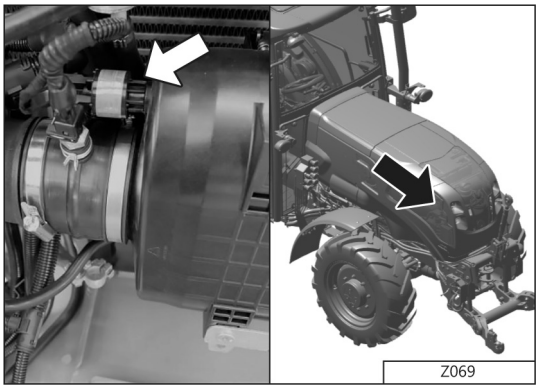

### 9.2.3.3.13 V031 - (100Hp)



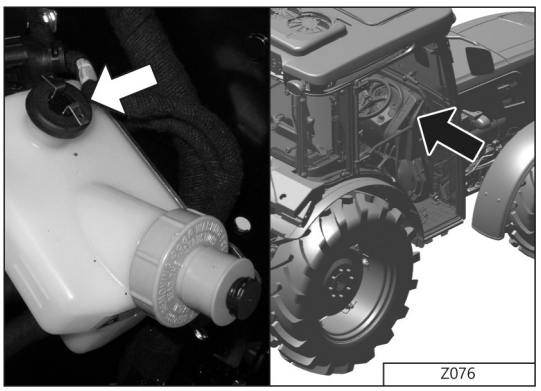

### 9.2.3.3.14 Y488 - (100Hp)




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# 10.1. DIAGNOSTIC TROUBLE CODES (DTC)

## 10.1.1. DTCs – Engine Control Unit (ECU)

### 10.1.1.1 Under 75hp Models

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 18 | 14 | Fuel pressure control Pressure control valve: Maximum rail pressure in limp home mode exceeded | Fuel pressure (Rail) control | YES (technical) |
| 27 | 20 | EGR Valve: DFC for valve drift at closed position | EGR Valve | none |
| 91 | 31 | ECU Internal: Diagnostic fault check to report the accelerator pedal position error | ECU Internal | none |
| 97 | 12 | Water in fuel Sensor defective | Water in Fuel determination | none |
| 97 | 31 | Water in Fuel Determination: Water in Fuel | Water in Fuel determination | none |
| 100 | 1 | Oil pressure sensing: Diagnostic fault check for oil pressure below minimum limit | Oil pressure sensing | none |
| 100 | 2 | Oil pressure sensing: Plausibility check for oil pressure sensor | Oil pressure sensing | none |
| 102 | 3 | Boost pressure sensor: SRC High Air Intake pressure value | Boost pressure | YES (technical) |
| 102 | 4 | Boost pressure sensor: SRC Low Air Intake pressure value | Boost pressure | YES (technical) |
| 102 | 15 | Boost Pressure: Diagnostic Fault Check for High Plausibility error | Boost pressure | YES (technical) |
| 102 | 17 | Boost Pressure: Diagnostic Fault Check for Low Plausibility error | Boost pressure | YES (technical) |
| 105 | 3 | Boost temperature: SRC high for air intake temperature | Boost temperature | none |
| 105 | 4 | Boost temperature: SRC low for air intake temperature | Boost temperature | none |
| 108 | 2 | Environmental pressure: Value implausible | Ambient pressure sensor | none |
| 108 | 3 | Environmental pressure: Signal Range Check High | Ambient pressure sensor | none |
| 108 | 4 | Environmental pressure: Signal Range Check Low | Ambient pressure sensor | none |
| 108 | 16 | Environmental pressure: Physical value implausibly high | Ambient pressure sensor | none |
| 108 | 18 | Environmental pressure: Physical value implausibly low | Ambient pressure sensor | none |
| 110 | 0 | Info: Engine temperature exceeded warn level | Info: Torque Limitation active | none |
| 110 | 2 | Coolant temp sensor: defect fault check for Absolute plausibility test | Coolant temp sensor | none |
| 110 | 16 | Info: Engine temperature exceeded pre-warn level | Info: Torque Limitation active | none |
| 152 | 2 | ECU SW Reset: Reset related to ASW (under voltage, bus errors, CPU) | ECU SW Reset | none |
| 152 | 11 | External device triggered an ECU reset during normal ECU initialisation | ECU Internal | none |
| 152 | 13 | External device triggered an ECU reset during normal ECU driving | ECU Internal | none |
| 152 | 14 | ECU SW Reset: Hardware related resets (Controller, HSM, Watchdog) | ECU SW Reset | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 152 | 31 | ECU SW Reset: Resets related to ECU Starter Block or Customer Block | ECU SW Reset | none |
| 156 | 12 | ECU Internal: Implausible Injector Temperature Compensation times | ECU Internal | none |
| 156 | 14 | ECU Internal: Error in the plausibility of the energising times of the zero fuel quantity calibration | ECU Internal | none |
| 156 | 31 | ECU Internal: Implausible valve closing correction times | None | none |
| 157 | 2 | Fuel pressure (Rail) sensor: Rail pressure raw value is intermittent | Fuel pressure (Rail) sensor | none |
| 157 | 4 | Fuel pressure (Rail) sensor: Sensor voltage below lower limit | Fuel pressure (Rail) sensor | YES (technical) |
| 157 | 11 | Fuel pressure (Rail) sensor: Sensor voltage above upper limit | Fuel pressure (Rail) sensor | YES (technical) |
| 157 | 20 | Fuel pressure (Rail) sensor: rail pressure raw value is above maximum offset | Fuel pressure (Rail) sensor | YES (technical) |
| 157 | 21 | Fuel pressure (Rail) sensor: rail pressure raw value is below minimum offset | Fuel pressure (Rail) sensor | YES (technical) |
| 158 | 16 | Battery voltage: Power stage diagnosis could be disabled due to high Battery voltage | Battery voltage | none |
| 158 | 18 | Battery voltage: Power stage diagnosis could be disabled due to low Battery voltage | Battery voltage | none |
| 168 | 3 | Battery voltage: SRC high for battery voltage sensor | Battery voltage | none |
| 168 | 4 | Battery voltage: SRC low for battery voltage sensor | Battery voltage | none |
| 171 | 2 | Selected Temperature sensor 3 delivering implausible value (check description for detail) | Temperature Sensor | none |
| 171 | 3 | Environmental Temperature sensor (in humidity sensor): SRC High for Environment Temperature | Ambient temperature sensor | none |
| 171 | 4 | Environmental Temperature sensor (in humidity sensor): SRC low for Environment Temperature | Ambient temperature sensor | none |
| 172 | 2 | Selected Temperature sensor 1 delivering implausible value (check description for detail) | Temperature Sensor | none |
| 172 | 14 | Selected Temperature sensor 2 delivering implausible value (check description for detail) | Temperature Sensor | none |
| 174 | 3 | Fuel Temp Sensor: SRC high for fuel temperature sensor | Fuel Temp Sensor | none |
| 174 | 4 | Fuel Temp Sensor: SRC low for fuel temperature sensor | Fuel Temp Sensor | none |
| 174 | 16 | Fuel Temperature Sensor: Physical Signal above maximum limit | Fuel Temp Sensor | none |
| 190 | 0 | Engine Overspeed: Overspeed detection in component engine protection | Engine Overspeed | none |
| 628 | 12 | ECU internal: write access to non volatile memory failed for at least one block | ECU Internal | none |
| 628 | 13 | ECU internal: read access to non volatile memory failed for at least one block | ECU Internal | none |
| 636 | 2 | Engine speed sensing: DFC for camshaft signal diagnosis - disturbed signal | Engine speed sensing | YES (technical) |
| 636 | 9 | Engine speed sensing: DFC for camshaft signal diagnosis - no signal | Engine speed sensing | YES (technical) |
| 636 | 31 | Engine speed sensing: DFC for camshaft offset angle exceeded | Engine speed sensing | YES (technical) |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 637 | 2 | Engine speed sensing: Crankshaft signal disturbance | Engine speed sensing | YES (technical) |
| 637 | 9 | Engine speed sensing: Crankshaft signal loss | Engine speed sensing | YES (technical) |
| 651 | 3 | Injector: Short Circuit between High Side and Low Side for injector 1 | Injector | Single injector shutoff |
| 651 | 4 | Injector: Short Circuit at Low Side for injector 1 | Injector | Single injector shutoff |
| 651 | 5 | Injector: Open load for injector 1 | None | none |
| 651 | 31 | Injector Adjustment: IMA programming not correct for injector cyl 1 | Injector Adjustment | none |
| 652 | 3 | Injector: Short Circuit between High Side and Low Side for injector 2 | Injector | Single injector shutoff |
| 652 | 4 | Injector: Short Circuit at Low Side for injector 2 | Injector | Single injector shutoff |
| 652 | 5 | Injector: Open load for injector 2 | None | none |
| 652 | 31 | Injector Adjustment: IMA programming not correct for injector cyl 2 | Injector Adjustment | none |
| 653 | 3 | Injector: Short Circuit between High Side and Low Side for injector 3 | Injector | Single injector shutoff |
| 653 | 4 | Injector: Short Circuit at Low Side for injector 3 | Injector | Single injector shutoff |
| 653 | 5 | Injector: Open load for injector 3 | None | none |
| 653 | 31 | Injector Adjustment: IMA programming not correct for injector cyl 3 | Injector Adjustment | none |
| 654 | 3 | Injector: Short Circuit between High Side and Low Side for injector 4 | Injector | Single injector shutoff |
| 654 | 4 | Injector: Short Circuit at Low Side for injector 4 | Injector | Single injector shutoff |
| 654 | 5 | Injector: Open load for injector 4 | None | none |
| 654 | 31 | Injector Adjustment: IMA programming not correct for injector cyl 4 | Injector Adjustment | none |
| 676 | 3 | Glow Plug Low Voltage System (LVS): Short Circuit to Battery error of low voltage glow system power stage | Glow Plug | none |
| 676 | 4 | Glow Plug Low Voltage System (LVS): Short Circuit to Ground error of low voltage glow system power stage | Glow Plug | none |
| 676 | 5 | Glow Plug Low Voltage System (LVS): DFC for Open Load error of low voltage glow system power stage | Glow Plug | none |
| 676 | 6 | Glow Plug Low Voltage System (LVS): Over temperature error of low voltage glow system power stage | Glow Plug | none |
| 1074 | 31 | ECU Internal: Diagnostic fault check to report the exhaust flap brake release error | None | none |
| 1116 | 31 | ECU Internal: Diagnostic fault check to report the error due to injection quantity correction | ECU Internal | none |
| 1127 | 0 | Turbocharger control: Boost pressure value above highest threshold value | Turbocharger control | YES (technical) |
| 1128 | 18 | Turbocharger control: Underboost detection | Turbocharger control | YES (technical) |
| 1136 | 2 | ECU Temperature Sensor: Implausible sensor measuring | ECU Temperature sensing | none |
| 1136 | 6 | ECU Temperature Sensor: Short circuit to battery (ECU internal error) | ECU Temperature sensing | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 1136 | 16 | ECU Temperature Sensor: Physical Signal ECU temperature above maximum limit | ECU Temperature sensing | none |
| 1136 | 17 | ECU Temperature Sensor: Short circuit to ground (ECU internal error) | ECU Temperature sensing | none |
| 1136 | 18 | ECU Temperature Sensor: Physical Signal ECU temperature below minimum limit | ECU Temperature sensing | none |
| 1209 | 3 | Turbine Upstream Pressure Sensor: Signal range check high | P3 Pressure | none |
| 1209 | 4 | Turbine Upstream Pressure Sensor: Signal range check low | P3 Pressure | none |
| 1209 | 7 | Trubine upstream Pressure: pressure too low | P3 Pressure | none |
| 1231 | 11 | CAN Bus: Error CAN Bus Node 1 | CAN Bus | none |
| 1240 | 11 | Fuel pressure control Metering unit: Leakage in overrun | Fuel pressure control Metering unit | YES (technical) |
| 1240 | 14 | Fuel pressure control Metering unit: Leakage in high pressure system detected at idle | Fuel pressure control Metering unit | YES (technical) |
| 1240 | 31 | Fuel pressure (Rail) control: Leakage in high pressure system | Fuel pressure (Rail) control | YES (technical) |
| 1442 | 0 | Fuel pressure control Metering unit: Fuel Rail pressure above maximum limit with MeUn Control | Fuel pressure control Metering unit | none |
| 1442 | 5 | Fuel metering unit: open load of metering unit output | Fuel metering unit | none |
| 1442 | 6 | Fuel metering unit: over temperature of device driver of metering unit | Fuel metering unit | YES (technical) |
| 1485 | 31 | Main Relay sticking | None | none |
| 1648 | 3 | ECU Internal: Diagnostic fault check to report "ABE active" due to overvoltage detection | ECU Internal | none |
| 1648 | 12 | ECU Internal: Diagnostic fault check to report "WDA active" due to errors in query-/response communication | ECU Internal | none |
| 1659 | 2 | Thermostat monitor: deviation between measured and modeled temperature | Coolant Thermostat | none |
| 2659 | 18 | EGR Control: EGR low flow detected | EGR Control | none |
| 2791 | 0 | EGR Valve: SRC high for valve position sensor voltage | EGR Valve | none |
| 2791 | 1 | EGR Valve: SRC low for valve position sensor voltage | EGR Valve | none |
| 2791 | 7 | EGR Valve: Jammed valve in closed state | EGR Valve | none |
| 2791 | 31 | EGR Valve: Current limited | EGR Valve | none |
| 2797 | 1 | Injector: Booster voltage too low | Injector | none |
| 2797 | 4 | Injector: Short circuit of the HDEV power stage high−side (first bank error) | Injector | Single injector shutoff |
| 2798 | 4 | Injector: Short circuit of the HDEV power stage high−side (second bank error) | Injector | Single injector shutoff |
| 3064 | 7 | DPF model plausibility: Diagnostic fault check for damaged particulate filter | DPF model plausibility | none |
| 3242 | 31 | Exhaust Temperature monitoring 2:  Measured value deviating from modelled temperature (check description for details) | Exhaust Temp monitoring | none |
| 3251 | 2 | DPF pressure monitoring: Fault check for the pressure sensor plausibility | DPF pressure monitoring | YES (technical) |
| 3251 | 3 | DPF differential pressure sensor: SRC value above maximum limit | DPF pressure sensing | YES (technical) |
| 3251 | 4 | DPF differential pressure sensor: SRC value below minimum limit | DPF pressure sensing | YES (technical) |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 3251 | 15 | DPF pressure monitoring: Differential pressure over DPF higher then expected | DPF pressure monitoring | YES (OBD/ Inducements); YES (technical) |
| 3294 | 0 | Failure memory delete counter exceeded threshold value | ECU EEPROM | none |
| 3509 | 3 | ECU Power Stage 1: Overvoltage failure at sensor supply 1 | ECU Power Stage 1 | none |
| 3509 | 5 | ECU Power Stage 1: Undervoltage failure at sensor supply 1 | ECU Power Stage 1 | none |
| 3509 | 6 | ECU Power Stage 1: Overtemperature failure at sensor supply 1 | ECU Power Stage 1 | none |
| 3509 | 12 | ECU Power Stage 1: Error Sensor supply for sensors | ECU Power Stage 1 | YES (technical) |
| 3510 | 3 | ECU Power Stage 2: Overvoltage failure at sensor supply 2 | ECU Power Stage 2 | none |
| 3510 | 5 | ECU Power Stage 2: Undervoltage failure at sensor supply 2 | ECU Power Stage 2 | none |
| 3510 | 6 | ECU Power Stage 2: Overtemperature failure at sensor supply 2 | ECU Power Stage 2 | none |
| 3510 | 12 | ECU Power Stage 2: Error Sensor supply for sensors | ECU Power Stage 2 | YES (technical) |
| 3511 | 3 | ECU Power Stage 3: Overvoltage failure at sensor supply 3 | ECU Power Stage 3 | none |
| 3511 | 5 | ECU Power Stage 3: Undervoltage failure at sensor supply 3 | ECU Power Stage 3 | none |
| 3511 | 6 | ECU Power Stage 3: Overtemperature failure at sensor supply 3 | ECU Power Stage 3 | none |
| 3511 | 12 | ECU Power Stage 3: Error Sensor supply for sensors | ECU Power Stage 3 | YES (technical) |
| 3525 | 0 | DPF model plausibility: Fault path for maximum number of locked regenerations | DPF model plausibility | YES (OBD/ Inducements) |
| 3607 | 14 | ECU internal Check: Injection cut off demand (ICO) for shut off coordinator | ECU internal Check | engine stop (indirect); YES (technical) |
| 3695 | 2 | DPF emergency regeneration switch: Not plausible switch value | DPF emergency regen.switch | none |
| 3703 | 7 | Particulate FIlter Inhibition Switch stuck | None | none |
| 3719 | 16 | DPF model plausibility: Calculated soot mass above threshold | DPF model plausibility | YES (OBD/ Inducements) |
| 4009 | 3 | Fuel filter heater: Short circuit to battery error in power stage of fuel filter heating | Fuel filter heater | none |
| 4009 | 4 | Fuel filter heater: Short circuit to ground error in power stage of fuel filter heating | Fuel filter heater | none |
| 4009 | 5 | Fuel filter heater: No load error in power stage of fuel filter heating | Fuel filter heater | none |
| 4009 | 6 | Fuel filter heater: Over Temperature error at ECM power stage | Fuel filter heater | none |
| 4076 | 3 | Coolant temp sensor: SRC High for Engine coolant temperature(down stream) | Coolant temp sensor | none |
| 4076 | 4 | Coolant temp sensor: SRC low for Engine coolant temperature(down stream) | Coolant temp sensor | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 4765 | 3 | Oxidation Catalyser Upstream Temperature Sensor: Defect Fault Check for "signal value above maximum limit" | Upstream DOC Temperature | none |
| 4765 | 4 | Oxidation Catalyser Upstream Temperature Sensor: Defect Fault Check for "signal value below minimum limit" | Upstream DOC Temperature | none |
| 4765 | 14 | Exhaust Temperature monitoring 1: deviation from other sensors at cold start (check description for details) | Exhaust Temp monitoring | YES (technical) |
| 4765 | 16 | Oxidation Catalyser Upstream Temperature Sensor: Physical Signal above maximum limit | Upstream DOC Temperature | none |
| 4765 | 31 | Oxicat Temp Monitoring: wrong mounting of temperature sensors | DOC Temp Monitoring | none |
| 4766 | 2 | Exhaust Temperature monitoring 2: deviation from other sensors at cold start (check description for details) | Exhaust Temp monitoring | YES (technical) |
| 4766 | 3 | Oxidation Catalyser Downstream Temperature Sensor: Signal range check high | Downstream DOC Temperature | none |
| 4766 | 4 | Oxidation Catalyser Downstream Temperature Sensor: Signal range check low | Downstream DOC Temperature | none |
| 4766 | 14 | Exhaust Temperature monitoring 1: Measured value deviating from modelled temperature (check description for details) | Exhaust Temp monitoring | none |
| 4766 | 16 | Oxidation Catalyser Downstream Temperature Sensor: Physical Signal above maximum limit | Downstream DOC Temperature | none |
| 4781 | 0 | DPF model plausibility: Maximum soot mass in DPF exceeded | DPF model plausibility | none |
| 5018 | 18 | Oxicat Temp Monitoring: Passive monitoring of the oxidation catalyst | DOC Temp Monitoring | YES (technical) |
| 5055 | 17 | Oil viscosity(below a first threshold) | Oil Lubricant | none |
| 5055 | 18 | Oil viscosity(below a second threshold) | Oil Lubricant | none |
| 5246 | 0 | Info: SCR Inducement: Level 3 (creep mode), triggered by Tampering fault | Inducement | YES (OBD/ Inducements); YES (technical) |
| 5246 | 15 | Info: SCR Inducement: Warning, triggered by Tampering fault | Inducement | YES (OBD/ Inducements) |
| 5246 | 16 | Info: SCR Inducement: Level 1 (Torque reduction), triggered by Tampering fault | Inducement | YES (OBD/ Inducements); YES (technical) |
| 5310 | 0 | HC accumulated in the exhaust reached first engine shut off limit | None | none |
| 5310 | 14 | HC accumulated in the exhaust not decreasing enough after reaching first engine shut off | None | none |
| 5313 | 2 | ECU Internal: Diagnostic fault check to report the plausibility error in rail pressure monitoring | ECU Internal | none |
| 5324 | 4 | Glow Plug Low Voltage System (LVS): Short Circuit or Over Voltage in glow plug of cylinder 1 (Low Voltage system GCU-T) | Glow Plug | none |
| 5325 | 4 | Glow Plug Low Voltage System (LVS): Short Circuit or Over Voltage in glow plug of cylinder 2 (Low Voltage system GCU-T) | Glow Plug | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 5326 | 4 | Glow Plug Low Voltage System (LVS): Short Circuit or Over Voltage in glow plug of cylinder 3 (Low Voltage system GCU-T) | Glow Plug | none |
| 5327 | 4 | Glow Plug Low Voltage System (LVS): Short Circuit or Over Voltage in glow plug of cylinder 4 (Low Voltage system GCU-T) | Glow Plug | none |
| 5419 | 3 | EGR Throttle: SRC High for TVA position | EGR Throttle | none |
| 5419 | 4 | EGR Throttle: SRC low for TVA position | EGR Throttle | none |
| 5441 | 2 | ECU Internal Check: Error in the plausibility of the injection energizing time | ECU internal Check | none |
| 5441 | 31 | ECU Internal: Error in the plausibility of the start of energising angles | ECU Internal | none |
| 5457 | 3 | Turbocharger control: Short circuit to battery of VTG actuator | Turbocharger control | YES (technical) |
| 5466 | 0 | Particulate filter overloaded (lower level 3) | DPF pressure monitoring | YES (OBD/ Inducements) |
| 5466 | 15 | Particulate filter overloaded (lower level 1) | DPF pressure monitoring | YES (OBD/ Inducements) |
| 5466 | 16 | Particulate filter overloaded (lower level 2) | DPF pressure monitoring | YES (OBD/ Inducements) |
| 5571 | 2 | Pressure Relief Valve: Averaged rail pressure is outside the expected range with open PRV | Pressure Relieve Valve | engine stop (indirect) |
| 5571 | 10 | Pressure Relief Valve: Pressure shock test performed, second step, rail pressure shock | Pressure Relieve Valve | engine stop (indirect) |
| 5571 | 11 | Info: Pressure Relief Valve Opened | Pressure Relieve Valve | YES (technical) |
| 5571 | 12 | Pressure Relief Valve: Pressure shock test: Quantity balance check for pressure shock failed | Pressure Relieve Valve | YES (technical) |
| 5571 | 14 | Pressure Relief Valve: Pressure shock test performed, first step, rail pressure increase | Pressure Relieve Valve | none |
| 5571 | 15 | Pressure Relief Valve: Opening count of PRV for wear out monitoring had exceeded maximum value | Pressure Relieve Valve | YES (technical) |
| 5571 | 16 | Pressure Relief Valve: Open time of PRV for wear out monitoring had exceeded maximum value | Pressure Relieve Valve | YES (technical) |
| 5572 | 14 | ECU Internal: Diagnostic fault check to report the ADC no-load test pulse error | ECU Internal | none |
| 5572 | 31 | ECU Internal: Diagnostic fault check to report the ADC test error | ECU Internal | none |
| 5840 | 0 | Info: SCR Inducement: Level 3 (creep mode), triggered by monitor attriubted to Reagent dosing interruption group | Inducement | YES (OBD/ Inducements); YES (technical) |
| 5840 | 15 | Info: SCR Inducement: Warning, triggered by monitor attriubted to Reagent dosing interruption group | Inducement | YES (OBD/ Inducements) |
| 5840 | 16 | Info: SCR Inducement: Level 1 (Torque reduction), triggered by monitor attriubted to Reagent dosing interruption group | Inducement | YES (OBD/ Inducements); YES (technical) |
| 6819 | 31 | Inducement: repeated offender logic activated | Inducement | none |
| 7026 | 3 | Fuel metering unit: Short Circuit to Battery Error | Fuel metering unit | YES (technical) |
| 7026 | 4 | Fuel metering unit: Short Circuit to Ground Error | Fuel metering unit | none |
| 8631 | 14 | Info: Turbo charger protection for cold start | None | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 516396 | 9 | Pressure Relief Valve: Opening count due to PLV Kick exceeded maximum value | None | engine stop (indirect) |
| 516396 | 10 | Pressure Relief Valve: Openi Time due to PLV Kick exceeded maximum value | None | engine stop (indirect) |
| 516396 | 14 | Pressure Relief Valve: Engine speed not reaching idle speed at restart after engine shut off | None | engine stop (indirect) |
| 516396 | 31 | Pressure Relief Valve: Forced PRV opening not possible due to high fuel injection quantity | Fuel pressure (Rail) control | engine stop (indirect) |
| 516445 | 3 | EGR Valve: Short circuit to battery on Out1 of H-bridge | EGR Valve | none |
| 516445 | 4 | EGR Valve: Short circuit to ground on Out1 of H-bridge | EGR Valve | none |
| 516445 | 5 | EGR Valve: Open load of H-Bridge | EGR Valve | none |
| 518144 | 14 | ECU Internal: Diagnostic fault check to report the engine speed error | ECU Internal | none |
| 518150 | 31 | ECU Internal: Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI2 shut-off | ECU Internal | none |
| 518151 | 31 | ECU Internal: Error in the plausibility of PoI3 efficiency. | ECU Internal | none |
| 518161 | 31 | ECU Internal: Diagnostic fault check to report the error due to torque comparison | ECU Internal | none |
| 518162 | 31 | ECU Internal: Error due to injector EnergizingTime exceeding threshold at overrun | ECU Internal | none |
| 518164 | 31 | Injection quantity limited by Level2 correction | None | none |
| 518165 | 31 | Level 2 torque limitation corrected for stable idle speed is activated | None | none |
| 518166 | 14 | ECU Internal: Stack memory threshold overrun error | None | none |
| 518201 | 11 | ECU system: Irregular switch off detected | None | none |
| 518201 | 31 | ECU system: Irregular switch off detected | None | none |
| 518203 | 31 | ECU Internal: Injection Cut Off request from Shut Off Path Test | ECU Internal | none |
| 518204 | 31 | ECU Internal: Post build selectable monitoring | ECU Internal | none |
| 518217 | 31 | ECU Internal: Diagnostic fault check to starter permission monitor | ECU Internal | none |
| 518219 | 31 | ECU Internal: Error in the operating mode at level 1 | ECU Internal | none |
| 518220 | 31 | ECU Internal: Error in total injection quantity at level 2 | ECU Internal | none |
| 518241 | 31 | ECU Internal: Diagnostic fault check to report "ABE active" | ECU Internal | none |
| 518242 | 31 | ECU Internal: Diagnostic fault check to report "Errorpin active" | ECU Internal | none |
| 518249 | 9 | CAN Bus: Timeout Error of CAN-Receive-Frame Vehicle Control Module to EDC (VM2EDC: low/high Idle, Intermediate speed Gov.parameters) | CAN Bus | none |
| 518254 | 11 | CAN Bus: CAN-Receive-Frame of TSC1VE out of range condition | CAN Bus | none |
| 518254 | 14 | CAN Bus: CAN-Receive-Frame of TSC1VE rolling counter error (frame missed) | CAN Bus | none |
| 518255 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame TSC1VE from Vehicle Controller | CAN Bus | none |
| 518255 | 19 | CAN Bus: CAN-Receive-Frame of TSC1VE, Checksum error | CAN Bus | none |
| 518256 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame TSC1VE from Vehicle Controller (active mode) | CAN Bus | none |
| 518256 | 31 | CAN Bus: CAN-Receive-Frame of TSC1VE error condition | CAN Bus | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 518257 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame TSC1VE from Vehicle Controller (passive mode) | CAN Bus | none |
| 518261 | 14 | CAN Bus: CAN-Receive-Frame of VM2EDC, Rolling counter or Checksum error | CAN Bus | none |
| 518494 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame Torque Speed Control TSC1PE message from PTO controller | CAN Bus | none |
| 518494 | 11 | CAN Bus: CAN-Receive-Frame of TSC1PE out of range condition | CAN Bus | none |
| 518494 | 14 | CAN Bus: CAN-Receive-Frame of TSC1PE rolling counter error (frame missed) | CAN Bus | none |
| 518494 | 19 | CAN Bus: CAN-Receive-Frame of TSC1PE, Checksum error | CAN Bus | none |
| 518494 | 31 | CAN Bus: CAN-Receive-Frame of TSC1PE error condition | CAN Bus | none |
| 518495 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame TSC1PE from PTO Controller (active mode) | CAN Bus | none |
| 518496 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame TSC1PE from PTO Controller (passive mode) | CAN Bus | none |
| 518500 | 19 | Glow Plug Low Voltage System (LVS): Faulty diagnostic data transmission or protocol error | Glow Plug | none |
| 518644 | 10 | CAN Bus: Timeout Error of CAN-Receive-Frame BC2EDC1 from Body Computer | CAN Bus | none |
| 518644 | 14 | CAN-Receive-Frame BC2EDC1 from Body Computer: Checksum error | CAN Bus | none |
| 518645 | 9 | CAN Bus: Timeout Error of CAN-Receive-Frame BC2EDC2 from Body Computer | CAN Bus | none |
| 518653 | 31 | CAN Bus VCM: DFC of Auxiliary Engine Shutdown Switch Message | CAN Bus VCM | engine stop (indirect) |
| 518654 | 9 | CAN Bus: Timeout Error of CAN-Receive-Frame CM1BC (from Body Computer) | CAN Bus | none |
| 519197 | 6 | EGR Valve: Over current of H-Bridge | EGR Valve | none |
| 519198 | 3 | EGR Valve: Short circuit to battery on Out2 of H-bridge | EGR Valve | none |
| 519198 | 4 | EGR Valve: Short circuit to ground on Out2 of H-bridge | EGR Valve | none |
| 519198 | 6 | EGR Valve: Over temperature of H-bridge | EGR Valve | none |
| 519199 | 5 | EGR Valve: Under voltage of H-bridge | EGR Valve | none |
| 519199 | 6 | EGR Valve: Short circuit over load of H-bridge | EGR Valve | none |
| 519201 | 7 | EGR Valve: Jammed valve in open state | EGR Valve | none |
| 519551 | 2 | Two or more Selected Temperature sensors deliver implausible values | Temperature Sensor | none |
| 519644 | 31 | Validation mode activated (full power restart in case of inducement activation) | Inducement | none |
| 519645 | 0 | Info: SCR Inducement: Warning, triggered by fault impacting on EGR | Inducement | YES (OBD/ Inducements) |
| 519645 | 16 | Info: SCR Inducement: Level 1 (Torque reduction), triggered by fault impacting on EGR | Inducement | YES (OBD/ Inducements) |
| 519646 | 31 | SCR Inducement: severe inducement locked status reached. | Inducement | YES (OBD/ Inducements); YES (technical) |
| 519648 | 15 | Info: SCR Inducement: Warning, triggered by Costumer Moderate fault (errors impacting NOx efficiency) | Inducement | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 519694 | 7 | DPF filter differential pressure sensor: Hose Line Monitoring | DPF pressure sensing | YES (technical) |
| 519695 | 7 | DPF differential pressure sensor: Hose Line Monitoring at cold state | DPF pressure sensing | YES (technical) |
| 519697 | 0 | DPF model plausibility: Measured differential pressure over DPF exceeds limit | DPF model plausibility | none |
| 519744 | 15 | Fuel pressure control Metering unit: Too high fuel pressure with MeUn on 0-delivery state | Fuel pressure control Metering unit | YES (technical) |
| 519744 | 18 | Fuel pressure control Metering unit: Too low fuel rail pressure with MeUn Control | Fuel pressure control Metering unit | YES (technical) |
| 519745 | 17 | Fuel pressure control Metering unit: Fuel rail pressure below limit with MeUn Control | Fuel pressure control Metering unit | YES (technical) |
| 519844 | 31 | Info: Torque Limitation active: Torque limitation caused by turbocharger protection | Info: Torque Limitation active | none |
| 519845 | 31 | Info: Torque Limitation active: Torque limitation caused by engine protection | Info: Torque Limitation active | none |
| 519846 | 31 | Info: Torque Limitation active: Torque limitation caused by injection system | Info: Torque Limitation active | none |
| 519847 | 31 | Info: Rail pressure, speed Limitation active: Limitation caused by ihigh rail temperature | Info: Torque Limitation active | none |
| 519859 | 0 | Info: Torque Limitation active: OBD performance limiter is active. | Info: Torque Limitation active | none |
| 519996 | 1 | Fuel pressure control: Insufficient rail pressure, fuel injection release inhibited | Fuel pressure | none |
| 520194 | 3 | Throttle Valve: Short circuit to battery on Out2 of H-bridge | None | YES (technical) |
| 520194 | 4 | Throttle Valve: Short circuit to ground on Out2 of H-bridge | None | YES (technical) |
| 520194 | 5 | Throttle Valve: Under voltage of H-bridge | None | none |
| 520194 | 7 | Throttle Valve: Jammed valve in closed state | None | none |
| 520194 | 15 | Throttle Valve: Short circuit over load of H-bridge | None | none |
| 520195 | 3 | Throttle Valve: Short circuit to battery on Out1 of H-bridge | None | YES (technical) |
| 520195 | 4 | Throttle Valve: Short circuit to ground on Out1 of H-bridge | None | YES (technical) |
| 520195 | 5 | Throttle Valve: Open load of H-Bridge | None | YES (technical) |
| 520195 | 6 | Throttle Valve: Over current of H-Bridge | None | none |
| 520195 | 7 | Throttle Valve: Jammed valve in open state | None | none |
| 520195 | 15 | Throttle Valve: Over temperature of H-bridge | None | none |
| 520344 | 11 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 11 issued | ECU Internal | none |
| 520344 | 31 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 1 issued | ECU Internal | none |
| 520345 | 11 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 15 issued | ECU Internal | none |
| 520345 | 31 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 12 issued | ECU Internal | none |
| 520346 | 11 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 3 issued | ECU Internal | none |
| 520346 | 31 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 16 issued | ECU Internal | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 520347 | 11 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 7 issued | ECU Internal | none |
| 520347 | 31 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 4 issued | ECU Internal | none |
| 520348 | 11 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 0 issued | ECU Internal | none |
| 520348 | 31 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 8 issued | ECU Internal | none |
| 520349 | 11 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 11 issued | ECU Internal | none |
| 520349 | 31 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 1 issued | ECU Internal | none |
| 520350 | 11 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 15 issued | ECU Internal | none |
| 520350 | 31 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 12 issued | ECU Internal | none |
| 520351 | 11 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 3 issued | ECU Internal | none |
| 520351 | 31 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 16 issued | ECU Internal | none |
| 520352 | 11 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 7 issued | ECU Internal | none |
| 520352 | 31 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 4 issued | ECU Internal | none |
| 520353 | 11 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 15 issued | ECU Internal | none |
| 520353 | 31 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 8 issued | ECU Internal | none |
| 520354 | 11 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 19 issued | ECU Internal | none |
| 520354 | 31 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 18 issued | ECU Internal | none |
| 520355 | 11 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 4 issued | ECU Internal | none |
| 520355 | 31 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 29 issued | ECU Internal | none |
| 520356 | 11 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 7 issued | ECU Internal | none |
| 520356 | 31 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 5 issued | ECU Internal | none |
| 520357 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 0 issued | ECU Internal | none |
| 520357 | 31 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 8 issued | ECU Internal | none |
| 520358 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 12 issued | ECU Internal | none |
| 520358 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 1 issued | ECU Internal | none |
| 520359 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 16 issued | ECU Internal | none |
| 520359 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 14 issued | ECU Internal | none |
| 520360 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 18 issued | ECU Internal | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 520360 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 17 issued | ECU Internal | none |
| 520361 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 2 issued | ECU Internal | none |
| 520361 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 19 issued | ECU Internal | none |
| 520362 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 26 issued | ECU Internal | none |
| 520362 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 20 issued | ECU Internal | none |
| 520363 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 28 issued | ECU Internal | none |
| 520363 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 27 issued | ECU Internal | none |
| 520364 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 4 issued | ECU Internal | none |
| 520364 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 3 issued | ECU Internal | none |
| 520365 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 6 issued | ECU Internal | none |
| 520365 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 5 issued | ECU Internal | none |
| 520366 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 8 issued | ECU Internal | none |
| 520366 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure7 issued | ECU Internal | none |
| 520367 | 11 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 1 issued | ECU Internal | none |
| 520367 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 9 issued | ECU Internal | none |
| 520368 | 11 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 17 issued | ECU Internal | none |
| 520368 | 31 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 10 issued | ECU Internal | none |
| 520369 | 11 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 2 issued | ECU Internal | none |
| 520369 | 31 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 18 issued | ECU Internal | none |
| 520370 | 11 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 6 issued | ECU Internal | none |
| 520370 | 31 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 5 issued | ECU Internal | none |
| 520371 | 11 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 1 issued | ECU Internal | none |
| 520371 | 31 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 9 issued | ECU Internal | none |
| 520372 | 11 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 12 issued | ECU Internal | none |
| 520372 | 31 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 11 issued | ECU Internal | none |
| 520373 | 11 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 16 issued | ECU Internal | none |
| 520373 | 31 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 15 issued | ECU Internal | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 520374 | 11 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 4 issued | ECU Internal | none |
| 520374 | 31 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 3 issued | ECU Internal | none |
| 520375 | 11 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 8 issued | ECU Internal | none |
| 520375 | 31 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 7 issued | ECU Internal | none |
| 520379 | 11 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 30 issued | ECU Internal | none |
| 520380 | 31 | Vehicle CAN Buffer overflow MCAN | CAN Bus | none |
| 520381 | 31 | Engine CAN BUffer overflow MCANR | CAN Bus | none |

### 10.1.1.2 Over 75hp Models

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 18 | 14 | Fuel pressure control Pressure control valve: Maximum rail pressure in limp home mode exceeded | Fuel pressure (Rail) control | engine stop (indirect) |
| 27 | 20 | EGR Valve: DFC for valve drift at closed position | EGR Valve | none |
| 97 | 31 | Water in Fuel Determination: Water in Fuel | Water in Fuel determination | none |
| 97 | 12 | Water in fuel Sensor defective | Water in Fuel determination | none |
| 100 | 1 | Oil pressure sensing: Diagnostic fault check for oil pressure below minimum limit | Oil pressure sensing | none |
| 100 | 2 | Oil pressure sensing: Plausibility check for oil pressure sensor | Oil pressure sensing | none |
| 102 | 15 | Boost Pressure: Diagnostic Fault Check for High Plausibility error | Boost pressure | YES (technical) |
| 102 | 17 | Boost Pressure: Diagnostic Fault Check for Low Plausibility error | Boost pressure | YES (technical) |
| 102 | 3 | Boost pressure sensor: SRC High Air Intake pressure value | Boost pressure | YES (technical) |
| 102 | 4 | Boost pressure sensor: SRC Low Air Intake pressure value | Boost pressure | YES (technical) |
| 105 | 3 | Boost temperature: SRC high for air intake temperature | Boost temperature | none |
| 105 | 4 | Boost temperature: SRC low for air intake temperature | Boost temperature | none |
| 108 | 16 | Environmental pressure: Physical value implausibly high | Ambient pressure sensor | none |
| 108 | 18 | Environmental pressure: Physical value implausibly low | Ambient pressure sensor | none |
| 108 | 3 | Environmental pressure: Signal Range Check High | Ambient pressure sensor | none |
| 108 | 4 | Environmental pressure: Signal Range Check Low | Ambient pressure sensor | none |
| 108 | 2 | Environmental pressure: Value implausible | Ambient pressure sensor | none |
| 110 | 16 | Info: Engine temperature exceeded pre-warn level | Info: Torque Limitation active | none |
| 110 | 0 | Info: Engine temperature exceeded warn level | Info: Torque Limitation active | none |
| 152 | 13 | External device triggered an ECU reset during normal ECU driving | ECU Internal | none |
| 152 | 11 | External device triggered an ECU reset during normal ECU initialisation | ECU Internal | none |
| 152 | 14 | ECU SW Reset: Hardware related resets (Controller, HSM, Watchdog) | ECU SW Reset | none |
| 152 | 31 | ECU SW Reset: Resets related to ECU Starter Block or Customer Block | ECU SW Reset | none |
| 152 | 2 | ECU SW Reset: Reset related to ASW (under voltage, bus errors, CPU) | ECU SW Reset | none |
| 156 | 12 | ECU Internal: Implausible Injector Temperature Compensation times | ECU Internal | none |
| 156 | 31 | ECU Internal: Implausible valve closing correction times | None | none |
| 156 | 14 | ECU Internal: Error in the plausibility of the energising times of the zero fuel quantity calibration | ECU Internal | none |
| 157 | 2 | Fuel pressure (Rail) sensor: Rail pressure raw value is intermittent | Fuel pressure (Rail) sensor | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 157 | 20 | Fuel pressure (Rail) sensor: rail pressure raw value is above maximum offset | Fuel pressure (Rail) sensor | YES (technical) |
| 157 | 21 | Fuel pressure (Rail) sensor: rail pressure raw value is below minimum offset | Fuel pressure (Rail) sensor | YES (technical) |
| 157 | 11 | Fuel pressure (Rail) sensor: Sensor voltage above upper limit | Fuel pressure (Rail) sensor | YES (technical) |
| 157 | 4 | Fuel pressure (Rail) sensor: Sensor voltage below lower limit | Fuel pressure (Rail) sensor | YES (technical) |
| 158 | 16 | Battery voltage: Power stage diagnosis could be disabled due to high Battery voltage | Battery voltage | none |
| 158 | 18 | Battery voltage: Power stage diagnosis could be disabled due to low Battery voltage | Battery voltage | none |
| 168 | 16 | Battery voltage: SRC high for battery voltage sensor | Battery voltage | none |
| 168 | 18 | Battery voltage: SRC low for battery voltage sensor | Battery voltage | none |
| 168 | 3 | Battery voltage: SRC high for battery voltage sensor | Battery voltage | none |
| 168 | 4 | Battery voltage: SRC low for battery voltage sensor | Battery voltage | none |
| 171 | 2 | Selected Temperature sensor 3 delivering implausible value (check description for detail) | Temperature Sensor | none |
| 171 | 3 | Environmental Temperature sensor (in humidity sensor): SRC High for Environment Temperature | Ambient temperature sensor | none |
| 171 | 4 | Environmental Temperature sensor (in humidity sensor): SRC low for Environment Temperature | Ambient temperature sensor | none |
| 172 | 2 | Selected Temperature sensor 1 delivering implausible value (check description for detail) | Temperature Sensor | none |
| 172 | 14 | Selected Temperature sensor 2 delivering implausible value (check description for detail) | Temperature Sensor | none |
| 174 | 16 | Fuel Temperature Sensor: Physical Signal above maximum limit | Fuel Temp Sensor | none |
| 174 | 3 | Fuel Temp Sensor: SRC high for fuel temperature sensor | Fuel Temp Sensor | none |
| 174 | 4 | Fuel Temp Sensor: SRC low for fuel temperature sensor | Fuel Temp Sensor | none |
| 190 | 0 | Engine Overspeed: Overspeed detection in component engine protection | Engine Overspeed | none |
| 628 | 13 | ECU internal: read access to non volatile memory failed for at least one block | ECU Internal | none |
| 628 | 12 | ECU internal: write access to non volatile memory failed for at least one block | ECU Internal | none |
| 636 | 2 | Engine speed sensing: DFC for camshaft signal diagnosis - disturbed signal | Engine speed sensing | YES (technical) |
| 636 | 9 | Engine speed sensing: DFC for camshaft signal diagnosis - no signal | Engine speed sensing | YES (technical) |
| 636 | 31 | Engine speed sensing: DFC for camshaft offset angle exceeded | Engine speed sensing | YES (technical) |
| 637 | 2 | Engine speed sensing: Crankshaft signal disturbance | Engine speed sensing | YES (technical) |
| 637 | 9 | Engine speed sensing: Crankshaft signal loss | Engine speed sensing | YES (technical) |
| 639 | 31 | CAN Bus: Error passive CAN Bus Node 0 | CAN Bus | none |
| 639 | 11 | CAN Bus: Error CAN Bus Node 0 | CAN Bus | none |
| 641 | 5 | Turbocharger control: Open load of VTG actuator | Turbocharger control | YES (technical) |
| 641 | 4 | Turbocharger control: Short circuit to ground of VTG actuator | Turbocharger control | YES (technical) |
| 651 | 5 | Injector: Open load for  injector 1 | None | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 651 | 4 | Injector: Short Circuit at Low Side for injector 1 | Injector | Single injector shutoff |
| 651 | 3 | Injector: Short Circuit between High Side and Low Side for injector 1 | Injector | Single injector shutoff |
| 651 | 31 | Injector Adjustment: IMA programming not correct for injector cyl 1 | Injector Adjustment | none |
| 652 | 5 | Injector: Open load for  injector 2 | None | none |
| 652 | 4 | Injector: Short Circuit at Low Side for injector 2 | Injector | Single injector shutoff |
| 652 | 3 | Injector: Short Circuit between High Side and Low Side for injector 2 | Injector | Single injector shutoff |
| 652 | 31 | Injector Adjustment: IMA programming not correct for injector cyl 2 | Injector Adjustment | none |
| 653 | 5 | Injector: Open load for  injector 3 | None | none |
| 653 | 4 | Injector: Short Circuit at Low Side for injector 3 | Injector | Single injector shutoff |
| 653 | 3 | Injector: Short Circuit between High Side and Low Side for injector 3 | Injector | Single injector shutoff |
| 653 | 31 | Injector Adjustment: IMA programming not correct for injector cyl 3 | Injector Adjustment | none |
| 654 | 5 | Injector: Open load for  injector 4 | None | none |
| 654 | 4 | Injector: Short Circuit at Low Side for injector 4 | Injector | Single injector shutoff |
| 654 | 3 | Injector: Short Circuit between High Side and Low Side for injector 4 | Injector | Single injector shutoff |
| 654 | 31 | Injector Adjustment: IMA programming not correct for injector cyl 4 | Injector Adjustment | none |
| 676 | 5 | Glow Plug Low Voltage System (LVS): DFC for Open Load error of low voltage glow system power stage | Glow Plug | none |
| 676 | 6 | Glow Plug Low Voltage System (LVS): Over temperature error of low voltage glow system power stage | Glow Plug | none |
| 676 | 3 | Glow Plug Low Voltage System (LVS): Short Circuit to Battery error of low voltage glow system power stage | Glow Plug | none |
| 676 | 4 | Glow Plug Low Voltage System (LVS): Short Circuit to Ground error of low voltage glow system power stage | Glow Plug | none |
| 785 | 31 | Urea Backflow Line Heater Field Effect Transistor error | None | none |
| 1074 | 31 | ECU Internal: Diagnostic fault check to report the exhaust flap brake release error | None | none |
| 1116 | 31 | ECU Internal: Diagnostic fault check to report the error due to injection quantity correction | ECU Internal | none |
| 1127 | 16 | Turbocharger control: Boost pressure deviation from target value too high (overboost) | Turbocharger control | YES (technical) |
| 1128 | 18 | Turbocharger control: Underboost detection | Turbocharger control | YES (technical) |
| 1136 | 16 | ECU Temperature Sensor: Physical Signal ECU temperature above maximum limit | ECU Temperature sensing | none |
| 1136 | 18 | ECU Temperature Sensor: Physical Signal ECU temperature below minimum limit | ECU Temperature sensing | none |
| 1136 | 6 | ECU Temperature Sensor: Short circuit to battery (ECU internal error) | ECU Temperature sensing | none |
| 1136 | 17 | ECU Temperature Sensor: Short circuit to ground (ECU internal error) | ECU Temperature sensing | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 1136 | 2 | ECU Temperature Sensor: Implausible sensor measuring | ECU Temperature sensing | none |
| 1209 | 7 | Trubine upstream Pressure: pressure too low | P3 Pressure | none |
| 1209 | 3 | Turbine Upstream Pressure Sensor: Signal range check high | P3 Pressure | none |
| 1209 | 4 | Turbine Upstream Pressure Sensor: Signal range check low | P3 Pressure | none |
| 1231 | 11 | CAN Bus: Error CAN Bus Node 1 | CAN Bus | none |
| 1240 | 31 | Fuel pressure (Rail) control: Leakage in high pressure system | Fuel pressure (Rail) control | YES (technical) |
| 1240 | 11 | Fuel pressure control Metering unit: Leakage in overrun | Fuel pressure control Metering unit | YES (technical) |
| 1240 | 14 | Fuel pressure control Metering unit: Leakage in high pressure system detected at idle | Fuel pressure control Metering unit | YES (technical) |
| 1442 | 5 | Fuel metering unit: open load of metering unit output | Fuel metering unit | none |
| 1442 | 6 | Fuel metering unit: over temperature of device driver of metering unit | Fuel metering unit | YES (technical) |
| 1442 | 0 | Fuel pressure control Metering unit: Fuel Rail pressure above maximum limit with MeUn Control | Fuel pressure control Metering unit | none |
| 1485 | 31 | Main Relay sticking | None | none |
| 1648 | 12 | ECU Internal: Diagnostic fault check to report "WDA active" due to errors in query-/response communication | ECU Internal | none |
| 1648 | 3 | ECU Internal: Diagnostic fault check to report "ABE active" due to overvoltage detection | ECU Internal | none |
| 1659 | 2 | Thermostat monitor: deviation between measured and modeled temperature | Coolant Thermostat | none |
| 1761 | 17 | Info: SCR reagent tank level below first warning level, DFC for triggering warning action dependent on filling level of reducing agent | SCR Reagent Tank Level | none |
| 1761 | 18 | Info: SCR reagent tank level below second warning level, DFC for triggering warning action dependent on filling level of reducing agent | SCR Reagent Tank Level | YES (OBD/ Inducements); YES (technical) |
| 1761 | 3 | SCR Reagent Tank Level Sensor: Signal above maximum limit. | SCR Reagent Tank Level | none |
| 1761 | 4 | SCR Reagent Tank Level Sensor: Signal below minimum limit. | SCR Reagent Tank Level | none |
| 1761 | 1 | SCR Reagent Tank Level: Empty Urea Tank | SCR Reagent Tank Level | YES (OBD/ Inducements); YES (technical) |
| 1761 | 14 | Urea Tank Level: system error | SCR Reagent Tank Level | none |
| 2659 | 18 | EGR Control: EGR low flow detected | EGR Control | none |
| 2791 | 31 | EGR Valve: Current limited | EGR Valve | none |
| 2791 | 7 | EGR Valve: Jammed valve in closed state | EGR Valve | none |
| 2791 | 0 | EGR Valve: SRC high for valve position sensor voltage | EGR Valve | none |
| 2791 | 1 | EGR Valve: SRC low for valve position sensor voltage | EGR Valve | none |
| 2797 | 1 | Injector: Booster voltage too low | Injector | none |
| 2797 | 4 | Injector: Short circuit of the HDEV power stage high−side (first bank error) | Injector | Single injector shutoff |
| 2798 | 4 | Injector: Short circuit of the HDEV power stage high−side (second bank error) | Injector | Single injector shutoff |
| 3031 | 6 | Urea Tank temperature: overheating of the AdBlue tank | SCR Tank heater | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 3031 | 3 | SCR Reagent Tank Temperature sensing: SRC high for Urea temperature sensor | SCR Reagent Tank Temperature sensing | none |
| 3031 | 4 | SCR Reagent Tank Temperature sensing: SRC low for Urea temperature sensor | SCR Reagent Tank Temperature sensing | none |
| 3031 | 11 | Urea Tank Temperature: system error | SCR Temp Sensing | none |
| 3031 | 20 | UREA Tank Temperature: Tank temperature sensor plausibility check failed (> max drift) | SCR Temp Sensing | none |
| 3031 | 21 | UREA Tank Temperature: Tank temperature sensor plausibility check failed (< min drift) | SCR Temp Sensing | none |
| 3064 | 7 | DPF model plausibility: Diagnostic fault check for damaged particulate filter | DPF model plausibility | none |
| 3216 | 14 | NOx Sensor upstream: Sensor Implausible | Upstream NOx Sensing | none |
| 3216 | 2 | NOx Sensor Upstream (CAN): Nox Concentration invalid | NOx Sensor (CAN) | none |
| 3216 | 31 | NOx Sensor Upstream (CAN): NOx Sensor detects incorrect supply | NOx Sensor (CAN) | none |
| 3222 | 12 | NOx Sensor Upstream (CAN): Sensor Heater performance insufficient | NOx Sensor (CAN) | none |
| 3223 | 5 | CAN NOx Sensor Upstream: Open Circuit Error for Nox Sensor upstream | CAN NOx Sensor | none |
| 3223 | 6 | CAN NOx Sensor Upstream: Short Circuit Error for Nox Sensor upstream | CAN NOx Sensor | none |
| 3224 | 5 | NOx Sensor Upstream (CAN): Open Wire error detected by sensor | NOx Sensor (CAN) | none |
| 3224 | 6 | NOx Sensor Upstream (CAN): Short circuit error detected by sensor | NOx Sensor (CAN) | none |
| 3224 | 2 | NOx upstream Sensor: Lambda value measurement from NOx upstream sensor incorrect | NOx Sensing | none |
| 3226 | 10 | NOx sensor: measured value stuck | NOx Sensing | none |
| 3226 | 31 | NOx Sensor (CAN): NOx Sensor detects incorrect supply | NOx Sensor (CAN) | none |
| 3232 | 5 | CAN NOx Sensor: Open Circuit Error for Nox Sensor | CAN NOx Sensor | none |
| 3232 | 6 | CAN NOx Sensor: Short Circuit Error for Nox Sensor | CAN NOx Sensor | none |
| 3232 | 12 | NOx Sensor (CAN): Sensor Heater performance insufficient | NOx Sensor (CAN) | none |
| 3234 | 5 | NOx Sensor (CAN): Open circuit error detected by sensor | NOx Sensor (CAN) | none |
| 3234 | 6 | NOx Sensor (CAN): Short circuit error detected by sensor | NOx Sensor (CAN) | none |
| 3234 | 2 | NOx Sensor: Lambda value measurement from NOx sensor incorrect | NOx Sensing | none |
| 3242 | 14 | Exhaust Temperature monitoring 3: deviation from other sensors at cold start (check description for details) | Exhaust Temp monitoring | none |
| 3242 | 31 | Exhaust Temperature monitoring 2:  Measured value deviating from modelled temperature (check description for details) | Exhaust Temp monitoring | none |
| 3251 | 2 | DPF pressure monitoring: Fault check for the pressure sensor plausibility | DPF pressure monitoring | YES (technical) |
| 3251 | 15 | DPF pressure monitoring: Differential pressure over DPF higher then expected | DPF pressure monitoring | YES (OBD/ Inducements); YES (technical) |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 3251 | 3 | DPF differential pressure sensor: SRC value above maximum limit | DPF pressure sensing | YES (technical) |
| 3251 | 4 | DPF differential pressure sensor: SRC value below minimum limit | DPF pressure sensing | YES (technical) |
| 3294 | 0 | Failure memory delete counter exceeded threshold value | ECU EEPROM | none |
| 3362 | 7 | SCR monitoring: Leakage detection during phase without dosing | SCR Control | none |
| 3363 | 12 | SCR Tank heater: Urea tank heating insufficient | SCR Tank heater | YES (technical) |
| 3363 | 5 | SCR Reagent Heating: Open Load error of Urea Tank Heater Valve Valve | SCR Tank heater | none |
| 3363 | 6 | SCR Reagent Heating: Over Temperature error of Urea Tank Heater Valve | SCR Tank heater | none |
| 3363 | 3 | SCR Reagent Heating: Short circuit to battery error of Urea Tank Heater Valve | SCR Tank heater | none |
| 3363 | 4 | SCR Reagent Heating: Short circuit to ground error of Urea Tank Heater Valve | SCR Tank heater | none |
| 3364 | 18 | Urea quality: concentration low (time based evaluation) | SCR Reagent Quality | none |
| 3364 | 6 | UREA Quality Sensor: Short Circuit to Battery Error (quality signal) | SCR Reagent Quality | none |
| 3364 | 5 | UREA Quality Sensor: Short Circuit to Ground Error (quality signal) | SCR Reagent Quality | none |
| 3509 | 12 | ECU Power Stage 1: Error Sensor supply for sensors | ECU Power Stage 1 | YES (technical) |
| 3509 | 6 | ECU Power Stage 1: Overtemperature failure at sensor supply 1 | ECU Power Stage 1 | none |
| 3509 | 3 | ECU Power Stage 1: Overvoltage failure at sensor supply 1 | ECU Power Stage 1 | none |
| 3509 | 5 | ECU Power Stage 1: Undervoltage failure at sensor supply 1 | ECU Power Stage 1 | none |
| 3510 | 12 | ECU Power Stage 2: Error Sensor supply for sensors | ECU Power Stage 2 | YES (technical) |
| 3510 | 6 | ECU Power Stage 2: Overtemperature failure at sensor supply 2 | ECU Power Stage 2 | none |
| 3510 | 3 | ECU Power Stage 2: Overvoltage failure at sensor supply 2 | ECU Power Stage 2 | none |
| 3510 | 5 | ECU Power Stage 2: Undervoltage failure at sensor supply 2 | ECU Power Stage 2 | none |
| 3511 | 12 | ECU Power Stage 3: Error Sensor supply for sensors | ECU Power Stage 3 | YES (technical) |
| 3511 | 6 | ECU Power Stage 3: Overtemperature failure at sensor supply 3 | ECU Power Stage 3 | none |
| 3511 | 3 | ECU Power Stage 3: Overvoltage failure at sensor supply 3 | ECU Power Stage 3 | none |
| 3511 | 5 | ECU Power Stage 3: Undervoltage failure at sensor supply 3 | ECU Power Stage 3 | none |
| 3516 | 1 | Urea quality: concentration low | SCR Reagent Quality | none |
| 3521 | 31 | DEF qualty sensor: critical fluid identified | SCR Reagent Quality | none |
| 3525 | 0 | DPF model plausibility: Fault path for maximum number of locked regenerations | DPF model plausibility | YES (OBD/ Inducements) |
| 3607 | 14 | ECU internal Check: Injection cut off demand (ICO) for shut off coordinator | ECU internal Check | engine stop (indirect); YES (technical) |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 3695 | 2 | DPF emergency regeneration switch: Not plausible switch value | DPF emergency regen.switch | none |
| 3703 | 7 | Particulate FIlter Inhibition Switch stuck | None | none |
| 3719 | 16 | DPF model plausibility: Calculated soot mass above threshold | DPF model plausibility | YES (OBD/ Inducements) |
| 4076 | 3 | Coolant temp sensor: SRC High for Engine coolant temperature(down stream) | Coolant temp sensor | none |
| 4076 | 4 | Coolant temp sensor: SRC low for Engine coolant temperature(down stream) | Coolant temp sensor | none |
| 4334 | 10 | SCR monitoring: pressure stabilization error | SCR Control | none |
| 4334 | 14 | SCR monitoring: pressure drop error | SCR Control | none |
| 4334 | 15 | SCR Reagent Feeding: UREA pressure too high | SCR Control | none |
| 4334 | 17 | SCR Reagent Feeding: UREA pressure too low | SCR Control | none |
| 4334 | 0 | SCR Reagent Feeding: UREA pressure too high (2nd level) | SCR Control | none |
| 4334 | 3 | SCR Supply Module: Voltage signal from Urea Pressure Sensor is too high | SCR Supply Module | none |
| 4334 | 4 | SCR Supply Module: Voltage signal from Urea Pressure Sensor is too low | SCR Supply Module | none |
| 4337 | 2 | Supply Module temperature dynamic plausibility error | SCR Supply Module | none |
| 4337 | 31 | Supply Module temperature cold start plausibility error | SCR Supply Module | none |
| 4354 | 14 | Heater error or repeated tank freezing condition require enforced shut off | SCR Control | none |
| 4354 | 5 | SCR Reagent Heating: No load error (Pressure Line Heater) | SCR Reagent Heating | none |
| 4354 | 3 | SCR Reagent Heating: Short circuit to battery error (Pressure Line Heater) | SCR Reagent Heating | none |
| 4354 | 4 | SCR Reagent Heating: Short circuit to ground error (Pressure Line Heater) | SCR Reagent Heating | none |
| 4355 | 5 | Urea Backflow Line Heater Actuator power stage: Open Load error | SCR Reagent Heating | none |
| 4355 | 3 | Urea Backflow Line Heater Actuator power stage: Short Circuit to Battery | SCR Reagent Heating | none |
| 4355 | 4 | Urea Backflow Line Heater Actuator power stage: Short Circuit to Ground | SCR Reagent Heating | none |
| 4360 | 2 | Exhaust Temperature monitoring 3:  Measured value deviating from modelled temperature (check description for details) | Exhaust Temp monitoring | none |
| 4360 | 20 | SCR Catalyst Temperature monitoring: Upstream temperature above physical maximum value | SCR Temp Sensor Upstream | none |
| 4360 | 3 | SCR Catalyst Temperature sensing: SRC high for Catalyst temperature upstream | SCR Temp Sensor Upstream | none |
| 4360 | 4 | SCR Catalyst Temperature sensing: SRC low for Catalyst temperature upstream | SCR Temp Sensor Upstream | none |
| 4363 | 20 | SCR Catalyst Temperature monitoring: Downstream temperature above physical maximum value | SCR Temp Sensor Downstream | none |
| 4363 | 3 | SCR Catalyst Temperature sensing: SRC high for Catalyst temperature downstream | SCR Temp Sensor Downstream | none |
| 4363 | 4 | SCR Catalyst Temperature sensing: SRC low for Catalyst temperature downstream | SCR Temp Sensor Downstream | none |
| 4365 | 6 | UREA Quality Sensor: Sensor Short Circuit to Battery error reported (Temperature signal) | SCR Reagent Quality | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 4365 | 5 | UREA Quality Sensor: Sensor Short Circuit to Ground error reported (Temperature signal) | SCR Reagent Quality | none |
| 4365 | 31 | UREA Quality Sensor: Sensor System error reported (Temperature signal) | SCR Reagent Quality | none |
| 4376 | 2 | SCR monitoring: general backflow line plausibility error | SCR Control | none |
| 4425 | 31 | SCR Control: NOx emission too high | SCR Control | none |
| 4765 | 14 | Exhaust Temperature monitoring 1: deviation from other sensors at cold start (check description for details) | Exhaust Temp monitoring | YES (technical) |
| 4765 | 31 | Oxicat Temp Monitoring: wrong mounting of temperature sensors | DOC Temp Monitoring | none |
| 4765 | 16 | Oxidation Catalyser Upstream Temperature Sensor: Physical Signal above maximum limit | Upstream DOC Temperature | none |
| 4765 | 3 | Oxidation Catalyser Upstream Temperature Sensor: Defect Fault Check for "signal value above maximum limit" | Upstream DOC Temperature | none |
| 4765 | 4 | Oxidation Catalyser Upstream Temperature Sensor: Defect Fault Check for "signal value below minimum limit" | Upstream DOC Temperature | none |
| 4766 | 2 | Exhaust Temperature monitoring 2: deviation from other sensors at cold start (check description for details) | Exhaust Temp monitoring | YES (technical) |
| 4766 | 14 | Exhaust Temperature monitoring 1:  Measured value deviating from modelled temperature (check description for details) | Exhaust Temp monitoring | none |
| 4766 | 16 | Oxidation Catalyser Downstream Temperature Sensor: Physical Signal above maximum limit | Downstream DOC Temperature | none |
| 4766 | 3 | Oxidation Catalyser Downstream Temperature Sensor: Signal range check high | Downstream DOC Temperature | none |
| 4766 | 4 | Oxidation Catalyser Downstream Temperature Sensor: Signal range check low | Downstream DOC Temperature | none |
| 4781 | 0 | DPF model plausibility: Maximum soot mass in DPF exceeded | DPF model plausibility | none |
| 5018 | 18 | Oxicat Temp Monitoring: Passive monitoring of the oxidation catalyst | DOC Temp Monitoring | YES (technical) |
| 5055 | 17 | Oil viscosity(below a first threshold) | Oil Lubricant | none |
| 5055 | 18 | Oil viscosity(below a second threshold) | Oil Lubricant | none |
| 5246 | 16 | Info: SCR Inducement: Level 1 (Torque reduction), triggered by Tampering fault | Inducement | YES (OBD/ Inducements); YES (technical) |
| 5246 | 0 | Info: SCR Inducement: Level 3 (creep mode), triggered by Tampering fault | Inducement | YES (OBD/ Inducements); YES (technical) |
| 5246 | 15 | Info: SCR Inducement: Warning, triggered by Tampering fault | Inducement | YES (OBD/ Inducements) |
| 5310 | 0 | HC accumulated in the exhaust reached first engine shut off limit | None | none |
| 5310 | 14 | HC accumulated in the exhaust not decreasing enough after reaching first engine shut off | None | none |
| 5313 | 2 | ECU Internal: Diagnostic fault check to report the plausibility error in rail pressure monitoring | ECU Internal | none |
| 5318 | 2 | Exhaust gas temperature sensor: two or more temp sensors not plausible after long stand still time | Exhaust Temp monitoring | none |
| 5324 | 4 | Glow Plug Low Voltage System (LVS): Short Circuit or Over Voltage in glow plug of cylinder 1 (Low Voltage system  GCU-T) | Glow Plug | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 5325 | 4 | Glow Plug Low Voltage System (LVS): Short Circuit or Over Voltage in glow plug of cylinder 2 (Low Voltage system GCU-T) | Glow Plug | none |
| 5326 | 4 | Glow Plug Low Voltage System (LVS): Short Circuit or Over Voltage in glow plug of cylinder 3 (Low Voltage system GCU-T) | Glow Plug | none |
| 5327 | 4 | Glow Plug Low Voltage System (LVS): Short Circuit or Over Voltage in glow plug of cylinder 4 (Low Voltage system GCU-T) | Glow Plug | none |
| 5392 | 14 | SCR Control: Pressure-Build-Up not possible | SCR Control | none |
| 5394 | 7 | SCR Dosing valve: Dosing Valve is stuck | SCR Dosing Module | none |
| 5394 | 31 | SCR Dosing valve: Diagnostic error check for open load. | SCR Dosing Module | none |
| 5394 | 6 | SCR Dosing valve: Diagnostic error check for overtemperature. | SCR Dosing valve | none |
| 5394 | 3 | SCR Dosing valve: Diagnostic error check for short circuit to battery. | SCR Dosing valve | none |
| 5394 | 5 | SCR Dosing Module: Diagnostic error check for short circuit to ground. | SCR Dosing Module | none |
| 5419 | 3 | EGR Throttle: SRC High for TVA position | EGR Throttle | none |
| 5419 | 4 | EGR Throttle: SRC low for TVA position | EGR Throttle | none |
| 5435 | 5 | SCR Supply Module: Open load error on power stage for urea pump motor | SCR Supply Module | none |
| 5435 | 6 | SCR Supply Module: Over temperature error on power stage for urea pump motor | ECU Internal | none |
| 5435 | 3 | SCR Reagent Pump: Short circuit to battery error on power stage for urea pump motor | SCR Supply Module | none |
| 5435 | 4 | SCR Reagent Pump: Short circuit to ground error on power stage for urea pump motor | SCR Supply Module | none |
| 5441 | 2 | ECU Internal Check: Error in the plausibility of the injection energizing time | ECU internal Check | none |
| 5441 | 31 | ECU Internal: Error in the plausibility of the start of energising angles | ECU Internal | none |
| 5457 | 3 | Turbocharger control: Short circuit to battery of VTG actuator | Turbocharger control | YES (technical) |
| 5466 | 15 | Particulate filter overloaded (lower level 1) | DPF pressure monitoring | YES (OBD/ Inducements) |
| 5466 | 16 | Particulate filter overloaded (lower level 2) | DPF pressure monitoring | YES (OBD/ Inducements) |
| 5466 | 0 | Particulate filter overloaded (lower level 3) | DPF pressure monitoring | YES (OBD/ Inducements) |
| 5571 | 15 | Pressure Relief Valve: Opening count of PRV for wear out monitoring had exceeded maximum value | Pressure Relieve Valve | YES (technical) |
| 5571 | 14 | Pressure Relief Valve: Pressure shock test performed, first step, rail pressure increase | Pressure Relieve Valve | none |
| 5571 | 10 | Pressure Relief Valve: Pressure shock test performed, second step, rail pressure shock | Pressure Relieve Valve | engine stop (indirect) |
| 5571 | 11 | Info: Pressure Relief Valve Opened | Pressure Relieve Valve | YES (technical) |
| 5571 | 2 | Pressure Relief Valve: Averaged rail pressure is outside the expected range with open PRV | Pressure Relieve Valve | engine stop (indirect) |
| 5571 | 16 | Pressure Relief Valve: Open time of PRV for wear out monitoring had exceeded maximum value | Pressure Relieve Valve | YES (technical) |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 5572 | 14 | ECU Internal: Diagnostic fault check to report the ADC no-load test pulse error | ECU Internal | none |
| 5572 | 31 | ECU Internal: Diagnostic fault check to report the ADC test error | ECU Internal | none |
| 5706 | 16 | Supply Module Heater Module: duty cycle above maximal limit | SCR Supply Module | none |
| 5706 | 18 | Supply Module Heater Module: duty cycle below minimal limit | SCR Supply Module | none |
| 5840 | 16 | Info: SCR Inducement: Level 1 (Torque reduction), triggered by monitor attriubted to Reagent dosing interruption group | Inducement | YES (OBD/ Inducements); YES (technical) |
| 5840 | 0 | Info: SCR Inducement: Level 3 (creep mode), triggered by monitor attriubted to Reagent dosing interruption group | Inducement | YES (OBD/ Inducements); YES (technical) |
| 5840 | 15 | Info: SCR Inducement: Warning, triggered by monitor attriubted to Reagent dosing interruption group | Inducement | YES (OBD/ Inducements) |
| 5841 | 16 | Info: SCR Inducement: Level 1 (Torque reduction), triggered by Reagent quality fault | Inducement | YES (OBD/ Inducements); YES (technical) |
| 5841 | 0 | Info: SCR Inducement: Level 3 (creep mode), triggered by Reagent Quality fault | Inducement | YES (OBD/ Inducements); YES (technical) |
| 5841 | 15 | Info: SCR Inducement: Warning, triggered by Reagent Quality fault | Inducement | none |
| 5862 | 15 | SCR Supply Module: Temperature above maximal limit | SCR Reagent Heating | none |
| 5862 | 17 | SCR Supply Module: Temperature below minimal limit | SCR Reagent Heating | none |
| 6819 | 31 | Inducement: repeated offender logic activated | Inducement | none |
| 6875 | 15 | SCR monitoring: UREA pressure positive offset | SCR Supply Module | none |
| 7026 | 3 | Fuel metering unit: Short Circuit to Battery Error | Fuel metering unit | YES (technical) |
| 7026 | 4 | Fuel metering unit: Short Circuit to Ground Error | Fuel metering unit | none |
| 7107 | 2 | SCR Reagent Pump: Pump motor communication receive fail | SCR Supply Module | none |
| 7107 | 8 | SCR Supply Module: Pump Motor PWM signal is out of range | SCR Supply Module | none |
| 7107 | 16 | SCR Supply Module: Pump motor internal duty cycle above maximal limit | SCR Supply Module | none |
| 7107 | 18 | SCR Supply Module: Pump motor internal duty cycle below minimal limit | SCR Supply Module | none |
| 7107 | 15 | SCR Reagent Pump: Pump motor speed duty cycle above maximal limit | SCR Supply Module | none |
| 7107 | 17 | SCR Reagent Pump: Pump motor speed duty cycle below minimal limit | SCR Supply Module | none |
| 8205 | 14 | UREA Heater Control Unit: Missing voltage detected | SCR Reagent Heating | none |
| 8205 | 31 | UREA Heater Control Unit: Non Volatile Memory error detected | SCR Reagent Heating | none |
| 8205 | 6 | UREA Heater Control Unit: Over Temperature Error detected | SCR Reagent Heating | none |
| 8205 | 3 | UREA Heater Control Unit: Over Voltage Error detected | SCR Reagent Heating | none |
| 8205 | 4 | UREA Heater Control Unit: Under Voltage Error detected | SCR Reagent Heating | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 8631 | 14 | Info: Turbo charger protection for cold start | None | none |
| 32492 | 31 | Urea Supply Module Heater Field Effect Transistor error | None | none |
| 516445 | 5 | EGR Valve: Open load of H-Bridge | EGR Valve | none |
| 516445 | 3 | EGR Valve: Short circuit to battery on Out1 of H-bridge | EGR Valve | none |
| 516445 | 4 | EGR Valve: Short circuit to ground on Out1 of H-bridge | EGR Valve | none |
| 518144 | 14 | ECU Internal: Diagnostic fault check to report the engine speed error | ECU Internal | none |
| 518150 | 31 | ECU Internal: Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI2 shut-off | ECU Internal | none |
| 518151 | 31 | ECU Internal: Error in the plausibility of PoI3 efficiency. | ECU Internal | none |
| 518161 | 31 | ECU Internal: Diagnostic fault check to report the error due to torque comparison | ECU Internal | none |
| 518162 | 31 | ECU Internal: Error due to injector EnergizingTime exceeding threshold at overrun | ECU Internal | none |
| 518164 | 31 | Injection quantity limited by Level2 correction | None | none |
| 518165 | 31 | Level 2 torque limitation corrected for stable idle speed is activated | None | none |
| 518166 | 14 | ECU Internal: Stack memory threshold overrun error | None | none |
| 518201 | 31 | ECU system: Irregular switch off detected | None | none |
| 518201 | 11 | ECU system: Irregular switch off detected | None | none |
| 518203 | 31 | ECU Internal: Injection Cut Off request from Shut Off Path Test | ECU Internal | none |
| 518204 | 31 | ECU Internal: Post build selectable monitoring | ECU Internal | none |
| 518217 | 31 | ECU Internal: Diagnostic fault check to starter permission monitor | ECU Internal | none |
| 518219 | 31 | ECU Internal: Error in the operating mode at level 1 | ECU Internal | none |
| 518220 | 31 | ECU Internal: Error in total injection quantity at level 2 | ECU Internal | none |
| 518241 | 31 | ECU Internal: Diagnostic fault check to report "ABE active" | ECU Internal | none |
| 518242 | 31 | ECU Internal: Diagnostic fault check to report "Errorpin active" | ECU Internal | none |
| 518249 | 9 | CAN Bus: Timeout Error of CAN-Receive-Frame Vehicle Control Module to EDC (VM2EDC: low/high Idle, Intermediate speed Gov.parameters) | CAN Bus | none |
| 518254 | 11 | CAN Bus: CAN-Receive-Frame of TSC1VE out of range condition | CAN Bus | none |
| 518254 | 14 | CAN Bus: CAN-Receive-Frame of TSC1VE rolling counter error (frame missed) | CAN Bus | none |
| 518255 | 19 | CAN Bus: CAN-Receive-Frame of TSC1VE, Checksum error | CAN Bus | none |
| 518255 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame TSC1VE from Vehicle Controller | CAN Bus | none |
| 518256 | 31 | CAN Bus: CAN-Receive-Frame of TSC1VE error condition | CAN Bus | none |
| 518256 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame TSC1VE from Vehicle Controller (active mode) | CAN Bus | none |
| 518257 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame TSC1VE from Vehicle Controller (passive mode) | CAN Bus | none |
| 518261 | 14 | CAN Bus: CAN-Receive-Frame of VM2EDC, Rolling counter or Checksum error | CAN Bus | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 518494 | 19 | CAN Bus: CAN-Receive-Frame of TSC1PE, Checksum error | CAN Bus | none |
| 518494 | 31 | CAN Bus: CAN-Receive-Frame of TSC1PE error condition | CAN Bus | none |
| 518494 | 11 | CAN Bus: CAN-Receive-Frame of TSC1PE out of range condition | CAN Bus | none |
| 518494 | 14 | CAN Bus: CAN-Receive-Frame of TSC1PE rolling counter error (frame missed) | CAN Bus | none |
| 518494 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame Torque Speed Control TSC1PE message from PTO controller | CAN Bus | none |
| 518495 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame TSC1PE from PTO Controller (active mode) | CAN Bus | none |
| 518496 | 9 | CAN Bus: TimeOut of CAN-Receive-Frame TSC1PE from PTO Controller (passive mode) | CAN Bus | none |
| 518500 | 19 | Glow Plug Low Voltage System (LVS): Faulty diagnostic data transmission or protocol error | Glow Plug | none |
| 518644 | 14 | CAN-Receive-Frame BC2EDC1 from Body Computer: Checksum error | CAN Bus | none |
| 518644 | 10 | CAN Bus: Timeout Error of CAN-Receive-Frame BC2EDC1 from Body Computer | CAN Bus | none |
| 518645 | 9 | CAN Bus: Timeout Error of CAN-Receive-Frame BC2EDC2 from Body Computer | CAN Bus | none |
| 518653 | 31 | CAN Bus VCM: DFC of Auxiliary Engine Shutdown Switch Message | CAN Bus VCM | engine stop (indirect) |
| 518654 | 9 | CAN Bus: Timeout Error of CAN-Receive-Frame CM1BC (from Body Computer) | CAN Bus | none |
| 518747 | 9 | CAN Bus: Timeout of CAN-Receive-Frame HCU2EDC1 | CAN Bus | none |
| 518748 | 9 | CAN Bus: Timeout of CAN-Receive-Frame HCU2EDC2 | CAN Bus | none |
| 518867 | 9 | CAN Bus: Timeout error of CAN-Receive frame NOxData from NOx sensor downstream | CAN NOx Sensor | none |
| 518868 | 9 | CAN Bus: Timeout error of CAN-Receive frame NOxData from NOx sensor upstream | CAN NOx Sensor | none |
| 519044 | 14 | UREA deposit accumulation at low temperature exceeded limit | None | none |
| 519044 | 31 | UREA Quality Sensor: Sensor System Error reported (quality signal) | SCR Reagent Quality | none |
| 519045 | 2 | NOx Sensor (CAN): NOx Sensor detects not plausible values (NOx or Lambda) | NOx Sensor (CAN) | none |
| 519050 | 9 | CAN Bus: Timeout Error of CAN-Receive-Frame A1DEFI from DEF quality sensor | CAN Bus | none |
| 519050 | 3 | SCR Dosing valve: Diagnostic error check for short circuit to battery on the high side switch. | SCR Dosing valve | none |
| 519051 | 9 | CAN Bus:Timeout Error of CAN-Receive-Frame AT1T1I from DEF Tank Level sensor | CAN Bus | none |
| 519056 | 7 | SCR Dosing valve: Dosing Valve is stuck at low voltage | SCR Dosing Module | none |
| 519063 | 6 | DEF Backflow Pump: Over Temperature High Side Power stage | SCR Reagent Feeding | none |
| 519063 | 3 | DEF Backflow Pump: Short Circuit to Battery High Side Power stage | SCR Reagent Feeding | none |
| 519095 | 6 | Turbocharger control: Over temperature of VTG actuator | Turbocharger control | none |
| 519197 | 6 | EGR Valve: Over current of H-Bridge | EGR Valve | none |
| 519198 | 6 | EGR Valve: Over temperature of H-bridge | EGR Valve | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 519198 | 3 | EGR Valve: Short circuit to battery on Out2 of H-bridge | EGR Valve | none |
| 519198 | 4 | EGR Valve: Short circuit to ground on Out2 of H-bridge | EGR Valve | none |
| 519199 | 6 | EGR Valve: Short circuit over load of H-bridge | EGR Valve | none |
| 519199 | 5 | EGR Valve: Under voltage of H-bridge | EGR Valve | none |
| 519201 | 7 | EGR Valve: Jammed valve in open state | EGR Valve | none |
| 519294 | 2 | Supply Module Heater temperature dynamic plausibility Error | SCR Supply Module | none |
| 519294 | 5 | Urea Supply Module Heater Actuator power stage: Open Load error | SCR Reagent Heating | none |
| 519294 | 3 | Urea Supply Module Heater Actuator power stage: Short Circuit to Battery | SCR Reagent Heating | none |
| 519294 | 4 | Urea Supply Module Heater Actuator power stage: Short Circuit to ground | SCR Reagent Heating | none |
| 519546 | 2 | Exhaust Temperature monitoring 4:  Measured value deviating from modelled temperature (check description for details) | Exhaust Temp monitoring | none |
| 519550 | 2 | Exhaust Temperature monitoring 4: deviation from other sensors at cold start (check description for details) | Exhaust Temp monitoring | none |
| 519551 | 2 | Two or more Selected Temperature sensors deliver implausible values | Temperature Sensor | none |
| 519644 | 31 | Validation mode activated (full power restart in case of inducement activation) | Inducement | none |
| 519645 | 16 | Info: SCR Inducement: Level 1 (Torque reduction), triggered by fault impacting on EGR | Inducement | YES (OBD/ Inducements) |
| 519645 | 0 | Info: SCR Inducement: Warning, triggered by fault impacting on EGR | Inducement | YES (OBD/ Inducements) |
| 519646 | 31 | SCR Inducement: severe inducement locked status reached. | Inducement | YES (OBD/ Inducements); YES (technical) |
| 519648 | 15 | Info: SCR Inducement: Warning, triggered by Costumer Moderate fault (errors impacting NOx efficiency) | Inducement | none |
| 519694 | 7 | DPF filter differential pressure sensor: Hose Line Monitoring | DPF pressure sensing | YES (technical) |
| 519695 | 7 | DPF differential pressure sensor: Hose Line Monitoring at cold state | DPF pressure sensing | YES (technical) |
| 519697 | 0 | DPF model plausibility: Measured differential pressure over DPF exceeds limit | DPF model plausibility | none |
| 519744 | 18 | Fuel pressure control Metering unit: Too low fuel rail pressure with MeUn Control | Fuel pressure control Metering unit | YES (technical) |
| 519744 | 15 | Fuel pressure control Metering unit: Too high fuel pressure with MeUn on 0-delivery state | Fuel pressure control Metering unit | YES (technical) |
| 519745 | 17 | Fuel pressure control Metering unit: Fuel rail pressure below limit with MeUn Control | Fuel pressure control Metering unit | YES (technical) |
| 519844 | 31 | Info: Torque Limitation active: Torque limitation caused by turbocharger protection | Info: Torque Limitation active | none |
| 519845 | 31 | Info: Torque Limitation active: Torque limitation caused by engine protection | Info: Torque Limitation active | none |
| 519846 | 31 | Info: Torque Limitation active: Torque limitation caused by injection system | Info: Torque Limitation active | none |
| 519847 | 31 | Info: Rail pressure, speed Limitation active: Limitation caused by ihigh rail temperature | Info: Torque Limitation active | none |
| 519859 | 0 | Info: Torque Limitation active: OBD performance limiter is active. | Info: Torque Limitation active | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 519996 | 1 | Fuel pressure control: Insufficient rail pressure, fuel injection release inhibited | Fuel pressure | none |
| 520194 | 3 | Throttle Valve: Short circuit to battery on Out2 of H-bridge | None | YES (technical) |
| 520194 | 4 | Throttle Valve: Short circuit to ground on Out2 of H-bridge | None | YES (technical) |
| 520194 | 15 | Throttle Valve: Short circuit over load of H-bridge | None | none |
| 520194 | 5 | Throttle Valve: Under voltage of H-bridge | None | none |
| 520194 | 7 | Throttle Valve: Jammed valve in closed state | None | none |
| 520195 | 5 | Throttle Valve: Open load of H-Bridge | None | YES (technical) |
| 520195 | 6 | Throttle Valve: Over current of H-Bridge | None | none |
| 520195 | 15 | Throttle Valve: Over temperature of H-bridge | None | none |
| 520195 | 3 | Throttle Valve: Short circuit to battery on Out1 of H-bridge | None | YES (technical) |
| 520195 | 4 | Throttle Valve: Short circuit to ground on Out1 of H-bridge | None | YES (technical) |
| 520195 | 7 | Throttle Valve: Jammed valve in open state | None | none |
| 520344 | 31 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 1 issued | ECU Internal | none |
| 520344 | 11 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 11 issued | ECU Internal | none |
| 520345 | 31 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 12 issued | ECU Internal | none |
| 520345 | 11 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 15 issued | ECU Internal | none |
| 520346 | 31 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 16 issued | ECU Internal | none |
| 520346 | 11 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 3 issued | ECU Internal | none |
| 520347 | 31 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 4 issued | ECU Internal | none |
| 520347 | 11 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 7 issued | ECU Internal | none |
| 520348 | 31 | ECU Internal: Safety Management Unit Alarm Group 0 Failure 8 issued | ECU Internal | none |
| 520348 | 11 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 0 issued | ECU Internal | none |
| 520349 | 31 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 1 issued | ECU Internal | none |
| 520349 | 11 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 11 issued | ECU Internal | none |
| 520350 | 31 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 12 issued | ECU Internal | none |
| 520350 | 11 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 15 issued | ECU Internal | none |
| 520351 | 31 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 16 issued | ECU Internal | none |
| 520351 | 11 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 3 issued | ECU Internal | none |
| 520352 | 31 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 4 issued | ECU Internal | none |
| 520352 | 11 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 7 issued | ECU Internal | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 520353 | 31 | ECU Internal: Safety Management Unit Alarm Group 1 Failure 8 issued | ECU Internal | none |
| 520353 | 11 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 15 issued | ECU Internal | none |
| 520354 | 31 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 18 issued | ECU Internal | none |
| 520354 | 11 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 19 issued | ECU Internal | none |
| 520355 | 31 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 29 issued | ECU Internal | none |
| 520355 | 11 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 4 issued | ECU Internal | none |
| 520356 | 31 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 5 issued | ECU Internal | none |
| 520356 | 11 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 7 issued | ECU Internal | none |
| 520357 | 31 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 8 issued | ECU Internal | none |
| 520357 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 0 issued | ECU Internal | none |
| 520358 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 1 issued | ECU Internal | none |
| 520358 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 12 issued | ECU Internal | none |
| 520359 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 14 issued | ECU Internal | none |
| 520359 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 16 issued | ECU Internal | none |
| 520360 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 17 issued | ECU Internal | none |
| 520360 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 18 issued | ECU Internal | none |
| 520361 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 19 issued | ECU Internal | none |
| 520361 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 2 issued | ECU Internal | none |
| 520362 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 20 issued | ECU Internal | none |
| 520362 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 26 issued | ECU Internal | none |
| 520363 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 27 issued | ECU Internal | none |
| 520363 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 28 issued | ECU Internal | none |
| 520364 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 3 issued | ECU Internal | none |
| 520364 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 4 issued | ECU Internal | none |
| 520365 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 5 issued | ECU Internal | none |
| 520365 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 6 issued | ECU Internal | none |
| 520366 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure7 issued | ECU Internal | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 520366 | 11 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 8 issued | ECU Internal | none |
| 520367 | 31 | ECU Internal: Safety Management Unit Alarm Group 3 Failure 9 issued | ECU Internal | none |
| 520367 | 11 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 1 issued | ECU Internal | none |
| 520368 | 31 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 10 issued | ECU Internal | none |
| 520368 | 11 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 17 issued | ECU Internal | none |
| 520369 | 31 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 18 issued | ECU Internal | none |
| 520369 | 11 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 2 issued | ECU Internal | none |
| 520370 | 31 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 5 issued | ECU Internal | none |
| 520370 | 11 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 6 issued | ECU Internal | none |
| 520371 | 31 | ECU Internal: Safety Management Unit Alarm Group 4 Failure 9 issued | ECU Internal | none |
| 520371 | 11 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 1 issued | ECU Internal | none |
| 520372 | 31 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 11 issued | ECU Internal | none |
| 520372 | 11 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 12 issued | ECU Internal | none |
| 520373 | 31 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 15 issued | ECU Internal | none |
| 520373 | 11 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 16 issued | ECU Internal | none |
| 520374 | 31 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 3 issued | ECU Internal | none |
| 520374 | 11 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 4 issued | ECU Internal | none |
| 520375 | 31 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 7 issued | ECU Internal | none |
| 520375 | 11 | ECU Internal: Safety Management Unit Alarm Group 6 Failure 8 issued | ECU Internal | none |
| 520379 | 11 | ECU Internal: Safety Management Unit Alarm Group 2 Failure 30 issued | ECU Internal | none |
| 520380 | 31 | Vehicle CAN Buffer overflow MCAN | CAN Bus | none |
| 520381 | 31 | Engine CAN BUffer overflow MCANR | CAN Bus | none |
| 520497 | 7 | SCR Heater Relay: Stuck closed | None | none |
| 520498 | 7 | SCR Heater Relay: Stuck open | None | none |
| 520499 | 5 | SCR External Relay: NO Load Error | None | none |
| 520499 | 6 | SCR External Relay: Over Temperature Error | None | none |
| 520499 | 3 | SCR External Relay: Short Circuit to Battery Error | None | none |
| 520499 | 4 | SCR External Relay: Short Circuit to Ground Error | None | none |
| 522002 | 31 | SCR monitoring: DEF pressure reduction error | None | none |
| 522003 | 31 | SCR Reagent Heating: FET error (Pressure Line Heater) | None | none |
| 522005 | 31 | DEF Backflow Pump: No Load error | SCR Reagent Feeding | none |

| SPN | FMI | Title | Component | Performance Limiter |
|---|---|---|---|---|
| 522006 | 31 | DEF Backflow Pump: Over Temperature error | SCR Reagent Feeding | none |
| 522007 | 31 | DEF Backflow Pump: Short Circuit to Battery error | SCR Reagent Feeding | none |
| 522008 | 31 | DEF Backflow Pump: Short Circuit to Ground error | SCR Reagent Feeding | none |

## 10.1.2. DTCs – Transmission Control Unit (TCU)

### 10.1.2.1 OOS Models

#### 10.1.2.1.1 E060 - Transmission Electronic Control Unit internal failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

#### 10.1.2.1.2 E061 - Transmission Electronic Control Unit internal failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

#### 10.1.2.1.3 E062 - Historical data replaced corrupted

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |
|---|

| | |
|---|---|
| 1. **Calibration of the clutch pedal and pressure sensors**<br>• Use the electronic tool to reset the parameters:<br>- clutch pedal<br>- forward high pressure sensor<br>- forward low pressure sensor<br>- reverse pressure sensor | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br>If the system does not function properly:<br>• Replace the control module<br>• Remake the calibration of the parameters |

### 10.1.2.1.4 E063 - FLASH MEMORY calibration parameters corruption

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the clutch pedal and pressure sensors**<br>• Use the electronic tool to reset the parameters:<br>- clutch pedal<br>- forward high pressure sensor<br>- forward low pressure sensor<br>- reverse pressure sensor | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br>If the system does not function properly:<br>• Replace the control module<br>• Remake the calibration of the parameters |

### 10.1.2.1.5 E064 - FLASH MEMORY writing failure

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the clutch pedal and pressure sensors**<br>• Use the electronic tool to reset the parameters:<br>- clutch pedal<br>- forward high pressure sensor<br>- forward low pressure sensor<br>- reverse pressure sensor | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br>If the system does not function properly:<br>• Replace the control module<br>• Remake the calibration of the parameters |

## 10.1.2.1.6 E065 - CAN Bus, High Error Rate

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

1. **Check the value of CAN bus resistance on diagnosis socket**

   - Switch OFF ignition.
   - Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CH_D_SKT connector) between:
   - pin 3 and 4

**Specification:**

CAN bus resistance: ……60 Ohms (±5%)

**OK:** Go to **2.**

**NOT OK:**

- Disconnect the CAN bus terminator (R994) from P_CH_CAN_B_RES connector and use a multimeter to check the value of resistance on terminator between:
  - pin A and B

If resistance does not respect the specific:

- Replace resistance.

**Specification:**
CAN bus resistance: ……120 Ohms (±5%)

- Disconnect the connector P_CH_TRAX.
- Check the absence of continuity between:
  - pin 27 and 55 of P_CH_TRAX
- Check the presence of continuity between:
  - pin 27 of P_CH_TRAX and any pins of the CAN-H line
  - pin 55 of P_CH_TRAX and any pins of the CAN-L line

***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*

- Check for short to ground.
  Check the absence of continuity between:
  - pin 27 of P_CH_TRAX and ground
  - pin 55 of P_CH_TRAX and ground
- Check for short to positive.
  Switch ON ignition.
  Check the voltage between:
  - pin 27 of P_CH_TRAX and ground
  - pin 55 of P_CH_TRAX and ground

**Specification:**
Voltage on pin 27 and 55: ……0 Volt

- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.
- Repair or replace harnesses as needed.

| | |
|---|---|
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.7 E066 - Transmission Electronic Control Unit supply voltage is under 9V

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on the transmission control unit**<br><br>• Disconnect the connector P_CH_TRAX of the transmission control unit (A057).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage on P_CH_TRAX connector between:<br><br>• pin 1 and 29<br>• pin 8 and 29<br>• pin 34 and 29<br>• pin 35 and 29<br>• pin 36 and 29<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>- Only if voltage is low, use a multimeter to check the voltage on battery between:<br><br>- The positive pole and the negative pole<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±5%)<br><br>- If the voltage is not as per specification, replace or recharge the battery as needed.<br><br>- Switch OFF ignition.<br><br>- Check that the line fuses F7 and F8 are OK.<br><br>- If any fuse is broken, check for short to ground on affected line of the circuit.<br><br>- Check the presence of continuity between:<br><br>- pin 1 and fuse F8<br>- pin 8 and fuse F7<br>- pin 34 and fuse F7<br>- pin 35 and fuse F7<br>- pin 36 and fuse F7<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>- Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.8 E067 - Transmission Electronic Control Unit supply voltage is over 16V

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check the alternator**<br><br>• Start the vehicle.<br><br>• Use a multimeter to check the supply voltage on battery between:<br><br>- The positive pole and the negative pole<br><br>**Specification:**<br>Supply voltage on battery: ……14 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>- Switch OFF ignition.<br><br>- Repair or replace the alternator. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.9 E068 - Sensor supply voltage is under 4.5V

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check for short to ground**<br><br>• Disconnect connectors P_CH_TRAX and P_CH_PS.<br><br>• Use a multimeter to check the absence of continuity on P_CH_TRAX between:<br><br>• pin 15 and ground | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>- Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.10 E069 - Sensor supply voltage is over 5.5V

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check for short on positive**<br><br>• Disconnect connectors P_CH_TRAX and P_CH_PS.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the voltage on P_CH_TRAX connector between:<br><br>• pin 15 and ground<br><br>**Specification:**<br>Voltage on pin 15: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>- Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or line breaks.<br><br>- Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.11 E070 - Overcurrent detected on Forward Low Clutch

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check the solenoid of the forward low solenoid valve**<br><br>• Disconnect connector P_CH_FL from forward low solenoid valve (Y508).<br><br>• Use a multimeter to check on the forward low solenoid valve the solenoid resistance between:<br><br>• pin 1 and 2<br><br>**Specification:**<br>Solenoid resistance: ……2,2 Ohm (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace forward low solenoid valve. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.12 E071 - Overcurrent detected on Forward High or Reverse clutch

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check the solenoids of the forward high and reverse solenoid valves**<br><br>• Disconnect connectors P_CH_FH from forward high valve (Y507) and P_CH_RV from reverse valve (Y233).<br><br>• Use a multimeter to check on both valves the solenoid resistance between:<br><br>• pin 1 and 2<br><br>**Specification:**<br>Solenoid resistance: ……2,2 Ohm (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace damaged solenoid valve. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.13 E072 - Overcurrent detected on main ring valve HS supply pin

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check the solenoid of the main ring valve**<br><br>• Disconnect the P_CH_MR connector from main ring valve (Y506).<br><br>• Use a multimeter to check on the valve the solenoid resistance between:<br><br>• pin 1 and 2<br><br>**Specification:**<br>Solenoid resistance: ……8 Ohm (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace main ring valve. |

| | |
|---|---|
| 2. **Check for short to ground**<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check the absence of continuity on connector P_CH_TRAX between:<br>• pin 39 and ground | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harnesses as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.14 E073 - All outputs overcurrent

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>- Replace the control module. |

### 10.1.2.1.15 E074 - FNR Lever is applying Forward and Reverse signals simultaneously to Transmission Electronic Control Unit

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check FNR lever**<br>• Disconnect connector P_D_FNR from the FNR lever (C073).<br>• Check FNR lever contacts.<br>• With FNR lever in neutral position, use a multimeter to check the absence of continuity between:<br>- pin 2 (N) and 3 (F)<br>- pin 2 (N) and 4 (R)<br>- pin 3 (F) and 4 (R) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace FNR lever. |

| | |
|---|---|
| 2. **Check continuity**<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check on connector P_CH_TRAX the absence of continuity between:<br>- pin 18 and 19 | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 3. **Check for short to positive**<br>• Switch ON ignition.<br>• Check the voltage on connector P_CH_TRAX between:<br>- pin 18 and ground<br>- pin 19 and ground<br>**Specification:**<br>Voltage on pins 18 and 19: ……0 Volt | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.16 E075 - FNR Lever is applying Forward and Neutral signals simultaneously to Transmission Electronic Control Unit

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check FNR lever**<br>• Disconnect connector P_D_FNR from the FNR lever (C073).<br>• Check FNR lever contacts.<br>• With FNR lever in neutral position, use a multimeter to check the absence of continuity between:<br>- pin 2 (N) and 3 (F)<br>- pin 2 (N) and 4 (R)<br>- pin 3 (F) and 4 (R) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace FNR lever. |

| | |
|---|---|
| 2. **Check continuity**<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check on connector P_CH_TRAX the absence of continuity between:<br>- pin 18 and 46 | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 3. **Check for short to positive**<br>• Switch ON ignition.<br>• Check the voltage on connector P_CH_TRAX between:<br>- pin 18 and ground<br>- pin 46 and ground<br>**Specification:**<br>Voltage on pins 18 and 46: ……0 Volt | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.17 E076 - FNR Lever is applying Neutral and Reverse signals simultaneously to Transmission Electronic Control Unit

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check FNR lever**<br>• Disconnect connector P_D_FNR from the FNR lever (C073).<br>• Check FNR lever contacts.<br>• With FNR lever in neutral position, use a multimeter to check the absence of continuity between:<br>- pin 2 (N) and 3 (F)<br>- pin 2 (N) and 4 (R)<br>- pin 3 (F) and 4 (R) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace FNR lever. |

| | |
|---|---|
| 2. **Check continuity**<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check on connector P_CH_TRAX the absence of continuity between:<br>- pin 19 and 46 | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 3. **Check for short to positive**<br>• Switch ON ignition.<br>• Check the voltage on connector P_CH_TRAX between:<br>- pin 19 and ground<br>- pin 46 and ground<br>**Specification:**<br>Voltage on pins 19 and 46: ……0 Volt | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.18 E077 - FNR Lever is applying simultaneously Forward, Neutral and Reverse signals to Transmission Electronic Control Unit

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check FNR lever**<br>• Disconnect connector P_D_FNR from the FNR lever (C073).<br>• Check FNR lever contacts.<br>• With FNR lever in neutral position, use a multimeter to check the absence of continuity between:<br>- pin 2 (N) and 3 (F)<br>- pin 2 (N) and 4 (R)<br>- pin 3 (F) and 4 (R) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace FNR lever. |

| | |
|---|---|
| 2. **Check continuity**<br><br>• Disconnect the transmission control unit connector P_CH_TRAX.<br><br>• Check on connector P_CH_TRAX the absence of continuity between:<br><br>- pin 18 and 19<br>- pin 18 and 46<br>- pin 19 and 46 | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 3. **Check for short to positive**<br><br>• Switch ON ignition.<br><br>• Check the voltage on connector P_CH_TRAX between:<br><br>- pin 18 and ground<br>- pin 19 and ground<br>- pin 46 and ground<br><br>**Specification:**<br>Voltage on pins 18, 19 and 46: ……0 Volt | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.19 E078 - PWM benches supplied with FNR lever in Neutral position or clutch pedal completely pressed

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check for short to positive**<br><br>• Disconnect the transmission control unit connector P_CH_TRAX.<br><br>• Disconnect PWM ENABLER relay (K990).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the voltage on PWM ENABLER connection side between:<br><br>- pin 87A and ground<br><br>**Specification:**<br>Voltage on pin 87A of PWM ENABLER: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

| | |
|---|---|
| 2. **Check PWM ENABLER relay (K990)**<br><br>• Check relay contacts:<br><br>- Check the presence of continuity between pin 30 and 87A<br><br>- Check the absence of continuity between pin 30 and 87<br><br>**Specification:**<br>Contacts 30 and 87A: ……normally closed<br>Contacts 30 and 87: ……normally open | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace relay. |
| 3. **Check supply voltage on PWM ENABLER connection side**<br><br>• With clutch pedal completely pressed and FNR lever in forward or reverse position, check the supply voltage of the relay between:<br><br>- pin 85 and 86<br><br>• With clutch pedal not pressed and FNR lever in neutral position, check the supply voltage of the relay between:<br><br>- pin 85 and 86<br><br>• Check the voltage between:<br><br>- pin 85 and 30<br><br>**Specification:**<br>Supply voltage of PWM ENABLER: ……12 Volt (±5%) | **OK:** Go to **9.**<br><br>**NOT OK:**<br><br>If there is not voltage with clutch pedal completely pressed, go to **4**.<br><br>If there is not voltage with FNR lever in neutral position, go to **5**.<br><br>If there is not voltage at all, go to **6**.<br><br>If there is voltage between pins 85 and 30, go to **7**. |
| 4. **Check clutch pedal end stroke switch**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_END_STK_ SW from the clutch pedal end stroke switch (Z115).<br><br>• Check clutch pedal end stroke contacts.<br>Check the absence of continuity between:<br><br>- pin 1 and 2<br><br>**Specification:**<br>Contacts 1 and 2: ……normally open | **OK:** Go to **8.**<br><br>**NOT OK:**<br><br>• Replace clutch pedal end stroke. |

| | |
|---|---|
| 5. **Check FNR lever**<br>• Switch OFF ignition.<br>• Disconnect connector P_D_FNR from the FNR lever (C073).<br>• Check FNR lever contacts.<br>Check the continuity between:<br>- pin 1 (COM) and 2 (N)<br>***NOTE:*** *There must be continuity only if FNR lever is in neutral position.* | **OK:** Go to **8.**<br>**NOT OK:**<br>• Replace FNR lever. |
| 6. **Check ground cable**<br>• Check the presence of continuity between:<br>- pin 85 (on PWM ENABLER connection side) and ground<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **7.**<br>**NOT OK:**<br>• Check wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or line breaks.<br>• Repair or replace as needed. |
| 7. **Check for short to ground**<br>• Check for short to ground.<br>Check the absence of continuity between:<br>- pin 86 (on PWM ENABLER connection side) and ground | **OK:** Go to **8.**<br>**NOT OK:**<br>• Check wirings to detect the presence of broken connectors, bent pins or line breaks.<br>• Repair or replace as needed. |
| 8. **Check wiring harness**<br>• Check the presence of continuity between:<br>- pin 86 of PWM ENABLER and pin 2 of P_D_END_STK_SW<br>- pin 87A of PWM ENABLER and any of the pins 2, 5, 30, 31, 32 or 33 of P_CH_TRAX<br>***Attention:*** *Connect red end-piece on PWM ENABLER and black end-piece on P_D_END_STK_SW and P_CH_TRAX.*<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **9.**<br>**NOT OK:**<br>• Check wirings to detect the presence of broken diodes, broken connectors, slid-back or corroded contacts, bent pins or line breaks.<br>• Repair or replace as needed. |
| 9. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

## 10.1.2.1.20 E080 - Clutch pedal angular sensor output voltage is too high

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check for short positive on the sensor output**<br><br>• Disconnect the transmission control unit connector P_CH_TRAX and the clutch pedal position sensor connector P_D_POS_SENS.<br><br>• Check for short to positive.<br>Switch ON ignition.<br>Use a multimeter to check the voltage on connector P_D_POS_SENS between:<br><br>- pin 3 and ground<br><br>**Specification:**<br>Voltage on pin 3 of P_D_POS_SENS: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission ECU, replace the angular sensor and clear the fault code.<br><br>If the fault code reappears, replace the control module. |

## 10.1.2.1.21 E081 - Clutch pedal angular sensor output voltage is too low

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check for short ground on the sensor output**<br><br>• Disconnect the transmission control unit connector P_CH_TRAX and the clutch pedal position sensor connector P_D_POS_SENS.<br><br>• Use a multimeter to check the absence of continuity on connector P_D_POS_SENS between:<br><br>- pin 3 and ground | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

| | |
|---|---|
| 2. **Check the line resistance**<br><br>• Check the line resistance between:<br><br>- pin 3 of P_D_POS_SENS and pin 16 of P_CH_TRAX<br><br>**Specification:**<br>Line resistance near to: ……0 Ohm | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 3. **Check the supply voltage of the angular sensor**<br><br>• Switch ON ignition.<br><br>• Check the supply voltage on connector P_D_POS_SENS between:<br><br>- pin 1 and 2<br><br>**Specification:**<br>Supply voltage of the position sensor: ……12 Volt (±5%) | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check the supply cables to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission ECU, replace the angular sensor and clear the fault code.<br><br>If the fault code reappears, replace the control module. |

## 10.1.2.1.22 E082 - Clutch pedal angular sensor signal is under stroke minimum value (lower than 100 digit)

| | |
|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Calibration of the clutch pedal position sensor B361**<br><br>• Use the electronic tool to reset the parameters of the clutch pedal position sensor. | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br><br>If the system does not function properly:<br><br>• Replace the control module<br><br>• Remake the calibration of the parameters |

### 10.1.2.1.23 E083 - Clutch pedal angular sensor signal is over stroke maximum value (higher than 990 digit)

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the clutch pedal position sensor B361**<br><br>• Use the electronic tool to reset the parameters of the clutch pedal position sensor. | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br><br>If the system does not function properly:<br><br>• Replace the control module<br><br>• Remake the calibration of the parameters |

### 10.1.2.1.24 E084 - Clutch pedal angular sensor and switch signals are not consistent (switch pressed signal at stroke over 20% or switch not pressed signal at 0% of stroke)

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the clutch pedal position sensor B361**<br><br>• Use the electronic tool to reset the parameters of the clutch pedal position sensor. | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br><br>If the system does not function properly:<br><br>• Replace the control module<br><br>• Remake the calibration of the parameters |

### 10.1.2.1.25 E085 - Differential pressure presence detected without engine being on

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check that the connector P_CH_FILTER_CL (75CV) or P_E_FILTER_CL (100CV) is connected to the oil filter clogged switch Z102** | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Reconnect the connector. |

| | |
|---|---|
| 2. **Check the line voltage**<br><br>• Disconnect the connector P_CH_FILTER_CL (75CV) or P_E_FILTER_CL (100CV) from oil filter clogged sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the voltage on connector P_CH_FILTER_CL (75CV) or P_E_FILTER_CL (100CV) between:<br><br>- pin 1 and ground<br><br>**Specification:**<br>Voltage between pin 1 and ground: …12 Volt (±5%) | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>If there is no voltage at all, go to **3**.<br><br>If there is voltage, but it is not as per specification:<br><br>• Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 3. **Check the fuse**<br><br>• Switch OFF ignition.<br><br>• Check the line fuse F6. | **OK:** Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>Repair or replace as needed.<br><br>**NOT OK:**<br><br>Before replacing the fuse F6, check for short to ground.<br><br>• Check the absence of continuity between:<br><br>• pin 1 of P_CH_FILTER_CL (75CV) or P_E_FILTER_CL (100CV) and ground<br>• pin 2 of P_CH_FILTER_CL (75CV) or P_E_FILTER_CL (100CV) and ground<br><br>• Check the wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check the oil filter clogged sensor contacts**<br><br>• Check the presence of continuity between the sensor contacts:<br><br>- pin 1 and 2<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Replace the sensor. |

| | |
|---|---|
| 5. **Check the continuity**<br><br>• Disconnect the transmission control unit connector P_CH_TRAX.<br><br>• Switch OFF ignition.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_CH_FILTER_CL (75CV) or P_E_ FILTER_CL (100CV) and fuse F6<br>- pin 2 of P_CH_FILTER_CL (75CV) or P_E_FIL-TER_CL (100CV) and pin 49 of P_CH_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **6.**<br><br>**NOT OK:**<br><br>• Check the wirings to detect the presence of broken con-nectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 6. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.26 E086 - Differential pressure detected on filter with engine on and oil temperature over 20°C

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check oil filter**<br><br>• Turn OFF engine.<br><br>• Switch ON ignition.<br><br>• Check if error code E085 is displayed. | **OK (error code E085 is displayed):** Go to **2.**<br><br>**NOT OK (error code E085 is not displayed):**<br><br>• Replace oil cartridge. |
| 2. **See error code E085** | |

### 10.1.2.1.27 E087 - Main ring line low pressure (less than 7 bar)

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|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check for short to positive**<br>• Disconnect the transmission control unit connector P_CH_TRAX and the oil pressure switch connector P_CH_O_PSW.<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage on connector P_CH_O_PSW between:<br>- pin 2 and ground<br>**Specification:**<br>Voltage on pin 2: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Check the wirings to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 2. **Check oil pressure switch Z184**<br>• Reconnect the connectors P_CH_TRAX and P_CH_O_PSW.<br>• Turn ON engine.<br>• Make hydraulic test using the hydraulic test kit. | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the pressure switch. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.28 E088 - Clutches main ring pressure presence detected without engine being on

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check that the connector P_CH_O_PSW is connected to the oil pressure switch Z184** | **OK:** Go to **2.**<br>**NOT OK:**<br>• Reconnect the connector. |

| | |
|---|---|
| 2. **Check the oil pressure switch Z184**<br>• Disconnect the connector P_CH_O_PSW.<br>• Use a multimeter to check the presence of continuity on connector P_CH_O_PSW between:<br>- pin 1 and 2<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3.**<br>**NOT OK:**<br>• Wear the protective devices and loosen the oil pressure switch to let out any residual pressure from the circuit.<br>• Reinstall the oil pressure switch.<br>• Reconnect the connector P_CH_O_PSW.<br>• Turn ON engine.<br>• Make hydraulic test using the hydraulic test kit.<br>If the check is not OK:<br>• Replace the oil pressure switch. |
| 3. **Check for short to ground**<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check the continuity on connector P_CH_O_PSW between:<br>- pin 1 and ground<br>- pin 2 and ground<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check the wiring harnesses to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

## 10.1.2.1.29 E089 - Clutches main ring pressure presence detected without valve being powered and engine on

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check that the main ring valve Y506 is not stuck open doing hydraulic and mechanical tests** | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace the main ring valve. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.30 E090 - Oil temperature is under –20 °C

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Warm the oil**<br>• Keep the engine running for 10÷15 minutes.<br>• Turn OFF engine.<br>• Wait approximately 30 seconds.<br>• Turn ON engine. | **OK:** END of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission ECU, replace the oil temperature sensor and clear the fault code.<br><br>If the fault code reappears:<br><br>- Replace the control module. |

### 10.1.2.1.31 E091 - Oil temperature is over 120 °C

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Cool the oil**<br>• Keep the engine idling for 10÷15 minutes.<br>• Turn OFF engine.<br>• Wait approximately 30 seconds.<br>• Turn ON engine. | **OK:** END of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check the cooling system** | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>Follow the instruction in the dedicated chapter in the service manual to repair the system. |

| | |
|---|---|
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission ECU, replace the oil temperature sensor and clear the fault code.<br><br>If the fault code reappears:<br><br>- Replace the control module. |

### 10.1.2.1.32 E092 - Oil temperature sensor signal too high

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check that the connector P_CH_TS is connected to the oil temperature sensor B123** | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Reconnect the connector. |
| 2. **Check the resistance value of the oil temperature sensor**<br><br>• Disconnect the connector P_CH_TS from the oil temperature sensor B123.<br><br>• Use a multimeter to check, on sensor, the resistance value between:<br><br>- pin 1 and 2<br><br>**Specification:**<br>Nominal resistance at 20 °C: ……2,5 kΩ<br>Measuring range: ……-30÷130 °C<br>Accuracy: ……±1K<br>Response time 90%: ……< 10 s | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the oil temperature sensor. |
| 3. **Check the contacts of the calibration hidden button that are not stuck**<br><br>• Disconnect the connector P_D_CAL_ BUTT from calibration hidden button S271.<br><br>• Check, on the switch S271, the absence of continuity between:<br><br>- pin 1 and 2 | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Replace the calibration hidden button. |

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|---|---|
| 4. **Check for short to ground**<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check the absence of continuity on connector P_CH_TS between:<br>- pin 1 and ground | **OK:** Go to **5.**<br>**NOT OK:**<br>• Check the wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.33 E093 - Oil temperature sensor signal too low

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the resistance value of the oil temperature sensor**<br>• Disconnect the connector P_CH_TS from the oil temperature sensor B123.<br>• Use a multimeter to check, on sensor, the resistance value between:<br>- pin 1 and 2<br>**Specification:**<br>Nominal resistance at 20 °C: ……2,5 kΩ<br>Measuring range: ……-30÷130 °C<br>Accuracy: ……±1K<br>Response time 90%: ……< 10 s | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace the oil temperature sensor. |
| 2. **Check for short to positive on the oil temperature sensor output**<br>• Switch ON ignition.<br>• Check the voltage on connector P_CH_TS between:<br>- pin 1 and ground<br>**Specification:**<br>Voltage on pin 1: ……5 Volt (±5%) | **OK:** Go to **3.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check the wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |

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|---|---|
| 3. **Check the continuity on the oil temperature sensor output**<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check the presence of continuity between:<br>- pin 1 of P_CH_TS and 43 of P_CH_TRAX<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.34 E094 - Forward High clutch valve coil no current feedback with command

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check the coil of the forward high clutch solenoid valve Y507 on another circuit**<br>• Disconnect the connectors P_CH_FH and P_CH_RV from their solenoid valves.<br>• Remove and reverse the coils from their solenoid valves.<br>• Reconnect the connectors P_CH_FH and P_CH_RV to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E100 is not displayed. | **OK (error code E094 is displayed):** Go to **3.**<br>**NOT OK (error code E100 is displayed):**<br>Go to **2.** |

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|---|---|
| 2. **Check the coil of the forward high clutch solenoid valve**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Use a multimeter to check on the forward high clutch solenoid valve the coil resistance between:<br>• pin 1 and 2<br><br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br><br>**NOT OK:**<br>• Replace the coil of the forward high clutch solenoid valve. |
| 3. **Check the continuity**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check the presence of continuity between:<br>• pin 1 of P_CH_FH and 6 of P_CH_TRAX<br>• pin 2 of P_CH_FH and 13 of P_CH_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check for short to ground**<br>• Check the absence of continuity on connector P_CH_FH between:<br>• pin 1 and ground<br>• pin 2 and ground | **OK:** Go to **5.**<br><br>**NOT OK:**<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.35 E095 - Forward High clutch valve coil current feedback detected when valve is not supplied

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check for short to positive**<br><br>• Disconnect the connector P_CH_FH from forward high clutch solenoid valve Y507.<br><br>• Switch ON ignition.<br><br>• Check the voltage on connector P_CH_FH between:<br><br>- pin 1 and ground<br>- pin 2 and ground<br><br>**Specification:**<br>Voltage on pins 1 and 2: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.36 E096 - Forward High clutch valve coil difference between measured and reference current

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the coil of the forward high clutch solenoid valve Y507 on another circuit**<br><br>• Disconnect the connectors P_CH_FH and P_CH_RV from their solenoid valves.<br><br>• Remove and reverse the coils from their solenoid valves.<br><br>• Reconnect the connectors P_CH_FH and P_CH_RV to the solenoid valves of their circuits.<br><br>• Turn ON engine.<br><br>• Drive the vehicle in reverse mode.<br><br>• Check that the error code E102 is not displayed. | **OK (error code E096 is displayed):** Go to **3.**<br><br>**NOT OK (error code E102 is displayed):**<br><br>Go to **2.** |

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|---|---|
| 2. **Check the coil of the forward high clutch solenoid valve**<br><br>• Switch OFF ignition.<br><br>• Restore the initial state (remove and reinvert the coils).<br><br>• Use a multimeter to check on the forward high clutch solenoid valve the coil resistance between:<br><br>• pin 1 and 2<br><br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the coil of the forward high clutch solenoid valve. |
| 3. **Check the circuit**<br><br>• Switch OFF ignition.<br><br>• Disconnect the transmission control unit connector P_CH_TRAX.<br><br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Check the line resistance between:<br><br>• pin 1 of P_CH_FH and 6 of P_CH_TRAX<br>• pin 2 of P_CH_FH and 13 of P_CH_TRAX<br><br>**Specification:**<br>Line resistance near: ……0 Ohm | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.37 E097 - Forward Low clutch valve coil no current feedback with command

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check the coil of the forward low clutch solenoid valve Y508 on another circuit**<br><br>• Disconnect the connectors P_CH_FL and P_CH_RV from their solenoid valves.<br><br>• Remove and reverse the coils from their solenoid valves.<br><br>• Reconnect the connectors P_CH_FL and P_CH_RV to the solenoid valves of their circuits.<br><br>• Turn ON engine.<br><br>• Drive the vehicle in reverse mode.<br><br>• Check that the error code E100 is not displayed. | **OK (error code E097 is displayed):** Go to **3.**<br><br>**NOT OK (error code E100 is displayed):**<br><br>Go to **2.**. |
| 2. **Check the coil of the forward low clutch solenoid valve**<br><br>• Switch OFF ignition.<br><br>• Restore the initial state (remove and reinvert the coils).<br><br>• Use a multimeter to check on the forward low clutch solenoid valve the coil resistance between:<br><br>• pin 1 and 2<br><br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the coil of the forward low clutch solenoid valve. |
| 3. **Check the continuity**<br><br>• Switch OFF ignition.<br><br>• Restore the initial state (remove and reinvert the coils).<br><br>• Disconnect the transmission control unit connector P_CH_TRAX.<br><br>• Check the presence of continuity between:<br><br>• pin 1 of P_CH_FL and 3 of P_CH_TRAX<br>• pin 2 of P_CH_FL and 12 of P_CH_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

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|---|---|
| 4. **Check for short to ground**<br>• Check the absence of continuity on connector P_CH_FL between:<br>• pin 1 and ground<br>• pin 2 and ground | **OK:** Go to **5.**<br>**NOT OK:**<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.38 E098 - Forward Low clutch valve coil current feedback detected when valve is not supplied

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check for short to positive**<br>• Disconnect the connector P_CH_FL from forward high clutch solenoid valve Y508.<br>• Switch ON ignition.<br>• Check the voltage on connector P_CH_FL between:<br>- pin 1 and ground<br>- pin 2 and ground<br>**Specification:**<br>Voltage on pins 1 and 2: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.39 E099 - Forward Low clutch valve coil difference between measured and reference current

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check the coil of the forward low clutch solenoid valve Y508 on another circuit**<br>• Disconnect the connectors P_CH_FL and P_CH_RV from their solenoid valves.<br>• Remove and reverse the coils from their solenoid valves.<br>• Reconnect the connectors P_CH_FL and P_CH_RV to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E102 is not displayed. | **OK (error code E099 is displayed):** Go to **3.**<br>**NOT OK (error code E102 is displayed):**<br>Go to **2.** |
| 2. **Check the coil of the forward low clutch solenoid valve**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Use a multimeter to check on the forward low clutch solenoid valve the coil resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the coil of the forward low clutch solenoid valve. |
| 3. **Check the circuit**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Check the line resistance between:<br>• pin 1 of P_CH_FL and 3 of P_CH_TRAX<br>• pin 2 of P_CH_FL and 12 of P_CH_TRAX<br>**Specification:**<br>Line resistance near: ……0 Ohm | **OK:** Go to **4.**<br>**NOT OK:**<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

## 10.1.2.1.40 E100 - Reverse clutch valve coil no current feedback with command

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the coil of the reverse clutch solenoid valve Y233 on another circuit**<br>• Disconnect the connectors P_CH_FL and P_CH_RV from their solenoid valves.<br>• Remove and reverse the coils from their solenoid valves.<br>• Reconnect the connectors P_CH_FL and P_CH_RV to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E097 is not displayed. | **OK (error code E100 is displayed):** Go to **3.**<br>**NOT OK (error code E097 is displayed):**<br>Go to **2.** |
| 2. **Check the coil of the reverse clutch solenoid valve**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Use a multimeter to check on the reverse clutch solenoid valve the coil resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the coil of the reverse clutch solenoid valve. |
| 3. **Check the continuity**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check the presence of continuity between:<br>• pin 1 of P_CH_RV and 7 of P_CH_TRAX<br>• pin 2 of P_CH_RV and 41 of P_CH_TRAX<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |

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|---|---|
| 4. **Check for short to ground**<br>• Check the absence of continuity on connector P_CH_RV between:<br>• pin 1 and ground<br>• pin 2 and ground | **OK:** Go to **5.**<br>**NOT OK:**<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.41 E101 - Reverse clutch valve coil current feedback detected when valve is not supplied

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check for short to positive**<br>• Disconnect the connector P_CH_RV from reverse clutch solenoid valve Y233.<br>• Switch ON ignition.<br>• Check the voltage on connector P_CH_RV between:<br>- pin 1 and ground<br>- pin 2 and ground<br>**Specification:**<br>Voltage on pins 1 and 2: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.42 E102 - Reverse clutch valve coil difference between measured and reference current

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the coil of the reverse clutch solenoid valve Y233 on another circuit**<br>• Disconnect the connectors P_CH_FL and P_CH_RV from their solenoid valves.<br>• Remove and reverse the coils from their solenoid valves.<br>• Reconnect the connectors P_CH_FL and P_CH_RV to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E099 is not displayed. | **OK (error code E102 is displayed):** Go to **3.**<br>**NOT OK (error code E099 is displayed):**<br>Go to **2.** |
| 2. **Check the coil of the reverse clutch solenoid valve**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Use a multimeter to check on the reverse clutch solenoid valve the coil resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the coil of the reverse clutch solenoid valve. |
| 3. **Check the circuit**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Check the line resistance between:<br>• pin 1 of P_CH_RV and 7 of P_CH_TRAX<br>• pin 2 of P_CH_RV and 41 of P_CH_TRAX<br>**Specification:**<br>Line resistance near: ……0 Ohm | **OK:** Go to **4.**<br>**NOT OK:**<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.43 E103 - Forward High clutch pressure sensor signal over maximum value (higher than 940 digit)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Calibration of the forward high clutch pressure sensor B384**<br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the supply voltage of the forward high clutch pressure sensor B384**<br>• Switch ON ignition.<br>• Use a multimeter to check, on the connector P_PRES_FH, the supply voltage between:<br>• pin A and B<br>**Specification:**<br>Supply voltage sensor: ……12 Volt | **OK:** Go to **3.**<br>**NOT OK (supply voltage over 5 volt):**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 3. **Check for short to positive on the sensor output line**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Switch ON ignition.<br>• Check the voltage between:<br>• pin C of P_PRES_FH and ground<br>**Specification:**<br>Voltage on pin C of connector P_PRES_FH: ……0 Volt | **OK:** Go to **4.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |

| | |
|---|---|
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission control unit:<br><br>• Replace the forward high clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br><br>If the system does not function properly:<br><br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.44 E104 - Forward High clutch pressure sensor signal under minimum value (lower than 40 digit)

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the forward high clutch pressure sensor B384**<br><br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check the supply voltage of the forward high clutch pressure sensor B384**<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check, on the connector P_PRES_FH, the supply voltage between:<br><br>• pin A and B<br><br>**Specification:**<br>Supply voltage sensor: ……12 Volt | **OK:** Go to **3.**<br><br>**NOT OK (supply voltage under 5 volt):**<br><br>• Switch OFF ignition.<br><br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

| | |
|---|---|
| 3. **Check sensor output line**<br><br>• Switch OFF ignition.<br><br>• Disconnect the transmission control unit connector P_CH_TRAX.<br><br>• Check the line resistance between:<br><br>• pin C of P_PRES_FH and 45 of P_CH_TRAX<br><br>**Specification:**<br>Line resistance near: ……0 Ohm<br><br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines. | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission control unit:<br><br>• Replace the forward high clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br><br>If the system does not function properly:<br><br>• Replace the control module.<br>• Remake the calibration of the parameters. |

## 10.1.2.1.45 E105 - Forward High clutch pressure lower than 0.250 bar when pressure requested

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the forward high clutch pressure sensor B384**<br><br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br><br>**NOT OK:**<br><br>Go to **2.** |

| | |
|---|---|
| 2. **Check the forward high clutch pressure sensor on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_PRES_FH and P_ PRES_RV from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_PRES_FH and P_ PRES_RV to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E117 is not displayed. | **OK (error code E105 is displayed):** Go to **3.**<br>**NOT OK (error code E117 is displayed):**<br>• Replace the forward high clutch pressure sensor B384. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward high clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.46 E106 - Forward High clutch pressure over 0.9 bar when clutch is not activated

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Calibration of the forward high clutch pressure sensor B384**<br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |

| | |
|---|---|
| 2. **Check the forward high clutch pressure sensor on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_PRES_FH and P_ PRES_RV from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_PRES_FH and P_ PRES_RV to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E118 is not displayed. | **OK (error code E106 is displayed):** Go to **3.**<br>**NOT OK (error code E118 is displayed):**<br>• Replace the forward high clutch pressure sensor B384. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward high clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.47 E107 - Forward High clutch pressure reference and measure differ of 0.5 bar

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the forward high clutch pressure sensor B384**<br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |

| | |
|---|---|
| 2. **Check the forward high clutch pressure sensor on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_PRES_FH and P_ PRES_RV from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_PRES_FH and P_ PRES_RV to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E119 is not displayed. | **OK (error code E107 is displayed):** Go to **3.**<br>**NOT OK (error code E119 is displayed):**<br>• Replace the forward high clutch pressure sensor B384. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward high clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.48 E108 - Forward High clutch proportional valve PI characteristic out of nominal ranges (150 mA)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the forward high clutch valve on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_CH_FH and P_CH_ RV from their solenoid valves.<br>• Remove and invert the valves from their circuits.<br>• Reconnect the connectors P_CH_FH and P_CH_ RV to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E120 is not displayed. | **OK (error code E108 is displayed):** Go to **3.**<br>**NOT OK (error code E120 is displayed):**<br>• Replace the forward high clutch valve Y507. |
| 2. **Check the forward high clutch pressure sensor on reverse circuit**<br>• Switch OFF ignition.<br>• Wear the protective devices.<br>• Disconnect the connectors P_CH_FH and P_CH_ RV from their sensors.<br>• Remove and invert the pressure sensors from their circuits.<br>• Reconnect the connectors P_CH_FH and P_CH_ RV to the pressure sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E120 is not displayed. | **OK (error code E108 is displayed):** Go to **4.**<br>**NOT OK (error code E120 is displayed):**<br>• Replace the forward high clutch pressure sensor B384. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the proportional valves and pressure sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission ECU, replace the forward high clutch proportional valve, replace the pressure sensor and clear the fault code.<br>If the system does not function properly:<br>• Replace the control module. |

### 10.1.2.1.49 E109 - Forward Low clutch pressure sensor signal over maximum value (higher than 940 digit)

| |
|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Calibration of the forward low clutch pressure sensor B385**<br><br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check the supply voltage of the forward low clutch pressure sensor B385**<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check, on the connector P_PRES_FL, the supply voltage between:<br><br>• pin A and B<br><br>**Specification:**<br>Supply voltage sensor: ……12 Volt | **OK:** Go to **3.**<br><br>**NOT OK (supply voltage over 5 volt):**<br><br>• Switch OFF ignition.<br><br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 3. **Check for short to positive on the sensor output line**<br><br>• Switch OFF ignition.<br><br>• Disconnect the transmission control unit connector P_CH_TRAX.<br><br>• Switch ON ignition.<br><br>• Check the voltage between:<br><br>• pin C of P_PRES_FL and ground<br><br>**Specification:**<br>Voltage on pin C of connector P_PRES_FL: ……0 Volt | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission control unit:<br><br>• Replace the forward low clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br><br>If the system does not function properly:<br><br>• Replace the control module.<br>• Remake the calibration of the parameters. |

## 10.1.2.1.50 E110 - Forward Low clutch pressure sensor signal under minimum value (lower than 40 digit)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Calibration of the forward low clutch pressure sensor B385**<br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the supply voltage of the forward low clutch pressure sensor B385**<br>• Switch ON ignition.<br>• Use a multimeter to check, on the connector P_PRES_FL, the supply voltage between:<br>• pin A and B<br>**Specification:**<br>Supply voltage sensor: ……12 Volt | **OK:** Go to **3.**<br>**NOT OK (supply voltage under 5 volt):**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 3. **Check sensor output line**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check the line resistance between:<br>• pin C of P_PRES_FL and 44 of P_CH_TRAX<br>**Specification:**<br>Line resistance near: ……0 Ohm<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines. | **OK:** Go to **4.**<br>**NOT OK:**<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward low clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.51 E111 - Forward Low clutch pressure lower than 0.250 bar when pressure requested

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the forward low clutch pressure sensor B385**<br><br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check the forward low clutch pressure sensor on reverse circuit**<br><br>• Wear the protective devices.<br><br>• Disconnect the connectors P_PRES_FL and P_ PRES_RV from their sensors.<br><br>• Remove and invert the sensors from their circuits.<br><br>• Reconnect the connectors P_PRES_FL and P_ PRES_RV to the sensors of their circuits.<br><br>• Turn ON engine.<br><br>• Drive the vehicle in reverse mode.<br><br>• Check that the error code E117 is not displayed. | **OK (error code E111 is displayed):** Go to **3.**<br><br>**NOT OK (error code E117 is displayed):**<br><br>• Replace the forward low clutch pressure sensor B385. |
| 3. **Check control module revision level**<br><br>• Switch OFF ignition.<br><br>• Restore the initial state (remove and reinvert the sensors).<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission control unit:<br><br>• Replace the forward low clutch pressure sensor.<br><br>• Remake the calibration of the parameters.<br><br>• Clear the fault code.<br><br>If the system does not function properly:<br><br>• Replace the control module.<br><br>• Remake the calibration of the parameters. |

### 10.1.2.1.52 E112 - Forward Low clutch pressure over 0.9 bar when clutch is not activated

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |
|---|

| | |
|---|---|
| 1. **Calibration of the forward low clutch pressure sensor B385**<br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the forward low clutch pressure sensor on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_PRES_FL and P_ PRES_RV from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_PRES_FL and P_ PRES_RV to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E118 is not displayed. | **OK (error code E112 is displayed):** Go to **3.**<br>**NOT OK (error code E118 is displayed):**<br>• Replace the forward low clutch pressure sensor B385. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward low clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.53 E113 - Forward Low clutch pressure reference and measure differ of 0.5 bar

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Calibration of the forward low clutch pressure sensor B385**<br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |

| | |
|---|---|
| 2. **Check the forward low clutch pressure sensor on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_PRES_FL and P_ PRES_RV from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_PRES_FL and P_ PRES_RV to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E119 is not displayed. | **OK (error code E113 is displayed):** Go to **3.**<br>**NOT OK (error code E119 is displayed):**<br>• Replace the forward low clutch pressure sensor B385. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward low clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.54 E114 - Forward Low clutch proportional valve PI characteristic out of nominal ranges (150 mA)

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|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check the forward low clutch valve on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_CH_FL and P_CH_ RV from their solenoid valves.<br>• Remove and invert the valves from their circuits.<br>• Reconnect the connectors P_CH_FL and P_CH_RV to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E120 is not displayed. | **OK (error code E114 is displayed):** Go to **3.**<br>**NOT OK (error code E120 is displayed):**<br>• Replace the forward low clutch valve Y508. |
| 2. **Check the forward low clutch pressure sensor on reverse circuit**<br>• Switch OFF ignition.<br>• Wear the protective devices.<br>• Disconnect the connectors P_CH_FL and P_CH_ RV from their sensors.<br>• Remove and invert the pressure sensors from their circuits.<br>• Reconnect the connectors P_CH_FL and P_CH_RV to the pressure sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E120 is not displayed. | **OK (error code E114 is displayed):** Go to **4.**<br>**NOT OK (error code E120 is displayed):**<br>• Replace the forward low clutch pressure sensor B385. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the proportional valves and pressure sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission ECU, replace the forward low clutch proportional valve, replace the pressure sensor and clear the fault code.<br>If the system does not function properly:<br>• Replace the control module. |

### 10.1.2.1.55 E115 - Reverse clutch pressure sensor signal over maximum value (higher than 940 digit)

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|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Calibration of the reverse clutch pressure sensor B383**<br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the supply voltage of the reverse clutch pressure sensor B383**<br>• Switch ON ignition.<br>• Use a multimeter to check, on the connector P_PRES_RV, the supply voltage between:<br>• pin A and B<br>**Specification:**<br>Supply voltage sensor: ……12 Volt | **OK:** Go to **3.**<br>**NOT OK (supply voltage over 5 volt):**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 3. **Check for short to positive on the sensor output line**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Switch ON ignition.<br>• Check the voltage between:<br>• pin C of P_PRES_RV and ground<br>**Specification:**<br>Voltage on pin C of connector P_PRES_RV: ……0 Volt | **OK:** Go to **4.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the reverse clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

## 10.1.2.1.56 E116 - Reverse clutch pressure sensor signal under minimum value (lower than 40 digit)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Calibration of the reverse clutch pressure sensor B383**<br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the supply voltage of the reverse clutch pressure sensor B383**<br>• Switch ON ignition.<br>• Use a multimeter to check, on the connector P_PRES_RV, the supply voltage between:<br>• pin A and B<br>**Specification:**<br>Supply voltage sensor: ……12 Volt | **OK:** Go to **3.**<br>**NOT OK (supply voltage under 5 volt):**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 3. **Check sensor output line**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Check the line resistance between:<br>• pin C of P_PRES_RV and 54 of P_CH_TRAX<br>**Specification:**<br>Line resistance near: ……0 Ohm<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines. | **OK:** Go to **4.**<br>**NOT OK:**<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the reverse clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.57 E117 - Reverse clutch pressure lower than 0.250 bar when pressure requested

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Calibration of the reverse clutch pressure sensor B383**<br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the reverse clutch pressure sensor on forward low circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_PRES_RV and P_PRES_FL from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_PRES_RV and P_PRES_FL to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E111 is not displayed. | **OK (error code E117 is displayed):** Go to **3.**<br>**NOT OK (error code E111 is displayed):**<br>• Replace the reverse clutch pressure sensor B383. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the reverse clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.58 E118 - Reverse clutch pressure over 0.9 bar when clutch is not activated

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Calibration of the reverse clutch pressure sensor B383**<br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the reverse clutch pressure sensor on forward low circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_PRES_RV and P_ PRES_FL from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_PRES_RV and P_ PRES_FL to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E112 is not displayed. | **OK (error code E118 is displayed):** Go to **3.**<br>**NOT OK (error code E112 is displayed):**<br>• Replace the reverse clutch pressure sensor B383. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the reverse clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.59 E119 - Reverse clutch pressure reference and measure differ of 0.5 bar

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Calibration of the reverse clutch pressure sensor B383**<br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |

| | |
|---|---|
| 2. **Check the reverse clutch pressure sensor on forward low circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_PRES_RV and P_PRES_FL from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_PRES_RV and P_PRES_FL to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E113 is not displayed. | **OK (error code E119 is displayed):** Go to **3.**<br>**NOT OK (error code E113 is displayed):**<br>• Replace the reverse clutch pressure sensor B383. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the reverse clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.60 E120 - Reverse clutch proportional valve PI characteristic out of nominal ranges (150 mA)

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. Check the reverse clutch valve on forward low circuit<br>• Wear the protective devices.<br>• Disconnect the connectors P_CH_RV and P_CH_FL from their solenoid valves.<br>• Remove and invert the valves from their circuits.<br>• Reconnect the connectors P_CH_RV and P_CH_FL to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E114 is not displayed. | OK (error code E120 is displayed): Go to 3.<br>NOT OK (error code E114 is displayed):<br>• Replace the reverse clutch valve Y233. |

| | |
|---|---|
| 2. Check the reverse clutch pressure sensor on forward low circuit<br>• Switch OFF ignition.<br>• Wear the protective devices.<br>• Disconnect the connectors P_CH_RV and P_CH_FL from their sensors.<br>• Remove and invert the pressure sensors from their circuits.<br>• Reconnect the connectors P_CH_RV and P_CH_FL to the pressure sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E114 is not displayed. | OK (error code E120 is displayed): Go to 4.<br>NOT OK (error code E114 is displayed):<br>• Replace the reverse clutch pressure sensor B383. |
| 3. Check control module revision level<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the proportional valves and pressure sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | OK: END of process.<br>NOT OK:<br>If the system does not function properly, before replacing the transmission ECU, replace the reverse clutch proportional valve, replace the pressure sensor and clear the fault code.<br>If the system does not function properly:<br>• Replace the control module. |

### 10.1.2.1.1 E121 - Forward High clutch unexpected slipping

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. Check clutches<br>• Start engine.<br>• Check that other clutches do not slip:<br>- Engage the low speed and check that no other errors are shown<br>- Engage the reverse and check that no other errors are shown | OK: Go to 2.<br>NOT OK:<br>• Disconnect connectors P_CH_TX_OUT and P_CH_TRAX.<br>• Use a multimeter.<br>• Check the presence of continuity between:<br>- pin 2 of P_CH_TX_OUT and 24 of P_CH_TRAX<br>- pin 3 of P_CH_TX_OUT and 52 of P_CH_TRAX<br>**NOTE: When a continuity check is done, verify that the resistance is near to 0 ohm.**<br>• Check for short to ground.<br>• Check the absence of continuity between:<br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br>• Switch ON ignition.<br>• Check for short to positive.<br>• Check the voltage between:<br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br>• If there are anomalies repair or replace wiring harness as needed.<br>• If there are not anomalies replace the sensor. |

| | |
|---|---|
| 2. Repair or replace forward high clutch | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

### 10.1.2.1.1 E122 - Forward Low clutch unexpected slipping

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check clutches**<br>• Start engine.<br>• Check that other clutches do not slip:<br>- Engage the high speed and check that no other errors are shown<br>- Engage the reverse and check that no other errors are shown | **OK:** Go to **2.**<br>**NOT OK:**<br>• Disconnect connectors P_CH_TX_OUT and P_CH_TRAX.<br>• Use a multimeter.<br>• Check the presence of continuity between:<br>- pin 2 of P_CH_TX_OUT and 24 of P_CH_TRAX<br>- pin 3 of P_CH_TX_OUT and 52 of P_CH_TRAX<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br>• Check for short to ground.<br>Check the absence of continuity between:<br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br>• Switch ON ignition.<br>• Check for short to positive.<br>Check the voltage between:<br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br>• If there are anomalies repair or replace wiring harness as needed.<br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace forward low clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

### 10.1.2.1.2 E123 - Reverse clutch unexpected slipping

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check clutches**<br>• Start engine.<br>• Check that other clutches do not slip:<br>- Engage the low speed and check that no other errors are shown<br>- Engage the high speed and check that no other errors are shown | **OK:** Go to **2.**<br>**NOT OK:**<br>• Disconnect connectors P_CH_TX_OUT and P_CH_TRAX.<br>• Use a multimeter.<br>• Check the presence of continuity between:<br>- pin 2 of P_CH_TX_OUT and 24 of P_CH_TRAX<br>- pin 3 of P_CH_TX_OUT and 52 of P_CH_TRAX<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br>• Check for short to ground.<br>Check the absence of continuity between:<br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br>• Switch ON ignition.<br>• Check for short to positive.<br>Check the voltage between:<br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br>• If there are anomalies repair or replace wiring harness as needed.<br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace reverse clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

### 10.1.2.1.3 E124 - Clutches output speed sensor failure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| 1. **Check that the connector P_CH_TX_OUT is connected to the transmission out speed sensor B229** | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Reconnect the connector. |
| 2. **Check the supply voltage of the sensor**<br><br>• Disconnect connector P_CH_TX_OUT, from the transmission out speed sensor B229, and P_CH_TRAX, from the transmission control unit A057.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the voltage on connector P_CH_TX_OUT between:<br><br>- pin 1 and 4<br><br>**Specification:**<br>Supply voltage of sensor: ……12 Volt (±5%) | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>If there is not voltage at all, go to **3**.<br><br>If there is voltage, but it is not as per specification:<br><br>• Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Check the power line resistance between:<br><br>• pin 1 of P_CH_TX_OUT and any of the pins 8, 34, 35 or 36 of P_CH_TRAX<br>• pin 4 of P_CH_TX_OUT and pin 17 of P_CH_TRAX<br><br>**Specification:**<br>Line resistance must be near: ……0 Ohm<br><br>• Repair or replace as needed. |
| 3. **Check the fuse**<br><br>• Switch OFF ignition.<br><br>• Check line protection fuse F7 in fuse box C144. | **OK:** Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed.<br><br>If everything is ok, go to **4**.<br><br>**NOT OK:**<br><br>Before replacing the fuse F7, check for short to ground.<br><br>• Check the absence of continuity between:<br><br>• pin 1 of P_CH_TX_OUT and ground<br><br>• Check the wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check for short to positive on ground line**<br><br>• Switch ON ignition.<br><br>• Check the voltage on ground line, between:<br><br>- pin 4 of P_CH_TX_OUT and ground<br><br>**Specification:**<br>Voltage on pin 4: ……0 Volt | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Check the wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

| | |
|---|---|
| 5. **Check the continuity on the sensor output lines**<br><br>• Switch OFF ignition.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_CH_TX_OUT and pin 24 of P_CH_TRAX<br>- pin 3 of P_CH_TX_OUT and pin 52 of P_CH_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **6.**<br><br>**NOT OK:**<br><br>• Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 6. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system is not function properly, before replacing the transmission ECU, replace the transmission out speed sensor and clear the fault code.<br><br>If the fault code reappears:<br><br>• Replace the control module. |

### 10.1.2.1.4 E125 - Top Shaft Speed Sensor, Out Of Range

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check that leads of the transmission out speed sensor B229 have not been inverted**<br><br>• Disconnect connector P_CH_TX_OUT, from the transmission out speed sensor B229, and P_CH_TRAX, from the transmission control unit A057.<br><br>• Check the continuity between:<br><br>- pin 2 of P_CH_TX_OUT and pin 24 of P_CH_TRAX<br>- pin 3 of P_CH_TX_OUT and pin 52 of P_CH_TRAX | **OK:** Reconnect connectors and go to **2.**<br><br>**NOT OK:**<br><br>• Check the continuity between:<br><br>- pin 2 of P_CH_TX_OUT and pin 52 of P_CH_TRAX<br>- pin 3 of P_CH_TX_OUT and pin 24 of P_CH_TRAX<br><br>If there is continuity, invert the leads on sensor connector P_CH_TX_OUT. |
| 2. **Check that wiring harnesses of the circuits (forward and reverse) have not been inverted**<br><br>• Check that connectors P_CH_FL, P_CH_FH and P_CH_RV are connected to the respective solenoid valves Y508, Y507 and Y233.<br><br>• Check that connectors P_CH_FH, P_CH_FL and P_CH_RV are connected to the respective pressure sensors B384, B385 and B383. | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Restore connections. |

| | |
|---|---|
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>If the system is not function properly, before replacing the transmission ECU, replace the transmission out speed sensor and clear the fault code.<br><br>If the fault code reappears:<br><br>• Replace the control module. |

### 10.1.2.1.5 E126 - Transmission Electronic Control Unit internal failure

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.6 E127 - Transmission Electronic Control Unit internal failure

| | |
|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.7 E128 - Transmission Electronic Control Unit internal failure

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.8 E129 - First calibration not performed

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Calibration of the clutch pedal and pressure sensors**<br>• Use the electronic tool to reset the parameters:<br>- clutch pedal<br>- forward high pressure sensor<br>- forward low pressure sensor<br>- reverse pressure sensor | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br>If the system does not function properly:<br>• Replace the control module<br>• Remake the calibration of the parameters |

### 10.1.2.1.9 E130 - Can bus physical support or communication failure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the value of CAN bus resistance on diagnosis socket**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CH_D_SKT connector) between:<br><br>• pin 3 and 4<br><br>**Specification:**<br><br>CAN bus resistance: ……60 Ohms (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>- Disconnect the CAN bus terminator (R994) from P_CH_CAN_B_RES connector and use a multimeter to check the value of resistance on terminator between:<br><br>- pin A and B<br><br>If resistance does not respect the specific:<br><br>- Replace resistance.<br><br>**Specification:**<br>CAN bus resistance: ……120 Ohms (±5%)<br><br>- Disconnect the connector P_CH_TRAX.<br><br>- Check the absence of continuity between:<br><br>- pin 27 and 55 of P_CH_TRAX<br><br>- Check the presence of continuity between:<br><br>- pin 27 of P_CH_TRAX and any pins of the CAN-H line<br>- pin 55 of P_CH_TRAX and any pins of the CAN-L line<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>- Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 27 of P_CH_TRAX and ground<br>- pin 55 of P_CH_TRAX and ground<br><br>- Check for short to positive.<br>Switch ON ignition.<br>Check the voltage between:<br><br>- pin 27 of P_CH_TRAX and ground<br>- pin 55 of P_CH_TRAX and ground<br><br>**Specification:**<br>Voltage on pin 27 and 55: ……0 Volt<br><br>- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>- Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

## 10.1.2.1.10 E131 - Can bus physical support or communication failure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

1. **Check the value of CAN bus resistance on diagnosis socket**

   - Switch OFF ignition.
   - Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CH_D_SKT connector) between:
   - pin 3 and 4

**Specification:**

CAN bus resistance: ……60 Ohms (±5%)

**OK:** Go to **2.**

**NOT OK:**

- Disconnect the CAN bus terminator (R994) from P_CH_CAN_B_RES connector and use a multimeter to check the value of resistance on terminator between:
  - pin A and B

If resistance does not respect the specific:

- Replace resistance.

**Specification:**
CAN bus resistance: ……120 Ohms (±5%)

- Disconnect the connector P_CH_TRAX.
- Check the absence of continuity between:
  - pin 27 and 55 of P_CH_TRAX
- Check the presence of continuity between:
  - pin 27 of P_CH_TRAX and any pins of the CAN-H line
  - pin 55 of P_CH_TRAX and any pins of the CAN-L line

***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*

- Check for short to ground.
  Check the absence of continuity between:
  - pin 27 of P_CH_TRAX and ground
  - pin 55 of P_CH_TRAX and ground
- Check for short to positive.
  Switch ON ignition.
  Check the voltage between:
  - pin 27 of P_CH_TRAX and ground
  - pin 55 of P_CH_TRAX and ground

**Specification:**
Voltage on pin 27 and 55: ……0 Volt

- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.
- Repair or replace harnesses as needed.

| | |
|---|---|
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.11 E132 - Can bus physical support or communication failure

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|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check the value of CAN bus resistance on diagnosis socket**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CH_D_SKT connector) between:<br><br>• pin 3 and 4<br><br>**Specification:**<br><br>CAN bus resistance: ……60 Ohms (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>- Disconnect the CAN bus terminator (R994) from P_CH_CAN_B_RES connector and use a multimeter to check the value of resistance on terminator between:<br><br>- pin A and B<br><br>If resistance does not respect the specific:<br><br>- Replace resistance.<br><br>**Specification:**<br>CAN bus resistance: ……120 Ohms (±5%)<br><br>- Disconnect the connector P_CH_TRAX.<br><br>- Check the absence of continuity between:<br><br>- pin 27 and 55 of P_CH_TRAX<br><br>- Check the presence of continuity between:<br><br>- pin 27 of P_CH_TRAX and any pins of the CAN-H line<br>- pin 55 of P_CH_TRAX and any pins of the CAN-L line<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>- Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 27 of P_CH_TRAX and ground<br>- pin 55 of P_CH_TRAX and ground<br><br>- Check for short to positive.<br>Switch ON ignition.<br>Check the voltage between:<br><br>- pin 27 of P_CH_TRAX and ground<br>- pin 55 of P_CH_TRAX and ground<br><br>**Specification:**<br>Voltage on pin 27 and 55: ……0 Volt<br><br>- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>- Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.12 E133 - Overcurrent detected on main ring valve

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the solenoid of main ring valve Y506**<br>• Disconnect the P_CH_MR connector from main ring valve Y506.<br>• Use a multimeter to check on the main ring valve the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……8 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace main ring valve Y506. |
| 2. **Check for short to positive**<br>• Disconnect the transmission control unit connector P_CH_TRAX.<br>• Switch ON ignition.<br>• Check the voltage on connector P_CH_ TRAX between:<br>• pin 14 and ground<br>• pin 39 and ground<br>**Specification:**<br>Voltage on pins 14 and 39: ……0 Volt | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or line breaks.<br>• Repair or replace harnesses as needed. |
| 3. **Check the continuity**<br>• Switch OFF ignition.<br>• Check the absence of continuity on connector P_CH_TRAX between:<br>• pin 14 and 39 | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or line breaks.<br>• Repair or replace harnesses as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.13 E134 - Engine EEC1 message timeout

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **To move the vehicle perform LIMP Mode** | If the problem is not resolved, before replacing the transmission control unit A057, download the correct software revision level and verify that the system functions properly. |

### 10.1.2.1.14 E135 - Vehicle ECU message CAN timeout

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check instrument panel A101 revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.15 E136 - Forward High clutch long time slipping

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|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check clutches**<br><br>• Start engine.<br><br>• Check that other clutches do not slip:<br><br>- Engage the low speed and check that no other errors are shown<br><br>- Engage the reverse and check that no other errors are shown | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect connectors P_CH_TX_OUT and P_CH_ TRAX.<br><br>• Use a multimeter.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_CH_TX_OUT and 24 of P_CH_ TRAX<br>- pin 3 of P_CH_TX_OUT and 52 of P_CH_ TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br><br>• Switch ON ignition.<br><br>• Check for short to positive.<br>Check the voltage between:<br><br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br><br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br><br>• If there are anomalies repair or replace wiring harness as needed.<br><br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace forward high clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

### 10.1.2.1.16 E137 - Reverse clutch long time slipping

| |
|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check clutches**<br><br>• Start engine.<br><br>• Check that other clutches do not slip:<br><br>- Engage the low speed and check that no other errors are shown<br><br>- Engage the high speed and check that no other errors are shown | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect connectors P_CH_TX_OUT and P_CH_TRAX.<br><br>• Use a multimeter.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_CH_TX_OUT and 24 of P_CH_TRAX<br>- pin 3 of P_CH_TX_OUT and 52 of P_CH_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br><br>• Switch ON ignition.<br><br>• Check for short to positive.<br>Check the voltage between:<br><br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br><br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br><br>• If there are anomalies repair or replace wiring harness as needed.<br><br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace reverse clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

### 10.1.2.1.17 E138 - Absence of electrical signal from FNR lever

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|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check fuse**<br><br>• Check line protection fuse F7 in fuse box C144. | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>Before replacing the fuse:<br><br>• Check for short to ground.<br><br>- Disconnect the connector P_D_FNR from FNR lever C073.<br><br>- Check the absence of continuity between:<br><br>▪ pin 1 of P_D_FNR and ground<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or line breaks.<br><br>• Repair or replace as needed. |
| 2. **Check supply voltage**<br><br>• Disconnect the connector P_D_FNR from FNR lever C073.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage on connector P_D_FNR between:<br><br>- pin 1 and ground<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±5%) | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_D_FNR and fuse F7<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or line breaks.<br><br>• Repair or replace as needed. |
| 3. **Check FNR lever C073**<br><br>• Check FNR lever contacts.<br><br>• FNR lever in neutral position, check the presence of continuity between:<br><br>- pin 1 (COM) and 2 (N)<br><br>• FNR lever in forward position, check the presence of continuity between:<br><br>- pin 1 (COM) and 3 (F)<br><br>• FNR lever in reverse position, check the presence of continuity between:<br><br>- pin 1 (COM) and 4 (R)<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Replace FNR lever. |

| | |
|---|---|
| 4. **Check continuity**<br><br>• Disconnect the transmission control unit connector P_CH_TRAX.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_D_FNR and 46 of P_CH_TRAX<br>- pin 3 of P_D_FNR and 18 of P_CH_TRAX<br>- pin 4 of P_D_FNR and 19 of P_CH_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 5. **Check for short to ground**<br><br>• Check the absence of continuity on connector P_CH_TRAX between:<br><br>- pin 18 and ground<br>- pin 19 and ground<br>- pin 46 and ground | **OK:** Go to **6.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 6. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.18 E139 - Comfort control command failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check fuse**<br><br>• Check line protection fuse F7 in fuse box C144. | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>Before replacing the fuse:<br><br>• Check for short to ground.<br><br>- Disconnect the connector P_D_FNR from FNR lever C073.<br><br>- Check the absence of continuity between:<br><br>▪ pin 1 of P_D_FNR and ground<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or line breaks.<br><br>• Repair or replace as needed. |

| | |
|---|---|
| 2. **Check supply voltage**<br><br>• Disconnect the connector P_D_FNR from FNR lever C073.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage on connector P_D_FNR between:<br><br>- pin 1 and ground<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±5%) | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_D_FNR and fuse F7<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or line breaks.<br><br>• Repair or replace as needed. |
| 3. **Check FNR lever C073**<br><br>• Check FNR lever contacts.<br><br>• FNR lever in neutral position, check the presence of continuity between:<br><br>- pin 1 (COM) and 2 (N)<br><br>• FNR lever in forward position, check the presence of continuity between:<br><br>- pin 1 (COM) and 3 (F)<br><br>• FNR lever in reverse position, check the presence of continuity between:<br><br>- pin 1 (COM) and 4 (R)<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Replace FNR lever. |
| 4. **Check continuity**<br><br>• Disconnect the transmission control unit connector P_CH_TRAX.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_D_FNR and 46 of P_CH_TRAX<br>- pin 3 of P_D_FNR and 18 of P_CH_TRAX<br>- pin 4 of P_D_FNR and 19 of P_CH_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

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|---|---|
| 5. **Check for short to ground**<br><br>• Check the absence of continuity on connector P_CH_TRAX between:<br><br>- pin 18 and ground<br>- pin 19 and ground<br>- pin 46 and ground | **OK:** Go to **6.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 6. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.19 E140 - Forward Low clutch long time slipping

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check clutches**<br><br>• Start engine.<br><br>• Check that other clutches do not slip:<br><br>- Engage the high speed and check that no other errors are shown<br><br>- Engage the reverse and check that no other errors are shown | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect connectors P_CH_TX_OUT and P_CH_TRAX.<br><br>• Use a multimeter.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_CH_TX_OUT and 24 of P_CH_TRAX<br>- pin 3 of P_CH_TX_OUT and 52 of P_CH_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br><br>• Switch ON ignition.<br><br>• Check for short to positive.<br>Check the voltage between:<br><br>- pin 2 of P_CH_TX_OUT and ground<br>- pin 3 of P_CH_TX_OUT and ground<br><br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br><br>• If there are anomalies repair or replace wiring harness as needed.<br><br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace forward low clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

### 10.1.2.1.20 E155 - Forward high high current

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|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check the solenoid of the forward high solenoid valve**<br>• Disconnect connector P_CH_FH from forward high solenoid valve (Y507).<br>• Use a multimeter to check on the forward high solenoid valve the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……2,2 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace forward high solenoid valve. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.21 E156 - Forward low high current

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the solenoid of the forward low solenoid valve**<br>• Disconnect connector P_CH_FL from forward low solenoid valve (Y508).<br>• Use a multimeter to check on the forward low solenoid valve the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……2,2 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace forward low solenoid valve. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.22 E157 - Reverse high current

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|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check the solenoid of the reverse solenoid valve**<br>• Disconnect connectors P_CH_RV from reverse solenoid valve (Y233).<br>• Use a multimeter to check on the reverse solenoid valve the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……2,2 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace reverse solenoid valve. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.23 Driver Seat Switch stuck

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check supply voltage of Z005 – Seat switch**<br>• Disconnect the connector P_CH_SEAT_SW of the seat switch.<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage between:<br>– Pin 1 of P_CH_SEAT_SW and ground<br>**Specification**<br>Supply voltage: ……12 Volt | **OK:** Go to **2.**<br>**NOT OK:** Check that the fuse F8 is not damaged.<br>Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>Repair or replace if needed. |
| 2. **Check for continuity**<br>• Switch OFF ignition.<br>• Disconnect the connector P_D_IP from the A101 control unit.<br>• Use a multimeter to check the continuity between:<br>– Pin 2 of P_CH_SEAT_SW and pin 48 of P_D_IP<br>**Specification**<br>Continuity: ……Present<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3**.<br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |

| | |
|---|---|
| 3. **Check for short to positive**<br><br>• Use a multimeter to check the voltage between:<br><br>– Pin 48 of P_D_IP and ground<br><br>**Specification**<br>Supply voltage: ……0 Volt | **OK:** Go to **4**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |
| 4. **Check for short to ground**<br><br>• Use a multimeter to check the absence of continuity between:<br><br>– Pin 1 of P_CH_SEAT_SW and ground<br>– Pin 2 of P_CH_SEAT_SW and ground<br><br>**Specification**<br><br>Continuity: ……Absent | **OK:** Go to **5**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |
| 5. **Check component**<br><br>• Check that the component seat switch Z005 is not damaged and functions properly. | **OK:** End of test.<br><br>**NOT OK:**<br><br>Repair or replace as needed. |

## 10.1.2.1 CAB Models

### 10.1.2.1.1 E060 - Transmission Electronic Control Unit internal failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.2 E061 - Transmission Electronic Control Unit internal failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.3 E062 - Historical data replaced corrupted

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the clutch pedal and pressure sensors**<br><br>• Use the electronic tool to reset the parameters:<br><br>- clutch pedal<br>- forward high pressure sensor<br>- forward low pressure sensor<br>- reverse pressure sensor | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br><br>If the system does not function properly:<br><br>• Replace the control module<br>• Remake the calibration of the parameters |

### 10.1.2.1.4 E063 - FLASH MEMORY calibration parameters corruption

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the clutch pedal and pressure sensors**<br><br>• Use the electronic tool to reset the parameters:<br><br>- clutch pedal<br>- forward high pressure sensor<br>- forward low pressure sensor<br>- reverse pressure sensor | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br><br>If the system does not function properly:<br><br>• Replace the control module<br>• Remake the calibration of the parameters |

### 10.1.2.1.5 E064 - FLASH MEMORY writing failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |
|---|

| | |
|---|---|
| 1. **Calibration of the clutch pedal and pressure sensors**<br>• Use the electronic tool to reset the parameters:<br>- clutch pedal<br>- forward high pressure sensor<br>- forward low pressure sensor<br>- reverse pressure sensor | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br><br>If the system does not function properly:<br>• Replace the control module<br>• Remake the calibration of the parameters |

### 10.1.2.1.6 E065 - CAN Bus, High Error Rate

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the value of CAN bus resistance on diagnosis socket**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CRT_D_SKT connector) between:<br><br>• pin C and D<br><br>**Specification:**<br><br>CAN bus resistance: ……60 Ohms (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>- Disconnect the CAN bus terminator (R994) from P_ CRT_CAN_TERM connector and use a multimeter to check the value of resistance on terminator between:<br><br>- pin A and B<br><br>If resistance does not respect the specific:<br><br>- Replace resistance.<br><br>**Specification:**<br>CAN bus resistance: ……120 Ohms (±5%)<br><br>- Disconnect the connector P_MAIN_TRAX.<br><br>- Check the absence of continuity between:<br><br>- pin 27 and 55 of P_MAIN_TRAX<br><br>- Check the presence of continuity between:<br><br>- pin 27 of P_MAIN_TRAX and any pins of the CAN-H line<br>- pin 55 of P_MAIN_TRAX and any pins of the CAN-L line<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>- Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 27 of P_MAIN_TRAX and ground<br>- pin 55 of P_MAIN_TRAX and ground<br><br>- Check for short to positive.<br>Switch ON ignition.<br>Check the voltage between:<br><br>- pin 27 of P_MAIN_TRAX and ground<br>- pin 55 of P_MAIN_TRAX and ground<br><br>**Specification:**<br>Voltage on pin 27 and 55: ……0 Volt<br><br>- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>- Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.7 E066 - Transmission Electronic Control Unit supply voltage is under 9V

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on the transmission control unit**<br><br>• Disconnect the connector P_MAIN_TRAX of the transmission control unit (A057).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage on P_MAIN_TRAX connector between:<br><br>• pin 1 and 29<br>• pin 8 and 29<br>• pin 34 and 29<br>• pin 35 and 29<br>• pin 36 and 29<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>- Only if voltage is low, use a multimeter to check the voltage on battery between:<br><br>- The positive pole and the negative pole<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±5%)<br><br>- If the voltage is not as per specification, replace or recharge the battery as needed.<br><br>- Switch OFF ignition.<br><br>- Check that the line fuses F7 and F8 are OK.<br><br>- If any fuse is broken, check for short to ground on affected line of the circuit.<br><br>- Check the presence of continuity between:<br><br>- pin 1 and fuse F8<br>- pin 8 and fuse F7<br>- pin 34 and fuse F7<br>- pin 35 and fuse F7<br>- pin 36 and fuse F7<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>- Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.8 E067 - Transmission Electronic Control Unit supply voltage is over 16V

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the alternator**<br>• Start the vehicle.<br>• Use a multimeter to check the supply voltage on battery between:<br>- The positive pole and the negative pole<br><br>**Specification:**<br>Supply voltage on battery: ……14 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br>- Switch OFF ignition.<br>- Repair or replace the alternator. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br>- Replace the control module. |

### 10.1.2.1.9 E068 - Sensor supply voltage is under 4.5V

| | |
|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check for short to ground**<br>• Disconnect connectors P_MAIN_TRAX, P_TRAS_RV_PS, P_TRAS_FH_PS and P_TRAS_FL_PS.<br>• Use a multimeter to check the absence of continuity on P_MAIN_TRAX between:<br>• pin 15 and ground | **OK:** Go to **2.**<br><br>**NOT OK:**<br>- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>- Repair or replace harnesses as needed. |

| | |
|---|---|
| 2. **Check supply voltage signal on pressure sensors**<br><br>• Connect the transmission control unit connector P_MAIN_TRAX.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the voltage on connectors P_TRAS_RV_PS, P_TRAS_FH_PS and P_TRAS_FL_PS between:<br><br>• pin A and B<br><br>**Specification:**<br>Voltage on the pressure sensors: ……5 Volt (±5%) | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>- Switch OFF ignition.<br><br>- Check the pressure sensors for failure.<br>Connect the P_TRAS_RV_PS connector to its pressure sensor.<br><br>- Switch ON ignition and check the voltage on connector P_TRAS_FH_PS or P_TRAS_FL_PS between:<br><br>- pin A and B<br><br>- Switch OFF ignition and disconnect connector P_TRAS_RV_PS and connect P_TRAS_FH_PS to its pressure sensor.<br><br>- Switch ON ignition and check the voltage on connector P_TRAS_RV_PS or P_TRAS_FL_PS between:<br><br>- pin A and B<br><br>- Switch OFF ignition and disconnect connector P_TRAS_FH_PS and connect P_TRAS_FL_PS to its pressure sensor.<br><br>- Switch ON ignition and check the voltage on connector P_TRAS_RV_PS or P_TRAS_FH_PS between:<br><br>- pin A and B<br><br>**Specification:**<br>Voltage on the pressure sensors: ……5 Volt (±5%)<br><br>If the voltage is not as per specification, replace pressure sensor damaged and do calibration of parameters. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.10 E069 - Sensor supply voltage is over 5.5V

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|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check for short on positive**<br>• Disconnect connectors P_MAIN_TRAX, P_TRAS_RV_PS, P_TRAS_FH_PS and P_TRAS_FL_PS.<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage on P_MAIN_TRAX connector between:<br>• pin 15 and ground<br>**Specification:**<br>Voltage on pin 15: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>- Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or line breaks.<br>- Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>- Replace the control module. |

### 10.1.2.1.11 E070 - Overcurrent detected on Forward Low Clutch

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the solenoid of the forward low solenoid valve**<br>• Disconnect connector P_TRAS_FL_V from forward low solenoid valve (Y508).<br>• Use a multimeter to check on the forward low solenoid valve the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……2,2 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace forward low solenoid valve. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.12 E071 - Overcurrent detected on Forward High or Reverse clutch

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the solenoids of the forward high and reverse solenoid valves**<br>• Disconnect connectors P_TRAS_FH_V from forward high valve (Y507) and P_ TRAS_RV_V from reverse valve (Y233).<br>• Use a multimeter to check on both valves the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……2,2 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace damaged solenoid valve. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.13 E072 - Overcurrent detected on main ring valve HS supply pin

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the solenoid of the main ring valve**<br>• Disconnect the P_TRAS_MR_V connector from main ring valve (Y506).<br>• Use a multimeter to check on the valve the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……8 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace main ring valve. |
| 2. **Check for short to ground**<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Check the absence of continuity on connector P_MAIN_TRAX between:<br>• pin 39 and ground | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harnesses as needed. |

| | |
|---|---|
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.14 E073 - All outputs overcurrent

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>- Replace the control module. |

### 10.1.2.1.15 E074 - FNR Lever is applying Forward and Reverse signals simultaneously to Transmission Electronic Control Unit

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check FNR lever**<br>• Disconnect connector P_MAIN_FNR from the FNR lever (C073).<br>• Check FNR lever contacts.<br>• With FNR lever in neutral position, use a multimeter to check the absence of continuity between:<br>- pin 2 (N) and 3 (F)<br>- pin 2 (N) and 4 (R)<br>- pin 3 (F) and 4 (R) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace FNR lever. |
| 2. **Check continuity**<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Check on connector P_MAIN_TRAX the absence of continuity between:<br>- pin 18 and 19 | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |

| | |
|---|---|
| 3. **Check for short to positive**<br><br>• Switch ON ignition.<br><br>• Check the voltage on connector P_MAIN_TRAX between:<br><br>- pin 18 and ground<br>- pin 19 and ground<br><br>**Specification:**<br>Voltage on pins 18 and 19: ……0 Volt | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.16 E075 - FNR Lever is applying Forward and Neutral signals simultaneously to Transmission Electronic Control Unit

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check FNR lever**<br><br>• Disconnect connector P_MAIN_FNR from the FNR lever (C073).<br><br>• Check FNR lever contacts.<br><br>• With FNR lever in neutral position, use a multimeter to check the absence of continuity between:<br><br>- pin 2 (N) and 3 (F)<br>- pin 2 (N) and 4 (R)<br>- pin 3 (F) and 4 (R) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace FNR lever. |
| 2. **Check continuity**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Check on connector P_MAIN_TRAX the absence of continuity between:<br><br>- pin 18 and 46 | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

| | |
|---|---|
| 3. **Check for short to positive**<br><br>• Switch ON ignition.<br><br>• Check the voltage on connector P_MAIN_ TRAX between:<br><br>- pin 18 and ground<br>- pin 46 and ground<br><br>**Specification:**<br>Voltage on pins 18 and 46: ……0 Volt | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.17 E076 - FNR Lever is applying Neutral and Reverse signals simultaneously to Transmission Electronic Control Unit

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check FNR lever**<br><br>• Disconnect connector P_MAIN_FNR from the FNR lever (C073).<br><br>• Check FNR lever contacts.<br><br>• With FNR lever in neutral position, use a multimeter to check the absence of continuity between:<br><br>- pin 2 (N) and 3 (F)<br>- pin 2 (N) and 4 (R)<br>- pin 3 (F) and 4 (R) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace FNR lever. |
| 2. **Check continuity**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Check on connector P_MAIN_TRAX the absence of continuity between:<br><br>- pin 19 and 46 | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

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|---|---|
| 3. **Check for short to positive**<br><br>• Switch ON ignition.<br><br>• Check the voltage on connector P_MAIN_TRAX between:<br><br>- pin 19 and ground<br>- pin 46 and ground<br><br>**Specification:**<br>Voltage on pins 19 and 46: ……0 Volt | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.18 E077 - FNR Lever is applying simultaneously Forward, Neutral and Reverse signals to Transmission Electronic Control Unit

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check FNR lever**<br><br>• Disconnect connector P_MAIN_FNR from the FNR lever (C073).<br><br>• Check FNR lever contacts.<br><br>• With FNR lever in neutral position, use a multimeter to check the absence of continuity between:<br><br>- pin 2 (N) and 3 (F)<br>- pin 2 (N) and 4 (R)<br>- pin 3 (F) and 4 (R) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace FNR lever. |
| 2. **Check continuity**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Check on connector P_MAIN_TRAX the absence of continuity between:<br><br>- pin 18 and 19<br>- pin 18 and 46<br>- pin 19 and 46 | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

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| 3. **Check for short to positive**<br><br>• Switch ON ignition.<br><br>• Check the voltage on connector P_MAIN_ TRAX between:<br><br>- pin 18 and ground<br>- pin 19 and ground<br>- pin 46 and ground<br><br>**Specification:**<br>Voltage on pins 18, 19 and 46: ……0 Volt | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.19 E078 - PWM benches supplied with FNR lever in Neutral position or clutch pedal completely pressed

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check for short to positive**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Disconnect PWM ENABLER relay (K990).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the voltage on PWM ENABLER connection side between:<br><br>- pin 87A and ground<br><br>**Specification:**<br>Voltage on pin 87A of PWM ENABLER: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 2. **Check PWM ENABLER relay (K990)**<br><br>• Check relay contacts:<br><br>- Check the presence of continuity between pin 30 and 87A<br><br>- Check the absence of continuity between pin 30 and 87<br><br>**Specification:**<br>Contacts 30 and 87A: ……normally closed<br>Contacts 30 and 87: ……normally open | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace relay. |

| | |
|---|---|
| 3. **Check supply voltage on PWM ENABLER connection side**<br><br>• With clutch pedal completely pressed and FNR lever in forward or reverse position, check the supply voltage of the relay between:<br><br>- pin 85 and 86<br><br>• With clutch pedal not pressed and FNR lever in neutral position, check the supply voltage of the relay between:<br><br>- pin 85 and 86<br><br>• Check the voltage between:<br><br>- pin 85 and 30<br><br>**Specification:**<br>Supply voltage of PWM ENABLER: ……12 Volt (±5%) | **OK:** Go to **9.**<br><br>**NOT OK:**<br><br>If there is not voltage with clutch pedal completely pressed, go to **4**.<br><br>If there is not voltage with FNR lever in neutral position, go to **5**.<br><br>If there is not voltage at all, go to **6**.<br><br>If there is voltage between pins 85 and 30, go to **7**. |
| 4. **Check clutch pedal end stroke switch**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_END_STK_SW from the clutch pedal end stroke switch (Z115).<br><br>• Check clutch pedal end stroke contacts.<br>Check the absence of continuity between:<br><br>- pin 1 and 2<br><br>**Specification:**<br>Contacts 1 and 2: ……normally open | **OK:** Go to **8.**<br><br>**NOT OK:**<br><br>• Replace clutch pedal end stroke. |
| 5. **Check FNR lever**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_FNR from the FNR lever (C073).<br><br>• Check FNR lever contacts.<br>Check the continuity between:<br><br>- pin 1 (COM) and 2 (N)<br><br>***NOTE:*** *There must be continuity only if FNR lever is in neutral position.* | **OK:** Go to **8.**<br><br>**NOT OK:**<br><br>• Replace FNR lever. |

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| 6. **Check ground cable**<br><br>• Check the presence of continuity between:<br><br>- pin 85 (on PWM ENABLER connection side) and ground<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **7.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or line breaks.<br><br>• Repair or replace as needed. |
| 7. **Check for short to ground**<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 86 (on PWM ENABLER connection side) and ground | **OK:** Go to **8.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or line breaks.<br><br>• Repair or replace as needed. |
| 8. **Check wiring harness**<br><br>• Check the presence of continuity between:<br><br>- pin 86 of PWM ENABLER and pin 2 of P_MAIN_END_STK_SW<br>- pin 87A of PWM ENABLER and any of the pins 2, 5, 30, 31, 32 or 33 of P_MAIN_TRAX<br><br>***Attention:*** *Connect red end-piece on PWM ENABLER and black end-piece on P_MAIN_END_STK_SW and P_MAIN_TRAX.*<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **9.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken diodes, broken connectors, slid-back or corroded contacts, bent pins or line breaks.<br><br>• Repair or replace as needed. |
| 9. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.20 E080 - Clutch pedal angular sensor output voltage is too high

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| 1. **Check for short positive on the sensor output**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX and the clutch pedal position sensor connector P_MAIN_POS_SENS.<br><br>• Check for short to positive.<br>Switch ON ignition.<br>Use a multimeter to check the voltage on connector P_MAIN_POS_SENS between:<br><br>- pin 3 and ground<br><br>**Specification:**<br>Voltage on pin 3 of P_MAIN_POS_SENS: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission ECU, replace the angular sensor and clear the fault code.<br><br>If the fault code reappears, replace the control module. |

### 10.1.2.1.21 E081 - Clutch pedal angular sensor output voltage is too low

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check for short ground on the sensor output**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX and the clutch pedal position sensor connector P_MAIN_POS_SENS.<br><br>• Use a multimeter to check the absence of continuity on connector P_MAIN_POS_SENS between:<br><br>- pin 3 and ground | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

| | |
|---|---|
| 2. **Check the line resistance**<br><br>• Check the line resistance between:<br><br>- pin 3 of P_MAIN_POS_SENS and pin 16 of P_MAIN_TRAX<br><br>**Specification:**<br>Line resistance near to: ……0 Ohm | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 3. **Check the supply voltage of the angular sensor**<br><br>• Switch ON ignition.<br><br>• Check the supply voltage on connector P_ MAIN_POS_SENS between:<br><br>- pin 1 and 2<br><br>**Specification:**<br>Supply voltage of the position sensor: ……12 Volt (±5%) | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check the supply cables to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission ECU, replace the angular sensor and clear the fault code.<br><br>If the fault code reappears, replace the control module. |

## 10.1.2.1.22 E082 - Clutch pedal angular sensor signal is under stroke minimum value (lower than 100 digit)

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Calibration of the clutch pedal position sensor B361**<br><br>• Use the electronic tool to reset the parameters of the clutch pedal position sensor. | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br><br>If the system does not function properly:<br><br>• Replace the control module<br><br>• Remake the calibration of the parameters |

### 10.1.2.1.23 E083 - Clutch pedal angular sensor signal is over stroke maximum value (higher than 990 digit)

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the clutch pedal position sensor B361**<br><br>• Use the electronic tool to reset the parameters of the clutch pedal position sensor. | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br><br>If the system does not function properly:<br><br>• Replace the control module<br><br>• Remake the calibration of the parameters |

### E084 - Clutch pedal angular sensor and switch signals are not consistent (switch pressed signal at stroke over 20% or switch not pressed signal at 0% of stroke)

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the clutch pedal position sensor B361**<br><br>• Use the electronic tool to reset the parameters of the clutch pedal position sensor. | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br><br>If the system does not function properly:<br><br>• Replace the control module<br><br>• Remake the calibration of the parameters |

### 10.1.2.1.24 E085 - Differential pressure presence detected without engine being on

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check that the connector P_CH_FILTER_CL (75CV) or P_E_FILTER_CL (100CV) is connected to the oil filter clogged switch Z102** | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Reconnect the connector. |

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|---|---|
| 2. **Check the line voltage**<br><br>• Disconnect the connector P_CH_FILTER_CL (75CV) or P_E_FILTER_CL (100CV) from oil filter clogged sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the voltage on connector P_CH_FILTER_CL (75CV) or P_E_FILTER_CL (100CV) between:<br><br>- pin 1 and ground<br><br>**Specification:**<br>Voltage between pin 1 and ground: …12 Volt (±5%) | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>If there is no voltage at all, go to **3**.<br><br>If there is voltage, but it is not as per specification:<br><br>• Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 3. **Check the fuse**<br><br>• Switch OFF ignition.<br><br>• Check the line fuse F6. | **OK:** Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>Repair or replace as needed.<br><br>**NOT OK:**<br><br>Before replacing the fuse F6, check for short to ground.<br><br>• Check the absence of continuity between:<br><br>• pin 1 of P_CH_FILTER_CL (75CV) or P_E_FILTER_CL (100CV) and ground<br>• pin 2 of P_CH_FILTER_CL (75CV) or P_E_FILTER_CL (100CV) and ground<br><br>• Check the wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check the oil filter clogged sensor contacts**<br><br>• Check the presence of continuity between the sensor contacts:<br><br>- pin 1 and 2<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Replace the sensor. |

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|---|---|
| 5. **Check the continuity**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Switch OFF ignition.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_CH_FILTER_CL (75CV) or P_E_ FILTER_CL (100CV) and fuse F6<br>- pin 2 of P_CH_FILTER_CL (75CV) or P_E_ FILTER_CL (100CV) and pin 49 of P_MAIN_ TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **6.**<br><br>**NOT OK:**<br><br>• Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 6. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.25 E086 - Differential pressure detected on filter with engine on and oil temperature over 20°C

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check oil filter**<br><br>• Turn OFF engine.<br><br>• Switch ON ignition.<br><br>• Check if error code E085 is displayed. | **OK (error code E085 is displayed):** Go to **2.**<br><br>**NOT OK (error code E085 is not displayed):**<br><br>• Replace oil cartridge. |
| 2. **See error code E085** | |

### 10.1.2.1.26 E087 - Main ring line low pressure (less than 7 bar)

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check for short to positive**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX and the oil pressure switch connector P_TRAS_OIL_PSW.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the voltage on connector P_TRAS_OIL_PSW between:<br><br>- pin 2 and ground<br><br>**Specification:**<br>Voltage on pin 2: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check the wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 2. **Check oil pressure switch Z184**<br><br>• Reconnect the connectors P_MAIN_TRAX and P_TRAS_OIL_PSW.<br><br>• Turn ON engine.<br><br>• Make hydraulic test using the hydraulic test kit. | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

## E088 - Clutches main ring pressure presence detected without engine being on

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check that the connector P_TRAS_OIL_PSW is connected to the oil pressure switch Z184** | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Reconnect the connector. |

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| 2. **Check the oil pressure switch Z184**<br>• Disconnect the connector P_TRAS_OIL_PSW.<br>• Use a multimeter to check the presence of continuity on connector P_TRAS_OIL_PSW between:<br>- pin 1 and 2<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3.**<br>**NOT OK:**<br>• Wear the protective devices and loosen the oil pressure switch to let out any residual pressure from the circuit.<br>• Reinstall the oil pressure switch.<br>• Reconnect the connector P_TRAS_OIL_PSW.<br>• Turn ON engine.<br>• Make hydraulic test using the hydraulic test kit.<br>If the check is not OK:<br>• Replace the oil pressure switch. |
| 3. **Check for short to ground**<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Check the continuity on connector P_TRAS_OIL_PSW between:<br>- pin 1 and ground<br>- pin 2 and ground<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check the wiring harnesses to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.27 E089 - Clutches main ring pressure presence detected without valve being powered and engine on

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check that the main ring valve Y506 is not stuck open doing hydraulic and mechanical tests** | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace the main ring valve. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.28 E090 - Oil temperature is under –20 °C

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Warm the oil**<br>• Keep the engine running for 10÷15 minutes.<br>• Turn OFF engine.<br>• Wait approximately 30 seconds.<br>• Turn ON engine. | **OK:** END of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission ECU, replace the oil temperature sensor and clear the fault code.<br><br>If the fault code reappears:<br><br>- Replace the control module. |

### 10.1.2.1.29 E091 - Oil temperature is over 120 °C

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Cool the oil**<br>• Keep the engine idling for 10÷15 minutes.<br>• Turn OFF engine.<br>• Wait approximately 30 seconds.<br>• Turn ON engine. | **OK:** END of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check the cooling system** | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>Follow the instruction in the dedicated chapter in the service manual to repair the system. |

| | |
|---|---|
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission ECU, replace the oil temperature sensor and clear the fault code.<br><br>If the fault code reappears:<br><br>- Replace the control module. |

## 10.1.2.1.30 E092 - Oil temperature sensor signal too high

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| 1. **Check that the connector P_TRAS_OIL_ TSW is connected to the oil temperature sensor B123** | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Reconnect the connector. |
| 2. **Check the resistance value of the oil temperature sensor**<br><br>• Disconnect the connector P_TRAS_OIL_ TSW from the oil temperature sensor B123.<br><br>• Use a multimeter to check, on sensor, the resistance value between:<br><br>- pin 1 and 2<br><br>**Specification:**<br>Nominal resistance at 20 °C: ……2,5 kΩ<br>Measuring range: ……-30÷130 °C<br>Accuracy: ……±1K<br>Response time 90%: ……< 10 s | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the oil temperature sensor. |
| 3. **Check the contacts of the calibration hidden button that are not stuck**<br><br>• Disconnect the connector P_MAIN_CAL_ BUTT from calibration hidden button S271.<br><br>• Check, on the switch S271, the absence of continuity between:<br><br>- pin 1 and 2 | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Replace the calibration hidden button. |

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| 4. **Check for short to ground**<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Check the absence of continuity on connector P_TRAS_OIL_TSW between:<br>- pin 1 and ground | **OK:** Go to **5.**<br>**NOT OK:**<br>• Check the wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.31 E093 - Oil temperature sensor signal too low

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the resistance value of the oil temperature sensor**<br>• Disconnect the connector P_TRAS_OIL_TSW from the oil temperature sensor B123.<br>• Use a multimeter to check, on sensor, the resistance value between:<br>- pin 1 and 2<br>**Specification:**<br>Nominal resistance at 20 °C: ……2,5 kΩ<br>Measuring range: ……-30÷130 °C<br>Accuracy: ……±1K<br>Response time 90%: ……< 10 s | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace the oil temperature sensor. |
| 2. **Check for short to positive on the oil temperature sensor output**<br>• Switch ON ignition.<br>• Check the voltage on connector P_TRAS_OIL_TSW between:<br>- pin 1 and ground<br>**Specification:**<br>Voltage on pin 1: ……5 Volt (±5%) | **OK:** Go to **3.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check the wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |

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| 3. **Check the continuity on the oil temperature sensor output**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_TRAS_OIL_TSW and 43 of P_ MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.32 E094 - Forward High clutch valve coil no current feedback with command

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check the coil of the forward high clutch solenoid valve Y507 on another circuit**<br><br>• Disconnect the connectors P_TRAS_ FH_V and P_TRAS_RV_V from their solenoid valves.<br><br>• Remove and reverse the coils from their solenoid valves.<br><br>• Reconnect the connectors P_TRAS_FH_V and P_TRAS_RV_V to the solenoid valves of their circuits.<br><br>• Turn ON engine.<br><br>• Drive the vehicle in reverse mode.<br><br>• Check that the error code E100 is not displayed. | **OK (error code E094 is displayed):** Go to **3.**<br><br>**NOT OK (error code E100 is displayed):**<br><br>Go to **2.** |

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|---|---|
| 2. **Check the coil of the forward high clutch solenoid valve**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Use a multimeter to check on the forward high clutch solenoid valve the coil resistance between:<br>• pin 1 and 2<br><br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br><br>**NOT OK:**<br>• Replace the coil of the forward high clutch solenoid valve. |
| 3. **Check the continuity**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Check the presence of continuity between:<br>• pin 1 of P_TRAS_FH_V and 6 of P_MAIN_TRAX<br>• pin 2 of P_TRAS_FH_V and 13 of P_MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check for short to ground**<br>• Check the absence of continuity on connector P_TRAS_FH_V between:<br>• pin 1 and ground<br>• pin 2 and ground | **OK:** Go to **5.**<br><br>**NOT OK:**<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.33 E095 - Forward High clutch valve coil current feedback detected when valve is not supplied

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check for short to positive**<br><br>• Disconnect the connector P_TRAS_FH_V from forward high clutch solenoid valve Y507.<br><br>• Switch ON ignition.<br><br>• Check the voltage on connector P_TRAS_FH_V between:<br><br>- pin 1 and ground<br>- pin 2 and ground<br><br>**Specification:**<br>Voltage on pins 1 and 2: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.34 E096 - Forward High clutch valve coil difference between measured and reference current

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the coil of the forward high clutch solenoid valve Y507 on another circuit**<br><br>• Disconnect the connectors P_TRAS_FH_V and P_TRAS_RV_V from their solenoid valves.<br><br>• Remove and reverse the coils from their solenoid valves.<br><br>• Reconnect the connectors P_TRAS_FH_V and P_TRAS_RV_V to the solenoid valves of their circuits.<br><br>• Turn ON engine.<br><br>• Drive the vehicle in reverse mode.<br><br>• Check that the error code E102 is not displayed. | **OK (error code E096 is displayed):** Go to **3.**<br><br>**NOT OK (error code E102 is displayed):**<br><br>Go to **2.** |

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|---|---|
| 2. **Check the coil of the forward high clutch solenoid valve**<br><br>• Switch OFF ignition.<br><br>• Restore the initial state (remove and reinvert the coils).<br><br>• Use a multimeter to check on the forward high clutch solenoid valve the coil resistance between:<br><br>• pin 1 and 2<br><br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the coil of the forward high clutch solenoid valve. |
| 3. **Check the circuit**<br><br>• Switch OFF ignition.<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Check the line resistance between:<br><br>• pin 1 of P_TRAS_FH_V and 6 of P_MAIN_TRAX<br>• pin 2 of P_TRAS_FH_V and 13 of P_MAIN_TRAX<br><br>**Specification:**<br>Line resistance near: ……0 Ohm | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.35 E097 - Forward Low clutch valve coil no current feedback with command

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check the coil of the forward low clutch solenoid valve Y508 on another circuit**<br>• Disconnect the connectors P_TRAS_FL_V and P_TRAS_RV_V from their solenoid valves.<br>• Remove and reverse the coils from their solenoid valves.<br>• Reconnect the connectors P_TRAS_FL_V and P_TRAS_RV_V to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E100 is not displayed. | **OK (error code E097 is displayed):** Go to **3.**<br>**NOT OK (error code E100 is displayed):**<br>Go to **2.**. |
| 2. **Check the coil of the forward low clutch solenoid valve**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Use a multimeter to check on the forward low clutch solenoid valve the coil resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the coil of the forward low clutch solenoid valve. |
| 3. **Check the continuity**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Check the presence of continuity between:<br>• pin 1 of P_TRAS_FL_V and 3 of P_MAIN_TRAX<br>• pin 2 of P_TRAS_FL_V and 12 of P_MAIN_TRAX<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |

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|---|---|
| 4. **Check for short to ground**<br>• Check the absence of continuity on connector P_TRAS_FL_V between:<br>• pin 1 and ground<br>• pin 2 and ground | **OK:** Go to **5.**<br>**NOT OK:**<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.36 E098 - Forward Low clutch valve coil current feedback detected when valve is not supplied

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check for short to positive**<br>• Disconnect the connector P_TRAS_FL_V from forward high clutch solenoid valve Y508.<br>• Switch ON ignition.<br>• Check the voltage on connector P_TRAS_FL_V between:<br>- pin 1 and ground<br>- pin 2 and ground<br>**Specification:**<br>Voltage on pins 1 and 2: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.37 E099 - Forward Low clutch valve coil difference between measured and reference current

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check the coil of the forward low clutch solenoid valve Y508 on another circuit**<br>• Disconnect the connectors P_TRAS_FL_V and P_TRAS_RV_V from their solenoid valves.<br>• Remove and reverse the coils from their solenoid valves.<br>• Reconnect the connectors P_TRAS_FL_V and P_TRAS_RV_V to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E102 is not displayed. | **OK (error code E099 is displayed):** Go to **3.**<br>**NOT OK (error code E102 is displayed):**<br>Go to **2.** |
| 2. **Check the coil of the forward low clutch solenoid valve**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Use a multimeter to check on the forward low clutch solenoid valve the coil resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the coil of the forward low clutch solenoid valve. |
| 3. **Check the circuit**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Check the line resistance between:<br>• pin 1 of P_TRAS_FL_V and 3 of P_MAIN_TRAX<br>• pin 2 of P_TRAS_FL_V and 12 of P_MAIN_TRAX<br>**Specification:**<br>Line resistance near: ……0 Ohm | **OK:** Go to **4.**<br>**NOT OK:**<br>• Repair or replace as needed. |

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|---|---|
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.38 E100 - Reverse clutch valve coil no current feedback with command

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check the coil of the reverse clutch solenoid valve Y233 on another circuit**<br>• Disconnect the connectors P_TRAS_FL_V and P_TRAS_RV_V from their solenoid valves.<br>• Remove and reverse the coils from their solenoid valves.<br>• Reconnect the connectors P_TRAS_FL_V and P_TRAS_RV_V to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E097 is not displayed. | **OK (error code E100 is displayed):** Go to **3.**<br>**NOT OK (error code E097 is displayed):**<br>Go to **2.** |
| 2. **Check the coil of the reverse clutch solenoid valve**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Use a multimeter to check on the reverse clutch solenoid valve the coil resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the coil of the reverse clutch solenoid valve. |

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|---|---|
| 3. **Check the continuity**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Check the presence of continuity between:<br>• pin 1 of P_TRAS_RV_V and 7 of P_MAIN_TRAX<br>• pin 2 of P_TRAS_RV_V and 41 of P_MAIN_TRAX<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check for short to ground**<br>• Check the absence of continuity on connector P_TRAS_RV_V between:<br>• pin 1 and ground<br>• pin 2 and ground | **OK:** Go to **5.**<br>**NOT OK:**<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

## 10.1.2.1.39 E101 - Reverse clutch valve coil current feedback detected when valve is not supplied

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check for short to positive**<br>• Disconnect the connector P_TRAS_RV_V from reverse clutch solenoid valve Y233.<br>• Switch ON ignition.<br>• Check the voltage on connector P_TRAS_RV_V between:<br>- pin 1 and ground<br>- pin 2 and ground<br>**Specification:**<br>Voltage on pins 1 and 2: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |

| | |
|---|---|
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.40 E102 - Reverse clutch valve coil difference between measured and reference current

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the coil of the reverse clutch solenoid valve Y233 on another circuit**<br>• Disconnect the connectors P_TRAS_FL_V and P_TRAS_RV_V from their solenoid valves.<br>• Remove and reverse the coils from their solenoid valves.<br>• Reconnect the connectors P_TRAS_FL_V and P_TRAS_RV_V to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E099 is not displayed. | **OK (error code E102 is displayed):** Go to **3.**<br>**NOT OK (error code E099 is displayed):**<br>Go to **2.** |
| 2. **Check the coil of the reverse clutch solenoid valve**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the coils).<br>• Use a multimeter to check on the reverse clutch solenoid valve the coil resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Coil resistance: ……2,2 Ohm (±5%) | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the coil of the reverse clutch solenoid valve. |

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|---|---|
| 3. **Check the circuit**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Check the line resistance between:<br>• pin 1 of P_TRAS_RV_V and 7 of P_MAIN_TRAX<br>• pin 2 of P_TRAS_RV_V and 41 of P_MAIN_TRAX<br>**Specification:**<br>Line resistance near: ……0 Ohm | **OK:** Go to **4.**<br>**NOT OK:**<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.41 E103 - Forward High clutch pressure sensor signal over maximum value (higher than 940 digit)

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Calibration of the forward high clutch pressure sensor B384**<br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the supply voltage of the forward high clutch pressure sensor B384**<br>• Switch ON ignition.<br>• Use a multimeter to check, on the connector P_TRAS_FH_PS, the supply voltage between:<br>• pin A and B<br>**Specification:**<br>Supply voltage sensor: ……5 Volt | **OK:** Go to **3.**<br>**NOT OK (supply voltage over 5 volt):**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |

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| 3. **Check for short to positive on the sensor output line**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Switch ON ignition.<br>• Check the voltage between:<br>• pin C of P_TRAS_FH_PS and ground<br><br>**Specification:**<br>Voltage on pin C of connector P_TRAS_FH_PS:<br>……0 Volt | **OK:** Go to **4.**<br><br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward high clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br><br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.42 E104 - Forward High clutch pressure sensor signal under minimum value (lower than 40 digit)

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the forward high clutch pressure sensor B384**<br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br><br>**NOT OK:**<br><br>Go to **2.** |

| | |
|---|---|
| 2. **Check the supply voltage of the forward high clutch pressure sensor B384**<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check, on the connector P_TRAS_FH_PS, the supply voltage between:<br><br>• pin A and B<br><br>**Specification:**<br>Supply voltage sensor: ……5 Volt | **OK:** Go to **3.**<br><br>**NOT OK (supply voltage under 5 volt):**<br><br>• Switch OFF ignition.<br><br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 3. **Check sensor output line**<br><br>• Switch OFF ignition.<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Check the line resistance between:<br><br>• pin C of P_TRAS_FH_PS and 45 of P_MAIN_TRAX<br><br>**Specification:**<br>Line resistance near: ……0 Ohm<br><br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines. | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission control unit:<br><br>• Replace the forward high clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br><br>If the system does not function properly:<br><br>• Replace the control module.<br>• Remake the calibration of the parameters. |

## 10.1.2.1.43 E105 - Forward High clutch pressure lower than 0.250 bar when pressure requested

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| 1. **Calibration of the forward high clutch pressure sensor B384**<br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the forward high clutch pressure sensor on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_FH_PS and P_TRAS_RV_PS from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_TRAS_FH_PS and P_TRAS_RV_PS to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E117 is not displayed. | **OK (error code E105 is displayed):** Go to **3.**<br>**NOT OK (error code E117 is displayed):**<br>• Replace the forward high clutch pressure sensor B384. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward high clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.44 E106 - Forward High clutch pressure over 0.9 bar when clutch is not activated

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Calibration of the forward high clutch pressure sensor B384**<br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the forward high clutch pressure sensor on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_FH_PS and P_TRAS_RV_PS from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_TRAS_FH_PS and P_TRAS_RV_PS to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E118 is not displayed. | **OK (error code E106 is displayed):** Go to **3.**<br>**NOT OK (error code E118 is displayed):**<br>• Replace the forward high clutch pressure sensor B384. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward high clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.45 E107 - Forward High clutch pressure reference and measure differ of 0.5 bar

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|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Calibration of the forward high clutch pressure sensor B384**<br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |

| | |
|---|---|
| 2. **Check the forward high clutch pressure sensor on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_FH_PS and P_TRAS_RV_PS from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_TRAS_FH_PS and P_TRAS_RV_PS to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E119 is not displayed. | **OK (error code E107 is displayed):** Go to **3.**<br>**NOT OK (error code E119 is displayed):**<br>• Replace the forward high clutch pressure sensor B384. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward high clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.46 E108 - Forward High clutch proportional valve PI characteristic out of nominal ranges (150 mA)

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the forward high clutch pressure sensor B384**<br>• Use the electronic tool to reset the parameters of the forward high clutch pressure sensor B384. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |

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| 2. **Check the forward high clutch valve on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_FH_V and P_ TRAS_RV_V from their solenoid valves.<br>• Remove and invert the valves from their circuits.<br>• Reconnect the connectors P_TRAS_FH_V and P_ TRAS_RV_V to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E120 is not displayed. | **OK (error code E108 is displayed):** Go to **3.**<br>**NOT OK (error code E120 is displayed):**<br>• Replace the forward high clutch valve Y507. |
| 3. **Check the forward high clutch pressure sensor on reverse circuit**<br>• Switch OFF ignition.<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_FH_PS and P_TRAS_RV_PS from their sensors.<br>• Remove and invert the pressure sensors from their circuits.<br>• Reconnect the connectors P_TRAS_FH_PS and P_TRAS_RV_PS to the pressure sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E120 is not displayed. | **OK (error code E108 is displayed):** Go to **4.**<br>**NOT OK (error code E120 is displayed):**<br>• Replace the forward high clutch pressure sensor B384. |
| 4. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the proportional valves and pressure sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission ECU, replace the forward high clutch proportional valve, replace the pressure sensor and clear the fault code.<br>If the system does not function properly:<br>• Replace the control module. |

### 10.1.2.1.47 E109 - Forward Low clutch pressure sensor signal over maximum value (higher than 940 digit)

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Calibration of the forward low clutch pressure sensor B385**<br><br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check the supply voltage of the forward low clutch pressure sensor B385**<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check, on the connector P_TRAS_FL_PS, the supply voltage between:<br><br>• pin A and B<br><br>**Specification:**<br>Supply voltage sensor: ……5 Volt | **OK:** Go to **3.**<br><br>**NOT OK (supply voltage over 5 volt):**<br><br>• Switch OFF ignition.<br><br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 3. **Check for short to positive on the sensor output line**<br><br>• Switch OFF ignition.<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Switch ON ignition.<br><br>• Check the voltage between:<br><br>• pin C of P_TRAS_FL_PS and ground<br><br>**Specification:**<br>Voltage on pin C of connector P_TRAS_FL_PS:<br>……0 Volt | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission control unit:<br><br>• Replace the forward low clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br><br>If the system does not function properly:<br><br>• Replace the control module.<br>• Remake the calibration of the parameters. |

## 10.1.2.1.48 E110 - Forward Low clutch pressure sensor signal under minimum value (lower than 40 digit)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| 1. **Calibration of the forward low clutch pressure sensor B385**<br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the supply voltage of the forward low clutch pressure sensor B385**<br>• Switch ON ignition.<br>• Use a multimeter to check, on the connector P_TRAS_FL_PS, the supply voltage between:<br>• pin A and B<br>**Specification:**<br>Supply voltage sensor: ……5 Volt | **OK:** Go to **3.**<br>**NOT OK (supply voltage under 5 volt):**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 3. **Check sensor output line**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Check the line resistance between:<br>• pin C of P_TRAS_FL_PS and 44 of P_MAIN_TRAX<br>**Specification:**<br>Line resistance near: ……0 Ohm<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines. | **OK:** Go to **4.**<br>**NOT OK:**<br>• Repair or replace as needed. |

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|---|---|
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission control unit:<br><br>• Replace the forward low clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br><br>If the system does not function properly:<br><br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.49 E111 - Forward Low clutch pressure lower than 0.250 bar when pressure requested

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Calibration of the forward low clutch pressure sensor B385**<br><br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check the forward low clutch pressure sensor on reverse circuit**<br><br>• Wear the protective devices.<br><br>• Disconnect the connectors P_TRAS_FL_PS and P_TRAS_RV_PS from their sensors.<br><br>• Remove and invert the sensors from their circuits.<br><br>• Reconnect the connectors P_TRAS_FL_PS and P_TRAS_RV_PS to the sensors of their circuits.<br><br>• Turn ON engine.<br><br>• Drive the vehicle in reverse mode.<br><br>• Check that the error code E117 is not displayed. | **OK (error code E111 is displayed):** Go to **3.**<br><br>**NOT OK (error code E117 is displayed):**<br><br>• Replace the forward low clutch pressure sensor B385. |

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|---|---|
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward low clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.50 E112 - Forward Low clutch pressure over 0.9 bar when clutch is not activated

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the forward low clutch pressure sensor B385**<br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the forward low clutch pressure sensor on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_FL_PS and P_TRAS_RV_PS from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_TRAS_FL_PS and P_TRAS_RV_PS to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E118 is not displayed. | **OK (error code E112 is displayed):** Go to **3.**<br>**NOT OK (error code E118 is displayed):**<br>• Replace the forward low clutch pressure sensor B385. |

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|---|---|
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward low clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.51 E113 - Forward Low clutch pressure reference and measure differ of 0.5 bar

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the forward low clutch pressure sensor B385**<br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the forward low clutch pressure sensor on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_FL_PS and P_TRAS_RV_PS from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_TRAS_FL_PS and P_TRAS_RV_PS to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E119 is not displayed. | **OK (error code E113 is displayed):** Go to **3.**<br>**NOT OK (error code E119 is displayed):**<br>• Replace the forward low clutch pressure sensor B385. |

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| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the forward low clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.52 E114 - Forward Low clutch proportional valve PI characteristic out of nominal ranges (150 mA)

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the forward low clutch pressure sensor B385**<br>• Use the electronic tool to reset the parameters of the forward low clutch pressure sensor B385. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the forward low clutch valve on reverse circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_FL_V and P_TRAS_RV_V from their solenoid valves.<br>• Remove and invert the valves from their circuits.<br>• Reconnect the connectors P_TRAS_FL_V and P_TRAS_RV_V to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E120 is not displayed. | **OK (error code E114 is displayed):** Go to **3.**<br>**NOT OK (error code E120 is displayed):**<br>• Replace the forward low clutch valve Y508. |

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| 3. **Check the forward low clutch pressure sensor on reverse circuit**<br>• Switch OFF ignition.<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_FL_PS and P_TRAS_RV_PS from their sensors.<br>• Remove and invert the pressure sensors from their circuits.<br>• Reconnect the connectors P_TRAS_FL_PS and P_TRAS_RV_PS to the pressure sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in reverse mode.<br>• Check that the error code E120 is not displayed. | **OK (error code E114 is displayed):** Go to **4.**<br>**NOT OK (error code E120 is displayed):**<br>• Replace the forward low clutch pressure sensor B385. |
| 4. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the proportional valves and pressure sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission ECU, replace the forward low clutch proportional valve, replace the pressure sensor and clear the fault code.<br>If the system does not function properly:<br>• Replace the control module. |

### 10.1.2.1.53 E115 - Reverse clutch pressure sensor signal over maximum value (higher than 940 digit)

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the reverse clutch pressure sensor B383**<br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |

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|---|---|
| 2. **Check the supply voltage of the reverse clutch pressure sensor B383**<br>• Switch ON ignition.<br>• Use a multimeter to check, on the connector P_TRAS_RV_PS, the supply voltage between:<br>• pin A and B<br>**Specification:**<br>Supply voltage sensor: ……5 Volt | **OK:** Go to **3.**<br>**NOT OK (supply voltage over 5 volt):**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 3. **Check for short to positive on the sensor output line**<br>• Switch OFF ignition.<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Switch ON ignition.<br>• Check the voltage between:<br>• pin C of P_TRAS_RV_PS and ground<br>**Specification:**<br>Voltage on pin C of connector P_TRAS_RV_PS:<br>……0 Volt | **OK:** Go to **4.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the reverse clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

## 10.1.2.1.54 E116 - Reverse clutch pressure sensor signal under minimum value (lower than 40 digit)

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Calibration of the reverse clutch pressure sensor B383**<br><br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check the supply voltage of the reverse clutch pressure sensor B383**<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check, on the connector P_TRAS_RV_PS, the supply voltage between:<br><br>• pin A and B<br><br>**Specification:**<br>Supply voltage sensor: ……5 Volt | **OK:** Go to **3.**<br><br>**NOT OK (supply voltage under 5 volt):**<br><br>• Switch OFF ignition.<br><br>• Check the supply line to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 3. **Check sensor output line**<br><br>• Switch OFF ignition.<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Check the line resistance between:<br><br>• pin C of P_TRAS_RV_PS and 54 of P_MAIN_TRAX<br><br>**Specification:**<br>Line resistance near: ……0 Ohm<br><br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines. | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission control unit:<br><br>• Replace the reverse clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br><br>If the system does not function properly:<br><br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.55 E117 - Reverse clutch pressure lower than 0.250 bar when pressure requested

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the reverse clutch pressure sensor B383**<br><br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br><br>**NOT OK:**<br><br>Go to **2.** |
| 2. **Check the reverse clutch pressure sensor on forward low circuit**<br><br>• Wear the protective devices.<br><br>• Disconnect the connectors P_TRAS_RV_PS and P_TRAS_FL_PS from their sensors.<br><br>• Remove and invert the sensors from their circuits.<br><br>• Reconnect the connectors P_TRAS_RV_PS and P_TRAS_FL_PS to the sensors of their circuits.<br><br>• Turn ON engine.<br><br>• Drive the vehicle in forward low mode.<br><br>• Check that the error code E111 is not displayed. | **OK (error code E117 is displayed):** Go to **3.**<br><br>**NOT OK (error code E111 is displayed):**<br><br>• Replace the reverse clutch pressure sensor B383. |
| 3. **Check control module revision level**<br><br>• Switch OFF ignition.<br><br>• Restore the initial state (remove and reinvert the sensors).<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system does not function properly, before replacing the transmission control unit:<br><br>• Replace the reverse clutch pressure sensor.<br><br>• Remake the calibration of the parameters.<br><br>• Clear the fault code.<br><br>If the system does not function properly:<br><br>• Replace the control module.<br><br>• Remake the calibration of the parameters. |

### 10.1.2.1.56 E118 - Reverse clutch pressure over 0.9 bar when clutch is not activated

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |
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| 1. **Calibration of the reverse clutch pressure sensor B383**<br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |
| 2. **Check the reverse clutch pressure sensor on forward low circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_RV_PS and P_TRAS_FL_PS from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_TRAS_RV_PS and P_TRAS_FL_PS to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E112 is not displayed. | **OK (error code E118 is displayed):** Go to **3.**<br>**NOT OK (error code E112 is displayed):**<br>• Replace the reverse clutch pressure sensor B383. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the reverse clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.57 E119 - Reverse clutch pressure reference and measure differ of 0.5 bar

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Calibration of the reverse clutch pressure sensor B383**<br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |

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|---|---|
| 2. **Check the reverse clutch pressure sensor on forward low circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_RV_PS and P_TRAS_FL_PS from their sensors.<br>• Remove and invert the sensors from their circuits.<br>• Reconnect the connectors P_TRAS_RV_PS and P_TRAS_FL_PS to the sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E113 is not displayed. | **OK (error code E119 is displayed):** Go to **3.**<br>**NOT OK (error code E113 is displayed):**<br>• Replace the reverse clutch pressure sensor B383. |
| 3. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission control unit:<br>• Replace the reverse clutch pressure sensor.<br>• Remake the calibration of the parameters.<br>• Clear the fault code.<br>If the system does not function properly:<br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.2.1.58 E120 - Reverse clutch proportional valve PI characteristic out of nominal ranges (150 mA)

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the reverse clutch pressure sensor B383**<br>• Use the electronic tool to reset the parameters of the reverse clutch pressure sensor B383. | **OK:** End of process.<br>**NOT OK:**<br>Go to **2.** |

| | |
|---|---|
| 2. **Check the reverse clutch valve on forward low circuit**<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_RV_V and P_ TRAS_FL_V from their solenoid valves.<br>• Remove and invert the valves from their circuits.<br>• Reconnect the connectors P_TRAS_RV_V and P_ TRAS_FL_V to the solenoid valves of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E114 is not displayed. | **OK (error code E120 is displayed):** Go to **3.**<br>**NOT OK (error code E114 is displayed):**<br>• Replace the reverse clutch valve Y233. |
| 3. **Check the reverse clutch pressure sensor on forward low circuit**<br>• Switch OFF ignition.<br>• Wear the protective devices.<br>• Disconnect the connectors P_TRAS_RV_PS and P_TRAS_FL_PS from their sensors.<br>• Remove and invert the pressure sensors from their circuits.<br>• Reconnect the connectors P_TRAS_RV_PS and P_TRAS_FL_PS to the pressure sensors of their circuits.<br>• Turn ON engine.<br>• Drive the vehicle in forward low mode.<br>• Check that the error code E114 is not displayed. | **OK (error code E120 is displayed):** Go to **4.**<br>**NOT OK (error code E114 is displayed):**<br>• Replace the reverse clutch pressure sensor B383. |
| 4. **Check control module revision level**<br>• Switch OFF ignition.<br>• Restore the initial state (remove and reinvert the proportional valves and pressure sensors).<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>If the system does not function properly, before replacing the transmission ECU, replace the reverse clutch proportional valve, replace the pressure sensor and clear the fault code.<br>If the system does not function properly:<br>• Replace the control module. |

### 10.1.2.1.59 E121 - Forward High clutch unexpected slipping

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check clutches**<br><br>• Start engine.<br><br>• Check that other clutches do not slip:<br><br>- Engage the low speed and check that no other errors are shown<br><br>- Engage the reverse and check that no other errors are shown | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect connectors P_TRAS_TX_OUT_SPEED and P_MAIN_TRAX.<br><br>• Use a multimeter.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and 24 of P_MAIN_TRAX<br>- pin 3 of P_TRAS_TX_OUT_SPEED and 52 of P_MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>• Switch ON ignition.<br><br>• Check for short to positive.<br>Check the voltage between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br><br>• If there are anomalies repair or replace wiring harness as needed.<br><br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace forward high clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

## 10.1.2.1.60 E122 - Forward Low clutch unexpected slipping

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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| 1. **Check clutches**<br><br>• Start engine.<br><br>• Check that other clutches do not slip:<br><br>- Engage the high speed and check that no other errors are shown<br><br>- Engage the reverse and check that no other errors are shown | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect connectors P_TRAS_TX_OUT_SPEED and P_MAIN_TRAX.<br><br>• Use a multimeter.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and 24 of P_MAIN_TRAX<br>- pin 3 of P_TRAS_TX_OUT_SPEED and 52 of P_MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>• Switch ON ignition.<br><br>• Check for short to positive.<br>Check the voltage between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br><br>• If there are anomalies repair or replace wiring harness as needed.<br><br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace forward low clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

## 10.1.2.1.61 E123 - Reverse clutch unexpected slipping

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check clutches**<br><br>• Start engine.<br><br>• Check that other clutches do not slip:<br><br>- Engage the low speed and check that no other errors are shown<br><br>- Engage the high speed and check that no other errors are shown | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect connectors P_TRAS_TX_OUT_SPEED and P_MAIN_TRAX.<br><br>• Use a multimeter.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and 24 of P_MAIN_TRAX<br>- pin 3 of P_TRAS_TX_OUT_SPEED and 52 of P_MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>• Switch ON ignition.<br><br>• Check for short to positive.<br>Check the voltage between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br><br>• If there are anomalies repair or replace wiring harness as needed.<br><br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace reverse clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

### 10.1.2.1.62 E124 - Clutches output speed sensor failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check that the connector P_TRAS_TX_OUT_SPEED is connected to the transmission out speed sensor B229** | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Reconnect the connector. |

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| 2. **Check the supply voltage of the sensor**<br><br>• Disconnect connector P_TRAS_TX_OUT_SPEED, from the transmission out speed sensor B229, and P_MAIN_TRAX, from the transmission control unit A057.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the voltage on connector P_TRAS_TX_OUT_SPEED between:<br><br>- pin 1 and 4<br><br>**Specification:**<br>Supply voltage of sensor: ……12 Volt (±5%) | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>If there is not voltage at all, go to **3**.<br><br>If there is voltage, but it is not as per specification:<br><br>• Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Check the power line resistance between:<br><br>• pin 1 of P_TRAS_TX_OUT_SPEED and any of the pins 8, 34, 35 or 36 of P_MAIN_TRAX<br>• pin 4 of P_TRAS_TX_OUT_SPEED and pin 17 of P_MAIN_TRAX<br><br>**Specification:**<br>Line resistance must be near: ……0 Ohm<br><br>• Repair or replace as needed. |
| 3. **Check the fuse**<br><br>• Switch OFF ignition.<br><br>• Check line protection fuse F7 in fuse box C144. | **OK:** Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed.<br><br>If everything is ok, go to **4**.<br><br>**NOT OK:**<br><br>Before replacing the fuse F7, check for short to ground.<br><br>• Check the absence of continuity between:<br><br>• pin 1 of P_TRAS_TX_OUT_SPEED and ground<br><br>• Check the wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 4. **Check for short to positive on ground line**<br><br>• Switch ON ignition.<br><br>• Check the voltage on ground line, between:<br><br>- pin 4 of P_TRAS_TX_OUT_SPEED and ground<br><br>**Specification:**<br>Voltage on pin 4: ……0 Volt | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Check the wirings to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

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| 5. **Check the continuity on the sensor output lines**<br><br>• Switch OFF ignition.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and pin 24 of P_MAIN_TRAX<br>- pin 3 of P_TRAS_TX_OUT_SPEED and pin 52 of P_MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **6.**<br><br>**NOT OK:**<br><br>• Check the wirings to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 6. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system is not function properly, before replacing the transmission ECU, replace the transmission out speed sensor and clear the fault code.<br><br>If the fault code reappears:<br><br>• Replace the control module. |

## 10.1.2.1.63 E125 - Top Shaft Speed Sensor, Out Of Range

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check that leads of the transmission out speed sensor B229 have not been inverted**<br><br>• Disconnect connector P_TRAS_TX_OUT_SPEED, from the transmission out speed sensor B229, and P_MAIN_TRAX, from the transmission control unit A057.<br><br>• Check the continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and pin 24 of P_MAIN_TRAX<br>- pin 3 of P_TRAS_TX_OUT_SPEED and pin 52 of P_MAIN_TRAX | **OK:** Reconnect connectors and go to **2.**<br><br>**NOT OK:**<br><br>• Check the continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and pin 52 of P_MAIN_TRAX<br>- pin 3 of P_TRAS_TX_OUT_SPEED and pin 24 of P_MAIN_TRAX<br><br>If there is continuity, invert the leads on sensor connector P_TRAS_TX_OUT_SPEED. |

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| 2. **Check that wiring harnesses of the circuits (forward and reverse) have not been inverted**<br><br>• Check that connectors P_TRAS_FL_V, P_TRAS_FH_V and P_TRAS_RV_V are connected to the respective solenoid valves Y508, Y507 and Y233.<br><br>• Check that connectors P_TRAS_FH_PS, P_TRAS_FL_PS and P_TRAS_RV_PS are connected to the respective pressure sensors B384, B385 and B383. | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Restore connections. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>If the system is not function properly, before replacing the transmission ECU, replace the transmission out speed sensor and clear the fault code.<br><br>If the fault code reappears:<br><br>• Replace the control module. |

### 10.1.2.1.64 E126 - Transmission Electronic Control Unit internal failure

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.65 E127 - Transmission Electronic Control Unit internal failure

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.66 E128 - Transmission Electronic Control Unit internal failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.67 E129 - First calibration not performed

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Calibration of the clutch pedal and pressure sensors**<br><br>• Use the electronic tool to reset the parameters:<br><br>- clutch pedal<br><br>- forward high pressure sensor<br><br>- forward low pressure sensor<br><br>- reverse pressure sensor | If the problem is not resolved, before replacing the transmission ECU, download the correct software revision level, and verify that the system functions properly.<br><br>If the system does not function properly:<br><br>• Replace the control module<br><br>• Remake the calibration of the parameters |

### 10.1.2.1.68 E130 - Can bus physical support or communication failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |
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| 1. **Check the value of CAN bus resistance on diagnosis socket**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CRT_D_SKT connector) between:<br><br>• pin C and D<br><br>**Specification:**<br><br>CAN bus resistance: ……60 Ohms (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>- Disconnect the CAN bus terminator (R994) from P_CRT_CAN_TERM connector and use a multimeter to check the value of resistance on terminator between:<br><br>- pin A and B<br><br>If resistance does not respect the specific:<br><br>- Replace resistance.<br><br>**Specification:**<br>CAN bus resistance: ……120 Ohms (±5%)<br><br>- Disconnect the connector P_MAIN_TRAX.<br><br>- Check the absence of continuity between:<br><br>- pin 27 and 55 of P_MAIN_TRAX<br><br>- Check the presence of continuity between:<br><br>- pin 27 of P_MAIN_TRAX and any pins of the CAN-H line<br>- pin 55 of P_MAIN_TRAX and any pins of the CAN-L line<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>- Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 27 of P_MAIN_TRAX and ground<br>- pin 55 of P_MAIN_TRAX and ground<br><br>- Check for short to positive.<br>Switch ON ignition.<br>Check the voltage between:<br><br>- pin 27 of P_MAIN_TRAX and ground<br>- pin 55 of P_MAIN_TRAX and ground<br><br>**Specification:**<br>Voltage on pin 27 and 55: ……0 Volt<br><br>- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>- Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Replace the control module. |

## 10.1.2.1.69 E131 - Can bus physical support or communication failure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

1. **Check the value of CAN bus resistance on diagnosis socket**

   - Switch OFF ignition.
   - Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CRT_D_SKT connector) between:

   • pin C and D

**Specification:**

CAN bus resistance: ……60 Ohms (±5%)

**OK:** Go to **2.**

**NOT OK:**

- Disconnect the CAN bus terminator (R994) from P_CRT_CAN_TERM connector and use a multimeter to check the value of resistance on terminator between:
  - pin A and B

If resistance does not respect the specific:

- Replace resistance.

**Specification:**
CAN bus resistance: ……120 Ohms (±5%)

- Disconnect the connector P_MAIN_TRAX.
- Check the absence of continuity between:
  - pin 27 and 55 of P_MAIN_TRAX
- Check the presence of continuity between:
  - pin 27 of P_MAIN_TRAX and any pins of the CAN-H line
  - pin 55 of P_MAIN_TRAX and any pins of the CAN-L line

***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*

- Check for short to ground.
  Check the absence of continuity between:
  - pin 27 of P_MAIN_TRAX and ground
  - pin 55 of P_MAIN_TRAX and ground
- Check for short to positive.
  Switch ON ignition.
  Check the voltage between:
  - pin 27 of P_MAIN_TRAX and ground
  - pin 55 of P_MAIN_TRAX and ground

**Specification:**
Voltage on pin 27 and 55: ……0 Volt

- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.
- Repair or replace harnesses as needed.

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| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.70 E132 - Can bus physical support or communication failure

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check the value of CAN bus resistance on diagnosis socket**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CRT_D_SKT connector) between:<br><br>• pin C and D<br><br>**Specification:**<br><br>CAN bus resistance: ……60 Ohms (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>- Disconnect the CAN bus terminator (R994) from P_CRT_CAN_TERM connector and use a multimeter to check the value of resistance on terminator between:<br><br>- pin A and B<br><br>If resistance does not respect the specific:<br><br>- Replace resistance.<br><br>**Specification:**<br>CAN bus resistance: ……120 Ohms (±5%)<br><br>- Disconnect the connector P_MAIN_TRAX.<br><br>- Check the absence of continuity between:<br><br>- pin 27 and 55 of P_MAIN_TRAX<br><br>- Check the presence of continuity between:<br><br>- pin 27 of P_MAIN_TRAX and any pins of the CAN-H line<br>- pin 55 of P_MAIN_TRAX and any pins of the CAN-L line<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>- Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 27 of P_MAIN_TRAX and ground<br>- pin 55 of P_MAIN_TRAX and ground<br><br>- Check for short to positive.<br>Switch ON ignition.<br>Check the voltage between:<br><br>- pin 27 of P_MAIN_TRAX and ground<br>- pin 55 of P_MAIN_TRAX and ground<br><br>**Specification:**<br>Voltage on pin 27 and 55: ……0 Volt<br><br>- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>- Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.71 E133 - Overcurrent detected on main ring valve

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

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| 1. **Check the solenoid of main ring valve Y506**<br>• Disconnect the P_TRAS_MR_V connector from main ring valve Y506.<br>• Use a multimeter to check on the main ring valve the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……8 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace main ring valve Y506. |
| 2. **Check for short to positive**<br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br>• Switch ON ignition.<br>• Check the voltage on connector P_MAIN_TRAX between:<br>• pin 14 and ground<br>• pin 39 and ground<br>**Specification:**<br>Voltage on pins 14 and 39: ……0 Volt | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or line breaks.<br>• Repair or replace harnesses as needed. |
| 3. **Check the continuity**<br>• Switch OFF ignition.<br>• Check the absence of continuity on connector P_MAIN_TRAX between:<br>• pin 14 and 39 | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or line breaks.<br>• Repair or replace harnesses as needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.72 E134 - Engine EEC1 message timeout

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

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| 1. **To move the vehicle perform LIMP Mode** | If the problem is not resolved, before replacing the transmission control unit A057, download the correct software revision level and verify that the system functions properly. |

### 10.1.2.1.73 E135 - Vehicle ECU message CAN timeout

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check instrument panel A101 revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>- Replace the control module. |

### 10.1.2.1.74 E136 - Forward High clutch long time slipping

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check clutches**<br><br>• Start engine.<br><br>• Check that other clutches do not slip:<br><br>- Engage the low speed and check that no other errors are shown<br><br>- Engage the reverse and check that no other errors are shown | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect connectors P_TRAS_TX_OUT_SPEED and P_MAIN_TRAX.<br><br>• Use a multimeter.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and 24 of P_MAIN_TRAX<br>- pin 3 of P_TRAS_TX_OUT_SPEED and 52 of P_MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>• Switch ON ignition.<br><br>• Check for short to positive.<br>Check the voltage between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br><br>• If there are anomalies repair or replace wiring harness as needed.<br><br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace forward high clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

## 10.1.2.1.75 E137 - Reverse clutch long time slipping

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check clutches**<br><br>• Start engine.<br><br>• Check that other clutches do not slip:<br><br>- Engage the low speed and check that no other errors are shown<br><br>- Engage the high speed and check that no other errors are shown | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect connectors P_TRAS_TX_OUT_SPEED and P_MAIN_TRAX.<br><br>• Use a multimeter.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and 24 of P_MAIN_TRAX<br>- pin 3 of P_TRAS_TX_OUT_SPEED and 52 of P_MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>• Switch ON ignition.<br><br>• Check for short to positive.<br>Check the voltage between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br><br>• If there are anomalies repair or replace wiring harness as needed.<br><br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace reverse clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

### 10.1.2.1.76 E138 - Absence of electrical signal from FNR lever

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check fuse**<br><br>• Check line protection fuse F7 in fuse box C144. | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>Before replacing the fuse:<br><br>• Check for short to ground.<br><br>- Disconnect the connector P_MAIN_FNR from FNR lever C073.<br><br>- Check the absence of continuity between:<br><br>▪ pin 1 of P_MAIN_FNR and ground<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or line breaks.<br><br>• Repair or replace as needed. |
| 2. **Check supply voltage**<br><br>• Disconnect the connector P_MAIN_FNR from FNR lever C073.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage on connector P_MAIN_FNR between:<br><br>- pin 1 and ground<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±5%) | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_MAIN_FNR and fuse F7<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or line breaks.<br><br>• Repair or replace as needed. |
| 3. **Check FNR lever C073**<br><br>• Check FNR lever contacts.<br><br>• FNR lever in neutral position, check the presence of continuity between:<br><br>- pin 1 (COM) and 2 (N)<br><br>• FNR lever in forward position, check the presence of continuity between:<br><br>- pin 1 (COM) and 3 (F)<br><br>• FNR lever in reverse position, check the presence of continuity between:<br><br>- pin 1 (COM) and 4 (R)<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Replace FNR lever. |

| | |
|---|---|
| 4. **Check continuity**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_MAIN_FNR and 46 of P_MAIN_TRAX<br>- pin 3 of P_MAIN_FNR and 18 of P_MAIN_TRAX<br>- pin 4 of P_MAIN_FNR and 19 of P_MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 5. **Check for short to ground**<br><br>• Check the absence of continuity on connector P_MAIN_TRAX between:<br><br>- pin 18 and ground<br>- pin 19 and ground<br>- pin 46 and ground | **OK:** Go to **6.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 6. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.2.1.77 E139 - Comfort control command failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check fuse**<br><br>• Check line protection fuse F7 in fuse box C144. | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>Before replacing the fuse:<br><br>• Check for short to ground.<br><br>- Disconnect the connector P_MAIN_FNR from FNR lever C073.<br><br>- Check the absence of continuity between:<br><br>▪ pin 1 of P_MAIN_FNR and ground<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or line breaks.<br><br>• Repair or replace as needed. |

| | |
|---|---|
| 2. **Check supply voltage**<br><br>• Disconnect the connector P_MAIN_FNR from FNR lever C073.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage on connector P_MAIN_FNR between:<br><br>- pin 1 and ground<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±5%) | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_MAIN_FNR and fuse F7<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or line breaks.<br><br>• Repair or replace as needed. |
| 3. **Check FNR lever C073**<br><br>• Check FNR lever contacts.<br><br>• FNR lever in neutral position, check the presence of continuity between:<br><br>- pin 1 (COM) and 2 (N)<br><br>• FNR lever in forward position, check the presence of continuity between:<br><br>- pin 1 (COM) and 3 (F)<br><br>• FNR lever in reverse position, check the presence of continuity between:<br><br>- pin 1 (COM) and 4 (R)<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Replace FNR lever. |
| 4. **Check continuity**<br><br>• Disconnect the transmission control unit connector P_MAIN_TRAX.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_MAIN_FNR and 46 of P_MAIN_TRAX<br>- pin 3 of P_MAIN_FNR and 18 of P_MAIN_TRAX<br>- pin 4 of P_MAIN_FNR and 19 of P_MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br><br>• Repair or replace as needed. |

| | |
|---|---|
| 5. **Check for short to ground**<br><br>• Check the absence of continuity on connector P_MAIN_TRAX between:<br><br>- pin 18 and ground<br>- pin 19 and ground<br>- pin 46 and ground | **OK:** Go to **6.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 6. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.78 E140 - Forward Low clutch long time slipping

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check clutches**<br><br>• Start engine.<br><br>• Check that other clutches do not slip:<br><br>- Engage the high speed and check that no other errors are shown<br><br>- Engage the reverse and check that no other errors are shown | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect connectors P_TRAS_TX_OUT_SPEED and P_MAIN_TRAX.<br><br>• Use a multimeter.<br><br>• Check the presence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and 24 of P_MAIN_TRAX<br>- pin 3 of P_TRAS_TX_OUT_SPEED and 52 of P_MAIN_TRAX<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>• Switch ON ignition.<br><br>• Check for short to positive.<br>Check the voltage between:<br><br>- pin 2 of P_TRAS_TX_OUT_SPEED and ground<br>- pin 3 of P_TRAS_TX_OUT_SPEED and ground<br><br>**Specification:**<br>Voltage on pin 2 and 3: ……0 Volt<br><br>• If there are anomalies repair or replace wiring harness as needed.<br><br>• If there are not anomalies replace the sensor. |
| 2. **Repair or replace forward low clutch** | • Follow the instruction in the dedicated chapter in the service manual to fix the issue. |

## 10.1.2.1.79 E155 - Forward high high current

| |
|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check the solenoid of the forward high solenoid valve**<br>• Disconnect connector P_TRAS_FH_V from forward high solenoid valve (Y507).<br>• Use a multimeter to check on the forward high solenoid valve the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……2,2 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace forward high solenoid valve. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.80 E156 - Forward low high current

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the solenoid of the forward low solenoid valve**<br>• Disconnect connector P_TRAS_FL_V from forward low solenoid valve (Y508).<br>• Use a multimeter to check on the forward low solenoid valve the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……2,2 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace forward low solenoid valve. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

## E157 - Reverse high current

| |
|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check the solenoid of the reverse solenoid valve**<br>• Disconnect connectors P_TRAS_RV_V from reverse solenoid valve (Y233).<br>• Use a multimeter to check on the reverse solenoid valve the solenoid resistance between:<br>• pin 1 and 2<br>**Specification:**<br>Solenoid resistance: ……2,2 Ohm (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace reverse solenoid valve. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.81 Driver Seat Switch stuck

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check supply voltage of Z005 – Seat switch**<br>• Disconnect the connector P_MAIN_SEAT_SW of the seat switch.<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage between:<br>– Pin 1 of P_MAIN_SEAT_SW and ground<br>**Specification**<br>Supply voltage: ……12 Volt | **OK:** Go to **2.**<br>**NOT OK:** Check that the fuse F8 is not damaged.<br>Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>Repair or replace if needed. |

| | |
|---|---|
| 2. **Check for continuity**<br><br>• Switch OFF ignition.<br>• Disconnect the connector P_MAIN_DASH from the A101 control unit.<br>• Use a multimeter to check the continuity between:<br><br>– Pin 2 of P_MAIN_SEAT_SW and pin 48 of P_MAIN_DASH<br><br>**Specification**<br><br>Continuity:<br>……Present<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |
| 3. **Check for short to positive**<br><br>• Use a multimeter to check the voltage between:<br><br>– Pin 48 of P_MAIN_DASH and ground<br><br>**Specification**<br>Supply voltage:<br>……0<br>Volt | **OK:** Go to **4**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |
| 4. **Check for short to ground**<br><br>• Use a multimeter to check the absence of continuity between:<br><br>– Pin 1 of P_MAIN_SEAT_SW and ground<br>– Pin 2 of P_MAIN_SEAT_SW and ground<br><br>**Specification**<br><br>Continuity:<br>……Absent | **OK:** Go to **5**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |
| 5. **Check component**<br><br>• Check that the component seat switch Z005 is not damaged and functions properly. | **OK:** End of test.<br><br>**NOT OK:**<br>Repair or replace as needed. |

# 10.1.1. DTCs – Vehicle Control Unit (VCU)

## 10.1.1.1 OOS Models

### 10.1.1.1.1 E001 - Foot Throttle Sensor is Out of Range (Negative characteristic)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B153 – Foot throttle sensor**<br><br>• Disconnect the connector P_CH_FOOT_THROTT of the foot throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_FOOT_THROTT between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the foot throttle fuse (F4) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check the continuity between pins: 2, 3 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check the continuity between pins: 1, 3 and F4).<br>Repair or replace if needed.<br><br>• Check that the component (B153) is not damaged. |
| 2. **Check continuity between foot throttle sensor and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect P_D_IP.<br><br>• Check continuity between P_CH_FOOT_THROTT pin 3 and P_D_IP pin 35.<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |
| 3. **Check for correct calibration of the foot throttle sensor**<br><br>• Reconnect all connectors<br><br>• Remake the calibration of the foot throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Check for a mechanical / hydraulic issue. |

| | |
|---|---|
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.1.2 E001 - Foot Throttle Sensor is Out of Range (Positive characteristic)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B153 – Foot throttle sensor**<br><br>• Disconnect the connector P_CH_FOOT_THROTT of the foot throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_FOOT_THROTT between pins:<br><br>- 4 and 5<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the foot throttle fuse (F4) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check the continuity between pins: 5, 6 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check the continuity between pins: 4, 6 and F4).<br>Repair or replace if needed.<br><br>• Check that the component (B153) is not damaged. |
| 2. **Check continuity between foot throttle sensor and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect P_D_IP.<br><br>• Check continuity between P_CH_FOOT_THROTT pin 6 and P_D_IP pin 15.<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |

| | |
|---|---|
| 3. **Check for correct calibration of the foot throttle sensor**<br><br>• Reconnect all connectors.<br><br>• Remake the calibration of the foot throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Check for a mechanical / hydraulic issue. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.1.3 E002 - Difference between Positive and Negative characteristic is Out of Range

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B153 – Foot throttle sensor**<br><br>• Disconnect the connector P_CH_FOOT_THROTT of the foot throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_FOOT_THROTT between pins:<br><br>- 1 and 2<br><br>- 4 and 5<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the foot throttle fuse (F4) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check continuity between pins: 2, 3, 5, 6 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check continuity between pins: 1, 3, 4, 6 and F4). Repair or replace if needed.<br><br>• Check that the component (B153) is not damaged. |

| | |
|---|---|
| 2. **Check continuity between foot throttle sensor and instrument panel control module**<br><br>• Switch OFF ignition.<br>• Disconnect P_D_IP.<br>• Check continuity between:<br>- P_CH_FOOT_THROTT pin 3 and P_D_IP pin 35<br>- P_CH_FOOT_THROTT pin 6 and P_D_IP pin 15<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>• Repair or replace if needed. |
| 3. **Check for correct calibration of the foot throttle sensor**<br><br>• Reconnect all connectors.<br>• Remake the calibration of the foot throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br>• Check for a mechanical / hydraulic issue. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br>• Change the control module. |

### 10.1.1.1.4 E004 - Hand Throttle Sensor is Out of Range (Negative characteristic)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B154 – hand throttle sensor**<br><br>• Disconnect the connector P_CH_HAND_THROT of the hand throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_HAND_THROT between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the hand throttle fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check continuity between pins: 2, 3 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check continuity between pins: 1, 3 and F6).<br>Repair or replace if needed.<br><br>• Check that the component (B154) is not damaged. |
| 2. **Check continuity between hand throttle sensor and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect P_D_IP.<br><br>• Check continuity between:<br><br>- P_CH_HAND_THROT pin 3 and P_D_IP pin 37<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |
| 3. **Check for correct calibration of the hand throttle sensor**<br><br>• Reconnect all connectors<br><br>• Remake the calibration of the hand throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Check for a mechanical / hydraulic issue. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.1.5 E004 - Hand Throttle Sensor is Out of Range (Positive characteristic)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B154 – hand throttle sensor**<br><br>• Disconnect the connector P_CH_HAND_THROT of the hand throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_HAND_THROT between pins:<br><br>- 4 and 5<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the hand throttle fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check continuity between pins: 5, 6 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check continuity between pins: 4, 6 and F6).<br>Repair or replace if needed.<br><br>• Check that the component (B154) is not damaged. |
| 2. **Check continuity between hand throttle sensor and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect P_D_IP.<br><br>• Check continuity between:<br><br>- P_CH_HAND_THROT pin 6 and P_D_IP pin 17<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |
| 3. **Check for correct calibration of the hand throttle sensor**<br><br>• Reconnect all connectors<br><br>• Remake the calibration of the hand throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Check for a mechanical / hydraulic issue. |

| | |
|---|---|
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.1.6 E005 - Difference between Positive and Negative characteristic is Out of Range

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B154 – hand throttle sensor**<br><br>• Disconnect the connector P_CH_HAND_THROT of the hand throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_HAND_THROT between pins:<br><br>- 1 and 2<br><br>- 4 and 5<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the hand throttle fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check continuity between pins: 2, 3, 5, 6 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check continuity between pins: 1, 3, 4, 6 and F6). Repair or replace if needed.<br><br>• Check that the component (B154) is not damaged. |
| 2. **Check continuity between hand throttle sensor and instrument panel control module**<br><br>.<br><br>• Switch OFF ignition.<br><br>• Disconnect P_D_IP.<br><br>• Check continuity between:<br><br>- P_CH_HAND_THROT pin 3 and P_D_IP pin 37<br><br>- P_CH_HAND_THROT pin 6 and P_D_IP pin 17<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |

| | |
|---|---|
| 3. **Check for correct calibration of the hand throttle sensor**<br><br>• Reconnect all connectors.<br><br>• Remake the calibration of the hand throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Check for a mechanical / hydraulic issue. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.1.7 E007 - Inconsistent values of Left Pedal Brake Sensor

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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| 1. **Check supply voltage of Z126 – Left hand pedal switch**<br><br>• Disconnect the connector P_BP_LHS<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_BP_LHS between pins:<br><br>- 1 and ground<br>- 2 and ground<br><br>**Specification**<br><br>Supply voltage of brake pedal switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the brakes line fuse (F10) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground:<br>Check continuity between pins:<br><br>- 1 of P_BP_LHS and ground<br>- 2 of P_BP_LHS and ground<br><br>Repair or replace if needed.<br><br>• Check that the components (Z126) is not damaged. |

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| 2. **Check continuity between brake pedal switch signal output and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP.<br><br>• Check continuity between:<br><br>- P_BP_LHS pin 3 and P_D_IP pin 77<br>- P_BP_LHS pin 4 and P_D_IP pin 57<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Check for short to ground:<br>check continuity between pins:<br><br>- P_D_IP pin 57 and ground<br>- P_D_IP pin 77 and ground<br><br>• Check for short to positive:<br>**With brakes pedals released**, check that there is continuity between pins:<br><br>- P_D_IP pin 77 and F10<br><br>Check that there is not continuity between pins:<br><br>- P_D_IP pin 57 and F10<br><br>**With brakes pedals pressed**, check that there is continuity between pins:<br><br>- P_D_IP pin 57 and F10<br><br>Check that there is not continuity between pins:<br><br>- P_D_IP pin 77 and F10<br><br>Repair or replace if needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.1.8 E007 - Inconsistent values of Right Pedal Brake Sensor

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

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| 1. **Check supply voltage of Z127 – Right hand pedal switch**<br><br>• Disconnect the connector P_BP_RHS<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_BP_RHS between pins:<br><br>- 1 and ground<br>- 2 and ground<br><br>**Specification**<br><br>Supply voltage of brake pedal switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the brakes line fuse (F10) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground:<br>Check continuity between pins:<br><br>- 1 of P_BP_RHS and ground<br>- 2 of P_BP_RHS and ground<br><br>Repair or replace if needed.<br><br>• Check that the components (Z127) is not damaged. |
| 2. **Check continuity between brake pedal switch signal output and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP.<br><br>• Check continuity between:<br><br>- P_BP_RHS pin 3 and P_D_IP pin 79<br>- P_BP_RHS pin 4 and P_D_IP pin 59<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Check for short to ground:<br>check continuity between pins:<br><br>- P_D_IP pin 59 and ground<br>- P_D_IP pin 79 and ground<br><br>• Check for short to positive:<br>**With brakes pedals released**, check that there is continuity between pins:<br><br>- P_D_IP pin 79 and F10<br><br>Check that there is not continuity between pins:<br><br>- P_D_IP pin 59 and F10<br><br>**With brakes pedals pressed**, check that there is continuity between pins:<br><br>- P_D_IP pin 59 and F10<br><br>Check that there is not continuity between pins:<br><br>- P_D_IP pin 79 and F10<br><br>Repair or replace if needed. |

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| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.1.9 E008 - 4WD Switch short circuit to Vbatt or stuck

**NOTE: This error is shown if the switch is pressed for more than 3 sec.**

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check for a short circuit to positive**<br><br>• Disconnect the connector P_D_IP of the control module (A101) and P_CH_4WD_SW connector of the 4WD switch (S001).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_4WD_SW between:<br><br>- Pin 2 and ground<br><br>**Specification**<br><br>The voltage must be near to: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br>Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br><br>Replace or repair as needed.<br><br>• Check continuity between:<br><br>- Pin 2 of P_CH_4WD_SW and pin 66 of P_D_IP<br><br>If there is not continuity, replace or repair as needed.<br><br>• Check that the component (S001) is not damaged. |
| 2. **Check control module revision level**<br><br>• Switch OFF ignition. Reconnect all the connectors before disconnected.<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.1.10 E009 - Pressure Switch signal on 4WD pipeline not correct at engine OFF

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |
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|---|---|
| 1. **Check supply voltage signal on the instrument panel connector P_D_IP**<br><br>• Disconnect the connector P_D_IP of the instrument panel (A101).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connectors P_D_IP between:<br><br>- Pin 30 and ground<br><br>**Specification**<br><br>Supply voltage of the pressure switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check that the pressure switch line fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br><br>• Check for short to ground:<br>Check continuity between:<br><br>- Pin 30 of P_D_IP and ground<br><br>If there is continuity, repair or replace as needed.<br><br>• Check for an open circuit.<br>Check continuity between:<br><br>- Pin 30 of P_D_IP and F6 (pressure switch line fuse).<br><br>If there is not continuity, repair or replace as needed.<br><br>• Check that the component (Z234) is not damaged and verify that there is continuity between pins:<br><br>- 1 and 2 of Z234<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for possible hydraulic / mechanical issue**<br><br>• Switch OFF ignition and reconnect all connectors.<br><br>• Check the correct hydraulic / mechanical operations of the Z234 pressure switch (see relevant section). | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>- Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Change the control module. |

### 10.1.1.1.11 E010 - Pressure Switch signal on 4WD pipeline not correct at engine ON (rpm > 700)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| ***NOTE:*** *This test must be done with hand brake activated.*<br><br>1. **Check supply voltage signal on the instrument panel connector P_D_IP**<br><br>• Disconnect the connector P_D_IP of the instrument panel (A101).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connectors P_D_IP between:<br><br>- Pin 30 and ground<br><br>**Specification**<br><br>Supply voltage of the pressure switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the pressure switch line fuse (F6) is OK.<br>•<br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground:<br>Check continuity between:<br><br>- Pin 30 of P_D_IP and ground<br><br>If there is continuity, repair or replace as needed.<br><br>• Check for an open circuit.<br>Check continuity between:<br><br>- Pin 30 of P_D_IP and F6 (pressure switch line fuse).<br><br>If there is not continuity, repair or replace as needed.<br><br>• Check that the component (Z234) is not damaged and verify that there is continuity between pins:<br><br>- 1 and 2 of Z234<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for possible hydraulic / mechanical issue**<br><br>- Switch OFF ignition and reconnect all connectors.<br>- Check the correct hydraulic / mechanical operations of the Z234 pressure switch (see relevant section). | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>- Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>- Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Change the control module. |

### 10.1.1.1.12 E011 - Diff-Lock Switch short circuit to Vbatt or stuck

**NOTE: This error is shown if the switch is pressed for more than 3 sec.**

| Circuit / harness test<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check for a short circuit to positive**<br><br>• Disconnect the connector P_D_IP of the control module (A101) and P_CH_D/L_SW connector of the Differential lock switch (S094).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_D/L_SW between:<br><br>- Pin 2 and ground<br><br>**Specification**<br><br>The voltage must be near to: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br>Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>Replace or repair as needed.<br><br>• Check continuity between:<br><br>- Pin 2 of P_CH_D/L_SW and pin 70 of P_D_IP<br><br>If there is not continuity, replace or repair as needed.<br><br>• Check that the component (S094) is not damaged. |
| 2. **Check control module revision level**<br><br>• Switch OFF ignition. Reconnect all the connectors before disconnected.<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Change the control module. |

### 10.1.1.1.13 E012 - Pressure Switch signal on Diff-Lock pipeline not correct at engine OFF

| Circuit / harness test<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |
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|---|---|
| 1. **Check supply voltage signal on the instrument panel connector P_D_IP**<br><br>• Disconnect the connector P_D_IP of the control module (A101).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_D_IP between:<br><br>- Pin 29 and ground<br><br>**Specification**<br><br>Supply voltage of the pressure switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check that the pressure switch line fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br><br>• Check for short to ground:<br>Check continuity between:<br><br>- Pin 29 of P_D_IP and ground<br><br>If there is continuity, repair or replace as needed.<br><br>• Check for an open circuit.<br>Check continuity between:<br><br>- Pin 29 of P_D_IP and F6 (pressure switch line fuse).<br><br>If there is not continuity, repair or replace as needed.<br><br>• Check that the components (Z235) is not damaged and verify that there is continuity between pins:<br><br>- 1 and 2 of Z235<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for possible hydraulic / mechanical issue**<br><br>• Switch OFF ignition. Reconnect all connectors.<br><br>• Check the correct hydraulic / mechanical operations of the Z235 pressure switch (see relevant section). | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Change the control module. |

## 10.1.1.1.14 E013 - Pressure Switch signal on Diff-Lock pipeline not correct at engine ON (rpm > 700)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| ***NOTE:*** *This test must be done with brake pedals pressed (**AFTER KEY ON**).*<br><br>1. **Check supply voltage signal on the instrument panel connector P_D_IP**<br><br>• Disconnect the connector P_D_IP of the control module (A101).<br><br>• Switch ON ignition and press the brake pedals.<br><br>• Use a multimeter to check the supply voltage at connector P_D_IP between:<br><br>- Pin 29 and ground<br><br>**Specification**<br><br>Supply voltage of the pressure switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the pressure switch line fuse (F6) is OK.<br>•<br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground:<br>Check continuity between:<br><br>- Pin 29 of P_D_IP and ground<br><br>If there is continuity, repair or replace as needed.<br><br>• Check for an open circuit.<br>Check continuity between:<br><br>- Pin 29 of P_D_IP and F6 (pressure switch line fuse).<br><br>If there is not continuity, repair or replace as needed.<br><br>• Check that the components (Z235) is not damaged and verify that there is continuity between pins:<br><br>- 1 and 2 of Z235<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for possible hydraulic / mechanical issue**<br><br>• Switch OFF ignition. Reconnect all connectors.<br><br>• Check the correct hydraulic / mechanical operations of the Z235 pressure switch (see relevant section). | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Change the control module. |

### 10.1.1.1.15 E014 - Cruise Control SET Switch short circuit to GND or stuck

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| **NOTE: This error can also be caused by prolonged pressure of button for more than 15 seconds.**<br><br>1. **Check of the engine speed 1 storage button**<br><br>• Check that the engine speed 1 storage button (S178) is not stuck.<br>• Disconnect the connector P_CH_MEM1 of the push button.<br>• Check the absence of continuity on push button between:<br>- pin 1 and 2 | **OK:** Go to **2.**<br><br>**NOT OK:**<br>• Replace the push button. |
| 2. **Check for short to ground**<br><br>• Disconnect the connector P_D_IP.<br>• Check the absence of continuity between:<br>- pin 1 of P_CH_MEM1 and ground | **OK:** Go to **3.**<br><br>**NOT OK:**<br>• Check connectors, pins and wiring.<br><br>Repair or replace harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.16 E015 - Cruise Control UP Switch short circuit to GND or stuck

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |
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|---|---|
| ***NOTE:*** ***NOTE:*** *This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the engine speed up button**<br><br>• Check that the engine speed up button (S188) is not stuck.<br>• Disconnect the connector P_CH_UP of the push button.<br>• Check the absence of continuity on push button between:<br>- pin 1 and 2 | **OK:** Go to **2.**<br><br>**NOT OK:**<br>• Replace the push button. |
| 2. **Check for short to ground**<br><br>• Disconnect the connector P_D_IP.<br>• Check the absence of continuity between:<br>- pin 1 of P_CH_UP and ground | **OK:** Go to **3.**<br><br>**NOT OK:**<br>• Check connectors, pins and wiring.<br><br>Repair or replace harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.17 E016 - Cruise Control DOWN Switch short circuit to GND or stuck

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| *NOTE: This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the engine speed down button**<br><br>• Check that the engine speed down button (S189) is not stuck.<br>• Disconnect the connector P_CH_DOWN of the push button.<br>• Check the absence of continuity on push button between:<br>- pin 1 and 2 | **OK:** Go to **2.**<br><br>**NOT OK:**<br>• Replace the push button. |

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| 2. **Check for short to ground**<br><br>• Disconnect the connector P_D_IP.<br><br>• Check the absence of continuity between:<br><br>- pin 1 of P_CH_DOWN and ground | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check connectors, pins and wiring.<br><br>Repair or replace harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.18 E017 - The Feedback of the Hi-Lo Valve is negative

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| *NOTE: This error can also be caused by simultaneous pressure of buttons for more than 15 seconds.*<br><br>1. **Check of the gear lever switches**<br><br>• Check that the “Hi-Lo” gear lever switches (C089) are not damaged.<br><br>• Disconnect the connector P_CH_GEAR_KNOB.<br><br>• Check the absence of continuity on the contacts of the gear lever switches between:<br><br>- pin 3 and 1 (Normally Open contact)<br>- pin 3 and 2 (Normally Open contact) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace the “Hi-Lo” gear lever switches. |
| 2. **Check for short to positive**<br><br>• Disconnect the connector P_D_IP.<br><br>• Switch ON ignition.<br><br>• Check the voltage between:<br><br>- pin 3 of P_CH_GEAR_KNOB and ground<br>- pin 4 of P_CH_GEAR_KNOB and ground<br><br>**Specification:**<br>Voltage on pin 3 and 4 of P_CH_GEAR_KNOB: ……0 Volt | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |

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|---|---|
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.19 E018 - Hi-Lo HI Switch short circuit to Vbatt or stuck

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| *NOTE: This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the gear lever switch**<br><br>• Check that the “Hi” gear lever switch is not damaged.<br>• Disconnect the connector P_CH_GEAR_KNOB.<br>• Check the absence of continuity on the contact of the gear lever switch between:<br>- pin 3 and 1 (Normally Open contact) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace the “Hi” gear lever switch. |
| 2. **Check for short to positive**<br><br>• Disconnect the connector P_D_IP.<br>• Switch ON ignition.<br>• Check the voltage between:<br>- pin 3 of P_CH_GEAR_KNOB and ground<br><br>**Specification:**<br>Voltage on pin 3 of P_CH_GEAR_KNOB: ……0 Volt | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 3. **Check for short to ground**<br><br>• Switch OFF ignition.<br>• Check the absence of continuity between:<br>- pin 3 of P_CH_GEAR_KNOB and ground | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |

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| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.20 E019 - Hi-Lo LO Switch short circuit to Vbatt or stuck

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| ***NOTE:*** ***NOTE:*** *This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the gear lever switch**<br><br>• Check that the “Lo” gear lever switch is not damaged.<br><br>• Disconnect the connector P_CH_GEAR_KNOB.<br><br>• Check the absence of continuity on the contact of the gear lever switch between:<br><br>- pin 3 and 2 (Normally Open contact) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace the “Lo” gear lever switch. |
| 2. **Check for short to positive**<br><br>• Disconnect the connector P_D_IP.<br><br>• Switch ON ignition.<br><br>• Check the voltage between:<br><br>- pin 4 of P_CH_GEAR_KNOB and ground<br><br>**Specification:**<br>Voltage on pin 4 of P_CH_GEAR_KNOB: ……0 Volt | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |
| 3. **Check for short to ground**<br><br>• Switch OFF ignition.<br><br>• Check the absence of continuity between:<br><br>- pin 4 of P_CH_GEAR_KNOB and ground | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |

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|---|---|
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.21 E020 - The Feedback of the PTO Safety Valve is negative

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|---|---|
| 1. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Change the control module. |

### 10.1.1.1.22 E021 - The Feedback of the PTO Main Valve is negative

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|---|---|
| 1. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Change the control module. |

### 10.1.1.1.23 E022 - Base control function call period not correct

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| ***NOTE:*** *Keep machine off for 15 minutes.*<br>1. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Change the control module. |

### 10.1.1.1.24 E023 - Inconsistent values of PTO activation Switch

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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| **1. Check supply voltage signal on PTO switch**<br><br>• Switch OFF ignition.<br><br>• Disconnect the connector P_CH_R_PTO of the switch (S114).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_R_PTO between:<br><br>- pin 3 and ground<br>- pin 4 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check that the line fuse (F6) is OK.<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Check continuity between:<br><br>- pin 3 of P_CH_R_PTO and fuse F6<br>- pin 4 of P_CH_R_PTO and fuse F6<br><br>If there is not continuity or the wiring is damaged, repair or replace harness as needed.<br><br>•<br><br>• Check for short to ground.<br><br>• Disconnect the connector P_D_IP and P_CH_PTO_MAIN.<br><br>• Check continuity between:<br><br>- pin 1 of P_CH_R_PTO and ground<br>- pin 2 of P_CH_R_PTO and ground<br>- pin 3 of P_CH_R_PTO and ground<br>- pin 4 of P_CH_R_PTO and ground<br>- pin 1 of P_CH_PTO_MAIN and ground<br>- pin 2 of P_CH_PTO_MAIN and ground<br><br>• If there is continuity, repair or replace harness as needed.<br><br>•<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| **2. Check continuity on the PTO switch**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the continuity on the component S114 between:<br><br>*Switch not activated:*<br>- pin 1 and 3 (no continuity)<br>- pin 2 and 4 (continuity)<br><br>*Switch activated:*<br>- pin 1 and 3 (continuity)<br>- pin 2 and 4 (no continuity) | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace switch. |

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| **3. Check wiring harness between P_CH_R_PTO and P_D_IP**<br><br>• Disconnect the connector P_D_IP.<br><br>• Use a multimeter to check the continuity between:<br><br>- pin 1 of P_CH_R_PTO and pin 67 of P_D_IP<br>- pin 2 of P_CH_R_PTO and pin 68 of P_D_IP<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |
| **4. Check for short to positive between P_CH_R_ PTO and P_D_IP**<br><br>• Disconnect the connector P_CH_PTO_MAIN.<br><br>• Switch ON ignition.<br><br>• Check voltage between:<br><br>- pin 1 of P_CH_R_PTO and ground<br>- pin 2 of P_CH_R_PTO and ground<br><br>***NOTE:*** *The voltage on pins must be near 0 volts.* | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Repair or replace harness as needed. |
| **5. Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.25 E024 - Gear 540 Engaged signal under threshold

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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| 1. **Check supply voltage signal on 540 PTO switch**<br><br>• Disconnect the connector P_CH_540 of the switch Z161.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_540 between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%)<br>Typical value: ……4,7 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP of the control module (A101).<br><br>• Check continuity between:<br><br>- pin 36 of P_D_IP and pin 1 of P_CH_540<br>- pin 74 of P_D_IP and pin 2 of P_CH_540<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• If there is not continuity or the wiring is damaged, repair or replace harness as needed.<br>•<br>• Check for a short to ground.<br>Check continuity between:<br><br>- pin 1 of P_CH_540 and ground<br><br>If there is continuity, repair or replace the wiring as needed.<br>•<br>•<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and pin 2 of the switch Z161<br><br>**Specification**<br><br>Resistance value must be near to: …1730 Ohm (±5%)<br><br>***NOTE:*** *The switch must be in open state (not operated).* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

## 10.1.1.1.26 E025 - Gear 540 Engaged signal inconsistent

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check supply voltage signal on 540 PTO switch**<br><br>• Disconnect the connector P_CH_540 of the switch Z161.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_540 between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP of the control module (A101).<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace harness as needed.<br><br>• Check continuity on wiring between:<br><br>- pin 36 of P_D_IP and pin 1 of P_CH_540<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.*<br><br>- If there is not continuity or an intermittent contact is indicated, repair or replace as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check that the resistance between pins 1 and 2 of the switch Z161 is approximately:<br><br>- 1730 Ohms (Switch not operated) (±5%)<br>- 530 Ohms (Switch operated) (±5%) | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check for continuity**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP of the control module (A101).<br><br>• Check continuity on wiring between:<br><br>- pin 74 of P_D_IP and pin 2 of P_CH_540<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.*<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• If there is not continuity or an intermittent contact is indicated, repair or replace as needed. |

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|---|---|
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.1.27 E026 - Gear 540 Engaged signal over threshold

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check supply voltage signal on 540 PTO switch**<br><br>• Disconnect the connector P_CH_540 of the switch Z161.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_540 between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check for a short to positive.<br>Check the voltage between:<br><br>- pin 1 of P_CH_540 and ground<br><br>If supply voltage is over 5 volts, check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>•<br><br>• Repair or replace harness as needed. |
| 2. **Check for short to positive (output signal)**<br><br>• Use a multimeter to check the supply voltage at connector P_CH_540 (output signal) between:<br><br>- pin 2 and ground<br><br>**Specification**<br><br>Voltage of the switch output signal: ……0 Volt | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Repair or replace the wiring harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

## 10.1.1.1.28 E027 - Gear 2ND Engaged signal under threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| 1. **Check supply voltage signal on 540E/1000 PTO switch**<br><br>• Disconnect the connector P_CH_540E/1000 of the switch Z208.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_540E/1000 between:<br><br>- pin 1 and ground<br><br>Specification<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP of the control module (A101).<br><br>• Check continuity between:<br><br>- pin 36 of P_D_IP and pin 1 of P_CH_540E/1000<br>- pin 73 of P_D_IP and pin 2 of P_CH_540E/1000<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• If there is not continuity or the wiring is damaged, repair or replace harness as needed.<br><br>• Check for a short to ground.<br>Check continuity between:<br><br>- pin 1 of P_CH_540E/1000 and ground<br><br>If there is continuity, repair or replace the wiring as needed.<br>•<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and pin 2 of the switch Z208<br><br>**Specification**<br><br>Resistance value must be near to:<br>……1730 Ohms (±5%)<br><br>***NOTE:*** *The switch must be in open state (not operated).* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.1.29 E028 - Gear 2ND Engaged signal inconsistent

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on 540E/1000 PTO switch**<br><br>• Disconnect the connector P_CH_540E/1000 of the switch Z208.<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage at connector P_CH_540E/1000 between:<br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br>• Switch OFF ignition.<br>• Disconnect connector P_D_IP of the control module (A101).<br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>• Repair or replace harness as needed.<br>• Check continuity on wiring between:<br>- pin 36 of P_D_IP and pin 1 of P_CH_540E/1000<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.*<br><br>- If there is not continuity or an intermittent contact is indicated, repair or replace as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check that the resistance between pins 1 and 2 of the switch Z208 is approximately:<br>- 1730 Ohms (Switch not operated) (±5%)<br>- 530 Ohms (Switch operated) (±5%) | **OK:** Go to **3**.<br><br>**NOT OK:**<br>• Switch OFF ignition.<br>• Replace the switch. |
| 3. **Check for continuity**<br><br>• Switch OFF ignition.<br>• Disconnect connector P_D_IP of the control module (A101)<br>• Check continuity on wiring between:<br>- pin 73 of P_D_IP and pin 2 of P_CH_540E/1000<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.* | **OK:** Go to **4**.<br><br>**NOT OK:**<br>• If there is not continuity or an intermittent contact is indicated, repair or replace as needed. |

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| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.30 E029 - Gear 2ND Engaged signal over threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on 540E/1000 PTO switch**<br><br>• Disconnect the connector P_ CH_540E/1000 of the switch Z208.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_540E/1000 between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check for a short to positive.<br>Check the voltage between:<br><br>- pin 1 of P_CH_540E/1000 and ground<br><br>• If supply voltage is over 5 volts, check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace harness as needed. |
| 2. **Check for short to positive (output signal)**<br><br>• Use a multimeter to check the supply voltage at connector P_CH_540E/1000 (output signal) between:<br><br>- pin 2 and ground<br><br>**Specification**<br><br>Voltage of the switch output signal: ……0 Volt | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Repair or replace the wiring harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.31 E030 - Engaged Gear Speed detection failure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| 1. **Check correct resistance of the PTO speed switches selection**<br>• Disconnect the connectors P_CH_540 and P_CH_540E/1000.<br>• Use a multimeter to check the resistance between:<br>- pin 1 and 2 of Z161 (switch not operated)<br>- pin 1 and 2 of Z208 (switch not operated)<br>**Specification:**<br>Resistance (switches not operated):<br>……1730 Ohms (±5%)<br>• Use a multimeter to check the resistance between:<br>- pin 1 and 2 of Z161 (switch operated)<br>- pin 1 and 2 of Z208 (switch operated)<br>**Specification**<br>Resistance (switches operated):<br>……530 Ohms (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace the faulty switch. |
| 2. **Check wiring harness, connectors and mechanical parts of the system**<br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>• Check for mechanical issues on PTO speed selection system. | **OK:** Go to **3.**<br>**NOT OK:**<br>• Repair or replace harness, connectors or mechanical part as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.32 E031 - Direct Mode Engaged signal under threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on direct PTO selector switch**<br><br>• Disconnect the connector P_CH_DIR_ PTO of the switch Z210.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_DIR_PTO between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK**: Go to **2**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP of the control module (A101).<br><br>• Check continuity between:<br><br>- pin 36 of P_D_IP and pin 1 of P_CH_DIR_ PTO<br>- pin 75 of P_D_IP and pin 2 of P_CH_DIR_ PTO<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• If there is not continuity or the wiring is damaged, repair or replace harness as needed.<br><br>• Check for a short to ground.<br>Check continuity between:<br><br>- pin 1 of P_CH_DIR_PTO and ground<br><br>If there is continuity, repair or replace the wiring as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and pin 2 of the switch Z210<br><br>**Specification**<br><br>Resistance value must be near to:<br>……1730 Ohms (±5%)<br><br>***NOTE:*** *The switch must be in open state (not operated).* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.33 E032 - Direct Mode Engaged signal inconsistent

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed**.

| | |
|---|---|
| 1. **Check supply voltage signal on direct PTO selector switch**<br><br>• Disconnect the connector P_CH_DIR_ PTO of the switch Z210.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_DIR_PTO between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP of the control module (A101).<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace harness as needed.<br><br>• Check continuity on wiring between:<br><br>- pin 36 of P_D_IP and pin 1 of P_CH_DIR_ PTO<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.*<br><br>If there is not continuity or an intermittent contact is indicated, repair or replace as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check that the resistance between pins 1 and 2 of the switch Z210 is approximately:<br><br>- 1730 Ohms (±5%) (Switch not operated)<br>- 530 Ohms (±5%) (Switch operated) | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check for continuity**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP of the control module (A101).<br><br>• Check continuity on wiring between:<br><br>- pin 75 of P_D_IP and pin 2 of P_CH_DIR_PTO<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.* | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• If there is not continuity or an intermittent contact is indicated, repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.34 E033 - Direct Mode Engaged signal over threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on direct PTO selector switch**<br>• Disconnect the connector P_CH_DIR_ PTO of the switch Z210.<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage at connector P_CH_DIR_PTO between:<br>- pin 1 and ground<br>**Specification**<br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Check for a short to positive.<br>Check the voltage between:<br>- pin 1 pf P_CH_DIR_PTO and ground<br>If supply voltage is over 5 volts, check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>•<br>• Repair or replace harness as needed. |
| 2. **Check for short to positive (output signal)**<br>• Use a multimeter to check the supply voltage at connector P_CH_DIR_PTO (output signal) between:<br>- pin 2 and ground<br>**Specification**<br>Voltage of the switch output signal: ……0 Volt | **OK:** Go to **3**.<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Repair or replace the wiring harness as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.35 E034 - GD Mode Engaged signal under threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on ground PTO selector switch**<br><br>• Disconnect the connector P_CH_GD_PTO of the switch Z162.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_GD_PTO between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP of the control module (A101).<br><br>• Check continuity between:<br><br>- pin 36 of P_D_IP and pin 1 of P_CH_GD_PTO<br>- pin 76 of P_D_IP and pin 2 of P_CH_GD_PTO<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• If there is not continuity or the wiring is damaged, repair or replace harness as needed.<br><br>• Check for a short to ground.<br>Check continuity between:<br><br>- pin 1 of P_CH_GD_PTO and ground<br><br>If there is continuity, repair or replace the wiring as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and pin 2 of the switch Z162<br><br>**Specification**<br><br>Resistance value must be near to:<br>……1730 Ohms (±5%)<br><br>***NOTE:*** *The switch must be in open state (not operated).* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.1.36 E035 - GD Mode Engaged signal inconsistent

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check supply voltage signal on ground PTO selector switch**<br><br>• Disconnect the connector P_CH_GD_PTO of the switch Z162.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_GD_PTO between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP of the control module (A101).<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace harness as needed.<br><br>• Check continuity on wiring between:<br><br>- pin 36 of P_D_IP and pin 1 of P_CH_GD_ PTO<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.*<br><br>• If there is not continuity or an intermittent contact is indicated, repair or replace as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check that the resistance between pins 1 and 2 of the switch Z162 is approximately:<br><br>- 1730 Ohms (±5%) (Switch not operated)<br>- 530 Ohms (±5%) (Switch operated) | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check for continuity**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_D_IP of the control module (A101)<br><br>• Check continuity on wiring between:<br><br>- pin 76 of P_D_IP and pin 2 of P_CH_GD_PTO<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.* | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• If there is not continuity or an intermittent contact is indicated, repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.37 E036 - GD Mode Engaged signal over threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on ground PTO selector switch**<br>• Disconnect the connector P_CH_GD_PTO of the switch Z162.<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage at connector P_CH_GD_PTO between:<br>- pin 1 and ground<br>**Specification**<br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Check for a short to positive.<br>Check the voltage between:<br>- pin 1 of P_CH_GD_PTO and ground<br>• If supply voltage is over 5 volts, check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>•<br>• Repair or replace harness as needed. |
| 2. **Check for short to positive (output signal)**<br>• Use a multimeter to check the supply voltage at connector P_CH_GD_PTO (output signal) between:<br>- pin 2 and ground<br>**Specification**<br>Voltage of the switch output signal: ……0 Volt | **OK:** Go to **3**.<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Repair or replace the wiring harness as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.38 E037 - Engaged Mode detection failure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check correct resistance of the PTO switches selection**<br><br>• Disconnect the connectors P_CH_GD_ PTO and P_CH_DIR_PTO.<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and 2 of Z162 (switch not operated)<br><br>- pin 1 and 2 of Z210 (switch not operated)<br><br>**Specification:**<br><br>Resistance (switches not operated):<br>……1730 Ohms (±5%)<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and 2 of Z162 (switch operated)<br><br>- pin 1 and 2 of Z210 (switch operated)<br><br>**Specification**<br><br>Resistance (switches operated):<br>……530 Ohms (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace the faulty switch. |
| 2. **Check wiring harness, connectors and mechanical parts of the system**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Check for mechanical issues on PTO selection system. | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Repair or replace harness, connectors or mechanical part as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.1.39 E041 - PTO pressure switch open signal failure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the voltage on pressure switch Z175**<br><br>• Disconnect the connector P_CH_PTO_ PSW of the pressure switch (Z175).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_PTO_PSW between:<br><br>- pin 1 and ground<br><br>**Specification:**<br><br>Voltage on pin 1: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check the presence of the continuity between:<br><br>- pin 1 and fuse (F6)<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 1 of P_CH_PTO_PSW and ground<br><br>• Check connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |
| 2. **Check pressure switch Z175**<br><br>• Use a multimeter to check the presence of continuity on pressure switch Z175 between:<br><br>- pin 1 and 2<br><br>***NOTE:*** *Switch is normally closed.*<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the pressure switch. |
| 3. **Check continuity between P_CH_PTO_ PSW and P_D_IP**<br><br>• Disconnect the connector P_D_IP of the instrument panel (A101).<br><br>• Use a multimeter to check the presence of continuity between:<br><br>- pin 2 of P_CH_PTO_PSW and 72 of P_D_IP<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_CH_PTO_PSW and ground<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |
| 4. **Check that the pressure switch is not damaged doing hydraulic and mechanical tests (see relevant section)** | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Replace the pressure switch. |

| | |
|---|---|
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.40 E042 - PTO pressure switch closed signal failure

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check for short to positive**<br>• Disconnect the connector P_CH_PTO_ PSW of the pressure switch (Z175).<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage at connector P_CH_PTO_PSW between:<br>- pin 2 and ground<br>**Specification:**<br>Voltage on pin 2: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 2. **Check that the pressure switch is not damaged doing hydraulic and mechanical tests (see relevant section)** | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the pressure switch. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.41 E043 - PTO Safety Valve stuck open

| |
|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check supply voltage signal on Y338 PTO safety valve**<br>• Disconnect the connector P_CH_PTO_ SEV of the safety valve (Y338).<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage at connector P_CH_PTO_SEV between:<br>- pin 1 and 2<br>**Specification:**<br>Voltage on the safety valve: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Disconnect the connectors P_D_IP.<br>• Check for short to positive.<br>• Switch ON ignition.<br>• Check the voltage between:<br>• pin 1 of P_CH_PTO_SEV and ground<br>**Specification:**<br>Voltage on pin 1 of P_CH_PTO_SEV: ……0 Volt<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 2. **Check that the safety valve is not damaged doing hydraulic and mechanical tests (see relevant section)** | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the safety valve. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.42 E044 - PTO Main Valve stuck open

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on Y325 PTO main valve**<br>• Disconnect the connector P_CH_PTO_ MAIN of the main valve (Y325).<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage at connector P_CH_PTO_MAIN between:<br>- pin 1 and 2<br>**Specification:**<br>Voltage on the main valve: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Check that relay K6 (in main fuse box) is not damaged, and check supply line of relay.<br>• Check for short to positive.<br>Check the voltage between:<br>- pin 1 of P_CH_PTO_MAIN and ground<br>**Specification:**<br>Voltage on pin 1 of P_CH_PTO_MAIN: ……0 Volt<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 2. **Check that the main valve is not damaged doing hydraulic and mechanical tests (see relevant section)** | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the main valve. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.43 E045 - PTO Clutch low pressure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| ***NOTE:*** *Before starting with checks, verify the hydraulic circuit.*<br>1. **Check for short to positive**<br>• Disconnect the connector P_CH_PTO_ PSW of the pressure switch (Z175).<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage at connector P_CH_PTO_PSW between:<br>- pin 2 and ground<br>**Specification:**<br>Voltage on pin 2: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |

| | |
|---|---|
| 2. **Check that the pressure switch is not damaged doing hydraulic and mechanical tests (see relevant section)** | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.44 E046 - PTO Output Shaft Speed signal failure

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| ***NOTE:*** *Before starting with checks, verify the correct operation of the tachometer and that the clutch does not slip.*<br><br>1. **Check the supply voltage on sensor B142**<br><br>• Disconnect the connector P_CH_PTO_OS of the sensor (B142).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_PTO_OS between:<br><br>- pin 3 and 2<br><br>**Specification:**<br><br>Supply voltage on the sensor: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check that the line fuse (F6) is OK.<br><br>• Check the presence of continuity between:<br><br>• pin 3 of P_CH_PTO_OS and fuse F6<br>• pin 2 of P_CH_PTO_OS and ground<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>• pin 3 of P_CH_PTO_OS and ground<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* |

| | |
|---|---|
| 2. **Check wiring harness between P_CH_ PTO_OS and P_D_IP**<br>• Switch OFF ignition.<br>• Disconnect the connector P_D_IP.<br>• Use a multimeter to check the presence of continuity between:<br>- pin 1 of P_CH_PTO_OS and pin 56 of P_D_IP<br>• Check for short to ground.<br>Check the absence of continuity between:<br>- pin 1 of P_CH_PTO_OS and ground<br>• Check for short to positive.<br>• Switch ON ignition.<br>• Check the voltage between:<br>- pin 1 of P_CH_PTO_OS and ground<br>**Specification:**<br>Voltage on pin 1 of P_CH_PTO_OS: ……0 Volt<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 3. **Check of the sensor**<br>• Check that the sensor is not damaged.<br>• Remove the sensor from work location.<br>• Connect the connector P_CH_PTO_OS to the sensor.<br>• Check the voltage between:<br>- pin 2 and 1 of P_CH_PTO_OS<br>**Specification:**<br>Voltage between pin 2 and 1: ……4,7 Volt (±5%) | **OK:** Go to **4.**<br>**NOT OK:**<br>• Replace the sensor. |
| 4. **Check of the mechanical component (pulse wheel)**<br>• Verify that the pulse wheel is not damaged and that it is correctly assembled. | **OK:** Go to **5.**<br>**NOT OK:**<br>• Repair or replace mechanical component. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.45 E047 - Cruise Control SET2 Switch short circuit to GND or stuck

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| ***NOTE:*** *This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the engine speed 2 storage button**<br><br>• Check that the engine speed 2 storage button (S179) is not stuck.<br>• Disconnect the connector P_CH_MEM2 of the push button.<br>• Check the absence of continuity on push button between:<br>- pin 1 and 2 | **OK:** Go to **2.**<br><br>**NOT OK:**<br>• Replace the push button. |
| 2. **Check for short to ground**<br><br>• Disconnect the connector P_D_IP.<br>• Check the absence of continuity between:<br>- pin 1 of P_CH_MEM2 and ground | **OK:** Go to **3.**<br><br>**NOT OK:**<br>• Check connectors, pins and wiring.<br><br>Repair or replace harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.46 E141 - EEPROM corrupted

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.1.47 E142 - MMC to SMC communication error

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on P_D_IP connector**<br><br>• Disconnect the P_D_IP connector from instrument panel control module A101.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage on P_D_IP connector between:<br><br>- pin 1 and 20<br>- pin 2 and 20<br>- pin 21 and 20<br><br>**Specification:**<br><br>Supply voltage: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Only if voltage is low use a multimeter to check the voltage on battery between:<br><br>- positive pole and negative pole<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±10%)<br><br>If the voltage is not as per specification:<br><br>• Replace or recharge the battery as needed.<br><br>• Switch OFF ignition.<br><br>• Check that the line fuses F7 and F8 are OK.<br><br>If any fuse is broken, check for short to ground on affected line of the circuit.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_D_IP and fuse F8 pin A<br>- pin 21 of P_D_IP and fuse F8 pin A<br>- pin 2 of P_D_IP and fuse F7 pin A<br>- pin 20 of P_D_IP and the negative pole of the battery<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.48 E143 - MMC and SMC SW version are different

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.49 E144 - MMC dead or not responding

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed**.

| | |
|---|---|
| 1. **Check supply voltage signal on P_D_IP connector**<br><br>• Disconnect the P_D_IP connector from instrument panel control module A101.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage on P_D_IP connector between:<br><br>- pin 1 and 20<br>- pin 2 and 20<br>- pin 21 and 20<br><br>**Specification:**<br><br>Supply voltage: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Only if voltage is low use a multimeter to check the voltage on battery between:<br><br>- positive pole and negative pole<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±10%)<br><br>If the voltage is not as per specification:<br><br>• Replace or recharge the battery as needed.<br><br>• Switch OFF ignition.<br><br>• Check that the line fuses F7 and F8 are OK.<br><br>If any fuse is broken, check for short to ground on affected line of the circuit.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_D_IP and fuse F8 pin A<br>- pin 21 of P_D_IP and fuse F8 pin A<br>- pin 2 of P_D_IP and fuse F7 pin A<br>- pin 20 of P_D_IP and the negative pole of the battery<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.1.50 E145 - Error on CAN BUS

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed**.

1. **Check the value of CAN bus resistance on diagnosis socket**

   - Switch OFF ignition.
   - Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CH_D_SKT connector) between:

   - pin 3 and 4

**Specification:**

CAN bus resistance: ……60 Ohms (±5%)

**OK:** Go to **2.**

**NOT OK:**

- Disconnect the CAN bus terminator (R994) from P_CH_CAN_B_RES connector and use a multimeter to check the value of resistance on terminator between:

  - pin A and B

If resistance does not respect the specific:

- Replace resistance.

**Specification:**
CAN bus resistance: ……120 Ohms (±5%)

- Disconnect the connector P_D_IP.
- Check the absence of continuity between:

  - pin 19 and 38 of P_D_IP

- Check the presence of continuity between:

  - pin 19 of P_D_IP and any pins of the CAN-H line
  - pin 38 of P_D_IP and any pins of the CAN-L line

***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*

- Check for short to ground.
  Check the absence of continuity between:

  - pin 19 of P_D_IP and ground
  - pin 38 of P_D_IP and ground

- Check for short to positive.
- Switch ON ignition.
- Check the voltage between:

  - pin 19 of P_D_IP and ground
  - pin 38 of P_D_IP and ground

**Specification:**
Voltage on pin 19 and 38: ……0 Volt

- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.
- Repair or replace harnesses as needed.

| | |
|---|---|
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.51 E154 - Wheel Speed Sensor Out of Range

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| ***NOTE:*** *Before starting with checks verify the correct operation of the tachometer and that the clutch does not slip.*<br><br>1. **Check the supply voltage on sensor B227**<br><br>• Disconnect the connector P_CH_SPD_S of the sensor (B227).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CH_SPD_S between:<br><br>- pin 2 and 3<br><br>**Specification:**<br><br>Supply voltage on the sensor: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check that the line fuse (F4) is OK.<br><br>• Check the presence of continuity between:<br><br>• pin 3 of P_CH_SPD_S and fuse F4<br>• pin 2 of P_CH_SPD_S and ground<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>• pin 3 of P_CH_SPD_S and ground<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* |

| | |
|---|---|
| 2. **Check wiring harness between P_CH_ SPD_S and P_D_IP**<br>• Switch OFF ignition.<br>• Disconnect the connector P_D_IP.<br>• Use a multimeter to check the presence of continuity between:<br>- pin 1 of P_CH_SPD_S and pin 49 of P_D_IP<br>• Check for short to ground.<br>Check the absence of continuity between:<br>- pin 1 of P_CH_SPD_S and ground<br>• Check for short to positive.<br>• Switch ON ignition<br>• Check the voltage between:<br>- pin 1 of P_CH_SPD_S and ground<br>**Specification:**<br>Voltage on pin 1 of P_CH_SPD_S: ……0 Volt<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 3. **Check of the sensor**<br>• Check that the sensor is not damaged.<br>• Remove the sensor from work location.<br>• Connect the connector P_CH_SPD_S to the sensor.<br>• Check the voltage between:<br>- pin 2 and 1 of P_CH_SPD_S<br>**Specification:**<br>Voltage on sensor: ……4,7 Volt (±5%) | **OK:** Go to **4.**<br>**NOT OK:**<br>• Replace the sensor. |
| 4. **Check of the mechanical component (pulse wheel)**<br>• Verify that the pulse wheel is not damaged and that it is correctly assembled. | **OK:** Go to **5.**<br>**NOT OK:**<br>• Repair or replace mechanical component. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

## 10.1.1.1.52 E158 - Self adaptation strategy fails

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

1. **Check the value of CAN bus resistance on diagnosis socket**

   - Switch OFF ignition.
   - Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CH_D_SKT connector) between:

   - pin 3 and 4

   **Specification:**

   CAN bus resistance: ……60 Ohms (±5%)

**OK:** Go to **2.**

**NOT OK:**

- Disconnect the CAN bus terminator (R994) from P_CH_CAN_B_RES connector and use a multimeter to check the value of resistance on terminator between:

  - pin A and B

If resistance does not respect the specific:

- Replace resistance.

**Specification:**
CAN bus resistance: ……120 Ohms (±5%)

- Disconnect the connector P_D_IP.
- Check the absence of continuity between:

  - pin 19 and 38 of P_D_IP

- Check the presence of continuity between:

  - pin 19 of P_D_IP and any pins of the CAN-H line
  - pin 38 of P_D_IP and any pins of the CAN-L line

***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*

- Check for short to ground.
  Check the absence of continuity between:

  - pin 19 of P_D_IP and ground
  - pin 38 of P_D_IP and ground

- Check for short to positive.
- Switch ON ignition.
- Check the voltage between:

  - pin 19 of P_D_IP and ground
  - pin 38 of P_D_IP and ground

**Specification:**
Voltage on pin 19 and 38: ……0 Volt

- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.
- Repair or replace harnesses as needed.

| | |
|---|---|
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.53 E159 - Self adaptation strategy fails

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the value of CAN bus resistance on diagnosis socket**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CH_D_SKT connector) between:<br><br>- pin 3 and 4<br><br>**Specification:**<br><br>CAN bus resistance: ……60 Ohms (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect the CAN bus terminator (R994) from P_CH_CAN_B_RES connector and use a multimeter to check the value of resistance on terminator between:<br><br>- pin A and B<br><br>If resistance does not respect the specific:<br><br>• Replace resistance.<br><br>**Specification:**<br>CAN bus resistance: ……120 Ohms (±5%)<br><br>• Disconnect the connector P_D_IP.<br>• Check the absence of continuity between:<br>- pin 19 and 38 of P_D_IP<br><br>• Check the presence of continuity between:<br><br>- pin 19 of P_D_IP and any pins of the CAN-H line<br>- pin 38 of P_D_IP and any pins of the CAN-L line<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 19 of P_D_IP and ground<br>- pin 38 of P_D_IP and ground<br><br>• Check for short to positive.<br><br>• Switch ON ignition.<br><br>• Check the voltage between:<br><br>- pin 19 of P_D_IP and ground<br>- pin 38 of P_D_IP and ground<br><br>**Specification:**<br>Voltage on pin 19 and 38: ……0 Volt<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harnesses as needed. |

| | |
|---|---|
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.1.54 Driver Seat Switch stuck

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of Z005 – Seat switch**<br><br>• Disconnect the connector P_CH_SEAT_SW of the seat switch.<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage between:<br>– Pin 1 of P_CH_SEAT_SW and ground<br><br>**Specification**<br>Supply voltage: ……12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:** Check that the fuse F8 is not damaged.<br>Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>Repair or replace if needed. |
| 2. **Check for continuity**<br><br>• Switch OFF ignition.<br>• Disconnect the connector P_D_IP from the A101 control unit.<br>• Use a multimeter to check the continuity between:<br>– Pin 2 of P_CH_SEAT_SW and pin 48 of P_D_IP<br><br>**Specification**<br>Continuity: ……Present<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |
| 3. **Check for short to positive**<br><br>• Use a multimeter to check the voltage between:<br>– Pin 48 of P_D_IP and ground<br><br>**Specification**<br>Supply voltage: ……0 Volt | **OK:** Go to **4**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |

| | |
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| 4. **Check for short to ground**<br><br>• Use a multimeter to check the absence of continuity between:<br><br>– Pin 1 of P_CH_SEAT_SW and ground<br>– Pin 2 of P_CH_SEAT_SW and ground<br><br>**Specification**<br><br>Continuity: ……Absent | **OK:** Go to **5**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |
| 5. **Check component**<br><br>• Check that the component seat switch Z005 is not damaged and functions properly. | **OK:** End of test.<br><br>**NOT OK:**<br><br>Repair or replace as needed. |

## 10.1.1.2 CAB Models

### 10.1.1.2.1 E001 - Foot Throttle Sensor is Out of Range (Negative characteristic)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B153 – Foot throttle sensor**<br><br>• Disconnect the connector P_MAIN_FOOT_T of the foot throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_MAIN_FOOT_T between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the foot throttle fuse (F4) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check the continuity between pins: 2, 3 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check the continuity between pins: 1, 3 and F4).<br>Repair or replace if needed.<br><br>• Check that the component (B153) is not damaged. |

| | |
|---|---|
| 2. **Check continuity between foot throttle sensor and instrument panel control module**<br><br>• Switch OFF ignition.<br>• Disconnect P_MAIN_DASH.<br>• Check continuity between P_MAIN_FOOT_T pin 3 and P_MAIN_DASH pin 35.<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>• Repair or replace if needed. |
| 3. **Check for correct calibration of the foot throttle sensor**<br><br>• Reconnect all connectors<br>• Remake the calibration of the foot throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br>• Check for a mechanical / hydraulic issue. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br>• Change the control module. |

### 10.1.1.2.2 E001 - Foot Throttle Sensor is Out of Range (Positive characteristic)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B153 – Foot throttle sensor**<br><br>• Disconnect the connector P_MAIN_FOOT_T of the foot throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_MAIN_FOOT_T between pins:<br><br>- 4 and 5<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the foot throttle fuse (F4) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check the continuity between pins: 5, 6 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check the continuity between pins: 4, 6 and F4).<br>Repair or replace if needed.<br><br>• Check that the component (B153) is not damaged. |
| 2. **Check continuity between foot throttle sensor and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect P_MAIN_DASH.<br><br>• Check continuity between P_MAIN_FOOT_T pin 6 and P_MAIN_DASH pin 15.<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |
| 3. **Check for correct calibration of the foot throttle sensor**<br><br>• Reconnect all connectors.<br><br>• Remake the calibration of the foot throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Check for a mechanical / hydraulic issue. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

## 10.1.1.2.3 E002 - Difference between Positive and Negative characteristic is Out of Range

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B153 – Foot throttle sensor**<br><br>• Disconnect the connector P_MAIN_FOOT_T of the foot throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_MAIN_FOOT_T between pins:<br>- 1 and 2<br>- 4 and 5<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the foot throttle fuse (F4) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check continuity between pins: 2, 3, 5, 6 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check continuity between pins: 1, 3, 4, 6 and F4). Repair or replace if needed.<br><br>• Check that the component (B153) is not damaged. |
| 2. **Check continuity between foot throttle sensor and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect P_MAIN_DASH.<br><br>• Check continuity between:<br>- P_MAIN_FOOT_T pin 3 and P_MAIN_DASH pin 35<br>- P_MAIN_FOOT_T pin 6 and P_MAIN_DASH pin 15<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |

| | |
|---|---|
| 3. **Check for correct calibration of the foot throttle sensor**<br><br>• Reconnect all connectors.<br><br>• Remake the calibration of the foot throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Check for a mechanical / hydraulic issue. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.2.4 E004 - Hand Throttle Sensor is Out of Range (Negative characteristic)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B154 – hand throttle sensor**<br><br>• Disconnect the connector P_CRT_HAND_T of the hand throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CRT_HAND_T between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the hand throttle fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check continuity between pins: 2, 3 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check continuity between pins: 1, 3 and F6).<br>Repair or replace if needed.<br><br>• Check that the component (B154) is not damaged. |

| | |
|---|---|
| 2. **Check continuity between hand throttle sensor and instrument panel control module**<br>• Switch OFF ignition.<br>• Disconnect P_MAIN_DASH.<br>• Check continuity between:<br>- P_CRT_HAND_T pin 3 and P_MAIN_DASH pin 37<br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br>**NOT OK:**<br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>• Repair or replace if needed. |
| 3. **Check for correct calibration of the hand throttle sensor**<br>• Reconnect all connectors<br>• Remake the calibration of the hand throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br>**NOT OK:**<br>• Check for a mechanical / hydraulic issue. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Change the control module. |

### 10.1.1.2.5 E004 - Hand Throttle Sensor is Out of Range (Positive characteristic)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B154 – hand throttle sensor**<br><br>• Disconnect the connector P_CRT_HAND_T of the hand throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CRT_HAND_T between pins:<br><br>- 4 and 5<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the hand throttle fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check continuity between pins: 5, 6 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check continuity between pins: 4, 6 and F6).<br>Repair or replace if needed.<br><br>• Check that the component (B154) is not damaged. |
| 2. **Check continuity between hand throttle sensor and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect P_MAIN_DASH.<br><br>• Check continuity between:<br><br>- P_CRT_HAND_T pin 6 and P_MAIN_DASH pin 17<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |
| 3. **Check for correct calibration of the hand throttle sensor**<br><br>• Reconnect all connectors<br><br>• Remake the calibration of the hand throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Check for a mechanical / hydraulic issue. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

## 10.1.1.2.6 E005 - Difference between Positive and Negative characteristic is Out of Range

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of B154 – hand throttle sensor**<br><br>• Disconnect the connector P_CRT_HAND_T of the hand throttle sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CRT_HAND_T between pins:<br><br>- 1 and 2<br><br>- 4 and 5<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the hand throttle fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground (Check continuity between pins: 2, 3, 5, 6 and ground).<br>Repair or replace if needed.<br><br>• Check for short to positive (Check continuity between pins: 1, 3, 4, 6 and F6). Repair or replace if needed.<br><br>• Check that the component (B154) is not damaged. |
| 2. **Check continuity between hand throttle sensor and instrument panel control module**<br><br>.<br><br>• Switch OFF ignition.<br><br>• Disconnect P_MAIN_DASH.<br><br>• Check continuity between:<br><br>- P_CRT_HAND_T pin 3 and P_MAIN_DASH pin 37<br><br>- P_CRT_HAND_T pin 6 and P_MAIN_DASH pin 17<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |

| | |
|---|---|
| 3. **Check for correct calibration of the hand throttle sensor**<br><br>• Reconnect all connectors.<br><br>• Remake the calibration of the hand throttle sensor, following the instructions on the **Accelerators adjustment procedure (Hand & Foot)**. | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Check for a mechanical / hydraulic issue. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.2.7 E007 - Inconsistent values of Left Pedal Brake Sensor

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check supply voltage of Z126 – Left hand pedal switch**<br><br>• Disconnect the connector P_BP_LHS<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_BP_LHS between pins:<br><br>- 1 and ground<br>- 2 and ground<br><br>**Specification**<br><br>Supply voltage of brake pedal switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the brakes line fuse (F10) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground:<br>Check continuity between pins:<br><br>- 1 of P_BP_LHS and ground<br>- 2 of P_BP_LHS and ground<br><br>Repair or replace if needed.<br><br>• Check that the components (Z126) is not damaged. |

| | |
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| 2. **Check continuity between brake pedal switch signal output and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH.<br><br>• Check continuity between:<br><br>- P_BP_LHS pin 3 and P_MAIN_DASH pin 77<br>- P_BP_LHS pin 4 and P_MAIN_DASH pin 57<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Check for short to ground:<br>check continuity between pins:<br><br>- P_MAIN_DASH pin 57 and ground<br>- P_MAIN_DASH pin 77 and ground<br><br>• Check for short to positive:<br>**With brakes pedals released**, check that there is continuity between pins:<br><br>- P_MAIN_DASH pin 77 and F10<br><br>Check that there is not continuity between pins:<br><br>- P_MAIN_DASH pin 57 and F10<br><br>**With brakes pedals pressed**, check that there is continuity between pins:<br><br>- P_MAIN_DASH pin 57 and F10<br><br>Check that there is not continuity between pins:<br><br>- P_MAIN_DASH pin 77 and F10<br><br>Repair or replace if needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.2.8 E007 - Inconsistent values of Right Pedal Brake Sensor

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|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check supply voltage of Z127 – Right hand pedal switch**<br><br>• Disconnect the connector P_BP_RHS<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_BP_RHS between pins:<br><br>- 1 and ground<br>- 2 and ground<br><br>**Specification**<br><br>Supply voltage of brake pedal switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the brakes line fuse (F10) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground:<br>Check continuity between pins:<br><br>- 1 of P_BP_RHS and ground<br>- 2 of P_BP_RHS and ground<br><br>Repair or replace if needed.<br><br>• Check that the components (Z127) is not damaged. |
| 2. **Check continuity between brake pedal switch signal output and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH.<br><br>• Check continuity between:<br><br>- P_BP_RHS pin 3 and P_MAIN_DASH pin 79<br>- P_BP_RHS pin 4 and P_MAIN_DASH pin 59<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Check for short to ground:<br>check continuity between pins:<br><br>- P_MAIN_DASH pin 59 and ground<br>- P_MAIN_DASH pin 79 and ground<br><br>• Check for short to positive:<br>**With brakes pedals released**, check that there is continuity between pins:<br><br>- P_MAIN_DASH pin 79 and F10<br><br>Check that there is not continuity between pins:<br><br>- P_MAIN_DASH pin 59 and F10<br><br>**With brakes pedals pressed**, check that there is continuity between pins:<br><br>- P_MAIN_DASH pin 59 and F10<br><br>Check that there is not continuity between pins:<br><br>- P_MAIN_DASH pin 79 and F10<br><br>Repair or replace if needed. |

| | |
|---|---|
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.2.9 E008 - 4WD Switch short circuit to Vbatt or stuck

**NOTE: This error is shown if the switch is pressed for more than 3 sec.**

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check for a short circuit to positive**<br><br>• Disconnect the connector P_MAIN_DASH of the control module (A101) and P_CRT_4WD_SW connector of the 4WD switch (S001).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CRT_4WD_SW between:<br><br>- Pin 2 and ground<br><br>**Specification**<br><br>The voltage must be near to: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br>Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br><br>Replace or repair as needed.<br><br>• Check continuity between:<br><br>- Pin 2 of P_CRT_4WD_SW and pin 66 of P_ MAIN_DASH<br><br>If there is not continuity, replace or repair as needed.<br><br>• Check that the component (S001) is not damaged. |
| 2. **Check control module revision level**<br><br>• Switch OFF ignition. Reconnect all the connectors before disconnected.<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.2.10 E009 - Pressure Switch signal on 4WD pipeline not correct at engine OFF

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |
|---|

| | |
|---|---|
| 1. **Check supply voltage signal on the instrument panel connector P_MAIN_DASH**<br><br>• Disconnect the connector P_MAIN_DASH of the instrument panel (A101).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connectors P_MAIN_DASH between:<br><br>- Pin 30 and ground<br><br>**Specification**<br><br>Supply voltage of the pressure switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check that the pressure switch line fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br><br>• Check for short to ground:<br>Check continuity between:<br><br>- Pin 30 of P_MAIN_DASH and ground<br><br>If there is continuity, repair or replace as needed.<br><br>• Check for an open circuit.<br>Check continuity between:<br><br>- Pin 30 of P_MAIN_DASH and F6 (pressure switch line fuse).<br><br>If there is not continuity, repair or replace as needed.<br><br>• Check that the component (Z234) is not damaged and verify that there is continuity between pins:<br><br>- 1 and 2 of Z234<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for possible hydraulic / mechanical issue**<br><br>• Switch OFF ignition and reconnect all connectors.<br><br>• Check the correct hydraulic / mechanical operations of the Z234 pressure switch (see relevant section). | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>- Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Change the control module. |

## 10.1.1.2.11 E010 - Pressure Switch signal on 4WD pipeline not correct at engine ON (rpm > 700)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| ***NOTE:*** *This test must be done with hand brake activated.*<br><br>1. **Check supply voltage signal on the instrument panel connector P_MAIN_DASH**<br><br>• Disconnect the connector P_MAIN_DASH of the instrument panel (A101).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connectors P_MAIN_DASH between:<br><br>- Pin 30 and ground<br><br>**Specification**<br><br>Supply voltage of the pressure switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the pressure switch line fuse (F6) is OK.<br>•<br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground:<br>Check continuity between:<br><br>- Pin 30 of P_MAIN_DASH and ground<br><br>If there is continuity, repair or replace as needed.<br><br>• Check for an open circuit.<br>Check continuity between:<br><br>- Pin 30 of P_MAIN_DASH and F6 (pressure switch line fuse).<br><br>If there is not continuity, repair or replace as needed.<br><br>• Check that the component (Z234) is not damaged and verify that there is continuity between pins:<br><br>- 1 and 2 of Z234<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for possible hydraulic / mechanical issue**<br><br>• Switch OFF ignition and reconnect all connectors.<br><br>• Check the correct hydraulic / mechanical operations of the Z234 pressure switch (see relevant section). | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>- Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Change the control module. |

## 10.1.1.2.12 E011 - Diff-Lock Switch short circuit to Vbatt or stuck

**NOTE: This error is shown if the switch is pressed for more than 3 sec.**

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check for a short circuit to positive**<br><br>• Disconnect the connector P_MAIN_DASH of the control module (A101) and P_CRT_DL_SW connector of the Differential lock switch (S094).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CRT_DL_SW between:<br><br>- Pin 2 and ground<br><br>**Specification**<br><br>The voltage must be near to: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br>Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>Replace or repair as needed.<br><br>• Check continuity between:<br><br>- Pin 2 of P_CRT_DL_SW and pin 70 of P_MAIN_DASH<br><br>If there is not continuity, replace or repair as needed.<br><br>• Check that the component (S094) is not damaged. |
| 2. **Check control module revision level**<br><br>• Switch OFF ignition. Reconnect all the connectors before disconnected.<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Change the control module. |

## 10.1.1.2.13 E012 - Pressure Switch signal on Diff-Lock pipeline not correct at engine OFF

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on the instrument panel connector P_MAIN_DASH**<br><br>• Disconnect the connector P_MAIN_DASH of the control module (A101).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_MAIN_DASH between:<br><br>- Pin 29 and ground<br><br>**Specification**<br><br>Supply voltage of the pressure switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check that the pressure switch line fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br><br>• Check for short to ground:<br>Check continuity between:<br><br>- Pin 29 of P_MAIN_DASH and ground<br><br>If there is continuity, repair or replace as needed.<br><br>• Check for an open circuit.<br>Check continuity between:<br><br>- Pin 29 of P_MAIN_DASH and F6 (pressure switch line fuse).<br><br>If there is not continuity, repair or replace as needed.<br><br>• Check that the components (Z235) is not damaged and verify that there is continuity between pins:<br><br>- 1 and 2 of Z235<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for possible hydraulic / mechanical issue**<br><br>• Switch OFF ignition. Reconnect all connectors.<br><br>• Check the correct hydraulic / mechanical operations of the Z235 pressure switch (see relevant section). | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Change the control module. |

**E013 - Pressure Switch signal on Diff-Lock pipeline not correct at engine ON (rpm > 700)**

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| ***NOTE:*** *This test must be done with brake pedals pressed (**AFTER KEY ON**).*<br><br>1. **Check supply voltage signal on the instrument panel connector P_MAIN_DASH**<br><br>• Disconnect the connector P_MAIN_DASH of the control module (A101).<br><br>• Switch ON ignition and press the brake pedals.<br><br>• Use a multimeter to check the supply voltage at connector P_MAIN_DASH between:<br><br>- Pin 29 and ground<br><br>**Specification**<br><br>Supply voltage of the pressure switch: …12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the pressure switch line fuse (F6) is OK.<br>•<br>• Check the leads and connecting points for bad,<br>• widened, slid-back, or corroded (loose) contacts.<br>•<br>• Switch OFF ignition.<br>Check for short to ground:<br>Check continuity between:<br><br>- Pin 29 of P_MAIN_DASH and ground<br><br>If there is continuity, repair or replace as needed.<br><br>• Check for an open circuit.<br>Check continuity between:<br><br>- Pin 29 of P_MAIN_DASH and F6 (pressure switch line fuse).<br><br>If there is not continuity, repair or replace as needed.<br><br>• Check that the components (Z235) is not damaged and verify that there is continuity between pins:<br><br>- 1 and 2 of Z235<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for possible hydraulic / mechanical issue**<br><br>• Switch OFF ignition. Reconnect all connectors.<br><br>• Check the correct hydraulic / mechanical operations of the Z235 pressure switch (see relevant section). | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>- Change the control module. |

### 10.1.1.2.14 E014 - Cruise Control SET Switch short circuit to GND or stuck

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| ***NOTE:*** *This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the engine speed 1 storage button**<br><br>• Check that the engine speed 1 storage button (S178) is not stuck.<br>• Disconnect the connector P_CRT_MEM1 of the push button.<br>• Check the absence of continuity on push button between:<br>- pin 1 and 2 | **OK:** Go to **2.**<br><br>**NOT OK:**<br>• Replace the push button. |
| 2. **Check for short to ground**<br><br>• Disconnect the connector P_MAIN_DASH.<br>• Check the absence of continuity between:<br>- pin 1 of P_CRT_MEM1 and ground | **OK:** Go to **3.**<br><br>**NOT OK:**<br>• Check connectors, pins and wiring.<br><br>Repair or replace harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.2.15 E015 - Cruise Control UP Switch short circuit to GND or stuck

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |
|---|

| | |
|---|---|
| ***NOTE:*** *This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the engine speed up button**<br><br>• Check that the engine speed up button (S188) is not stuck.<br>• Disconnect the connector P_CRT_CC(+) of the push button.<br>• Check the absence of continuity on push button between:<br>- pin 1 and 2 | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace the push button. |
| 2. **Check for short to ground**<br><br>• Disconnect the connector P_MAIN_DASH.<br>• Check the absence of continuity between:<br>- pin 1 of P_CRT_CC(+) and ground | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check connectors, pins and wiring.<br><br>Repair or replace harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.16 E016 - Cruise Control DOWN Switch short circuit to GND or stuck

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| ***NOTE:*** *This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the engine speed down button**<br><br>• Check that the engine speed down button (S189) is not stuck.<br>• Disconnect the connector P_CRT_CC(-) of the push button.<br>• Check the absence of continuity on push button between:<br>- pin 1 and 2 | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace the push button. |

| | |
|---|---|
| 2. **Check for short to ground**<br><br>• Disconnect the connector P_MAIN_DASH.<br><br>• Check the absence of continuity between:<br>- pin 1 of P_CRT_CC(-) and ground | **OK:** Go to **3.**<br><br>**NOT OK:**<br>• Check connectors, pins and wiring.<br><br>Repair or replace harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.2.17 E017 - The Feedback of the Hi-Lo Valve is negative

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| ***NOTE:*** *This error can also be caused by simultaneous pressure of buttons for more than 15 seconds.*<br><br>1. **Check of the gear lever switches**<br><br>• Check that the "Hi-Lo" gear lever switches (C089) are not damaged.<br><br>• Disconnect the connector P_MAIN_GEAR_INT.<br><br>• Check the absence of continuity on the contacts of the gear lever switches between:<br>- pin 3 and 1 (Normally Open contact)<br>- pin 3 and 2 (Normally Open contact) | **OK:** Go to **2.**<br><br>**NOT OK:**<br>• Replace the "Hi-Lo" gear lever switches. |
| 2. **Check for short to positive**<br><br>• Disconnect the connector P_MAIN_DASH.<br><br>• Switch ON ignition.<br><br>• Check the voltage between:<br>- pin 3 of P_MAIN_GEAR_INT and ground<br>- pin 4 of P_MAIN_GEAR_INT and ground<br><br>**Specification:**<br>Voltage on pin 3 and 4 of P_MAIN_GEAR_INT: ……0 Volt | **OK:** Go to **3.**<br><br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |

| | |
|---|---|
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.18 E018 - Hi-Lo HI Switch short circuit to Vbatt or stuck

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| ***NOTE:*** *This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the gear lever switch**<br><br>• Check that the “Hi” gear lever switch is not damaged.<br>• Disconnect the connector P_MAIN_GEAR_INT.<br>• Check the absence of continuity on the contact of the gear lever switch between:<br>- pin 3 and 1 (Normally Open contact) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace the “Hi” gear lever switch. |
| 2. **Check for short to positive**<br><br>• Disconnect the connector P_MAIN_DASH.<br>• Switch ON ignition.<br>• Check the voltage between:<br>- pin 3 of P_MAIN_GEAR_INT and ground<br><br>**Specification:**<br>Voltage on pin 3 of P_MAIN_GEAR_INT: ……0 Volt | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 3. **Check for short to ground**<br><br>• Switch OFF ignition.<br>• Check the absence of continuity between:<br>- pin 3 of P_MAIN_GEAR_INT and ground | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |

| | |
|---|---|
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.19 E019 - Hi-Lo LO Switch short circuit to Vbatt or stuck

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| ***NOTE:*** *This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the gear lever switch**<br><br>• Check that the “Lo” gear lever switch is not damaged.<br><br>• Disconnect the connector P_MAIN_GEAR_INT.<br><br>• Check the absence of continuity on the contact of the gear lever switch between:<br><br>- pin 3 and 2 (Normally Open contact) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace the “Lo” gear lever switch. |
| 2. **Check for short to positive**<br><br>• Disconnect the connector P_MAIN_DASH.<br><br>• Switch ON ignition.<br><br>• Check the voltage between:<br><br>- pin 4 of P_MAIN_GEAR_INT and ground<br><br>**Specification:**<br>Voltage on pin 4 of P_MAIN_GEAR_INT: ……0 Volt | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |
| 3. **Check for short to ground**<br><br>• Switch OFF ignition.<br><br>• Check the absence of continuity between:<br><br>- pin 4 of P_MAIN_GEAR_INT and ground | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.20 E020 - The Feedback of the PTO Safety Valve is negative

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|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.2.21 E021 - The Feedback of the PTO Main Valve is negative

| | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.2.22 E022 - Base control function call period not correct

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|---|---|
| ***NOTE:*** *Keep machine off for 15 minutes.*<br><br>1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.2.23 E023 - Inconsistent values of PTO activation Switch

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|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| **1. Check supply voltage signal on PTO switch**<br><br>• Switch OFF ignition.<br><br>• Disconnect the connector P_CRT_RPTO_SW of the switch (S114).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CRT_RPTO_SW between:<br><br>- pin 3 and ground<br>- pin 4 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check that the line fuse (F6) is OK.<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Check continuity between:<br><br>- pin 3 of P_CRT_RPTO_SW and fuse F6<br>- pin 4 of P_CRT_RPTO_SW and fuse F6<br><br>If there is not continuity or the wiring is damaged, repair or replace harness as needed.<br><br>• Check for short to ground.<br><br>• Disconnect the connector P_MAIN_DASH and P_TRAS_PTO_MAIN_V.<br><br>• Check continuity between:<br><br>- pin 1 of P_CRT_RPTO_SW and ground<br>- pin 2 of P_CRT_RPTO_SW and ground<br>- pin 3 of P_CRT_RPTO_SW and ground<br>- pin 4 of P_CRT_RPTO_SW and ground<br>- pin 1 of P_TRAS_PTO_MAIN_V and ground<br>- pin 2 of P_TRAS_PTO_MAIN_V and ground<br><br>• If there is continuity, repair or replace harness as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| **2. Check continuity on the PTO switch**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the continuity on the component S114 between:<br><br>*Switch not activated:*<br>- pin 1 and 3 (no continuity)<br>- pin 2 and 4 (continuity)<br><br>*Switch activated:*<br>- pin 1 and 3 (continuity)<br>- pin 2 and 4 (no continuity) | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace switch. |

| | |
|---|---|
| **3. Check wiring harness between P_CRT_ RPTO_SW and P_MAIN_DASH**<br><br>• Disconnect the connector P_MAIN_DASH.<br><br>• Use a multimeter to check the continuity between:<br><br>- pin 1 of P_CRT_RPTO_SW and pin 67 of P_ MAIN_DASH<br>- pin 2 of P_CRT_RPTO_SW and pin 68 of P_ MAIN_DASH<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |
| **4. Check for short to positive between P_CRT_ RPTO_SW and P_MAIN_DASH**<br><br>• Disconnect the connector P_TRAS_PTO_MAIN_V.<br><br>• Switch ON ignition.<br><br>• Check voltage between:<br><br>- pin 1 of P_CRT_RPTO_SW and ground<br>- pin 2 of P_CRT_RPTO_SW and ground<br><br>***NOTE:*** *The voltage on pins must be near 0 volts.* | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Repair or replace harness as needed. |
| **5. Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.24 E024 - Gear 540 Engaged signal under threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on 540 PTO switch**<br><br>• Disconnect the connector P_TRAS_540_SW of the switch Z161.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_540_SW between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%)<br>Typical value: ……4,7 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101).<br><br>• Check continuity between:<br><br>- pin 36 of P_MAIN_DASH and pin 1 of P_TRAS_540_SW<br>- pin 74 of P_MAIN_DASH and pin 2 of P_TRAS_540_SW<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• If there is not continuity or the wiring is damaged, repair or replace harness as needed.<br>•<br>• Check for a short to ground.<br>Check continuity between:<br><br>- pin 1 of P_TRAS_540_SW and ground<br><br>If there is continuity, repair or replace the wiring as needed.<br>•<br>•<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and pin 2 of the switch Z161<br><br>**Specification**<br><br>Resistance value must be near to: …1730 Ohm (±5%)<br><br>***NOTE:*** *The switch must be in open state (not operated).* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Change the control module. |

## 10.1.1.2.25 E025 - Gear 540 Engaged signal inconsistent

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** |

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|---|---|
| 1. **Check supply voltage signal on 540 PTO switch**<br><br>• Disconnect the connector P_TRAS_540_SW of the switch Z161.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_540_SW between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101).<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace harness as needed.<br><br>• Check continuity on wiring between:<br><br>- pin 36 of P_MAIN_DASH and pin 1 of P_TRAS_540_SW<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.*<br><br>- If there is not continuity or an intermittent contact is indicated, repair or replace as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check that the resistance between pins 1 and 2 of the switch Z161 is approximately:<br><br>- 1730 Ohms (Switch not operated) (±5%)<br>- 530 Ohms (Switch operated) (±5%) | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check for continuity**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101).<br><br>• Check continuity on wiring between:<br><br>- pin 74 of P_MAIN_DASH and pin 2 of P_TRAS_540_SW<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.*<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• If there is not continuity or an intermittent contact is indicated, repair or replace as needed. |

| | |
|---|---|
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

### 10.1.1.2.26 E026 - Gear 540 Engaged signal over threshold

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check supply voltage signal on 540 PTO switch**<br><br>• Disconnect the connector P_TRAS_540_SW of the switch Z161.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_540_SW between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check for a short to positive.<br>Check the voltage between:<br><br>- pin 1 of P_TRAS_540_SW and ground<br><br>If supply voltage is over 5 volts, check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>•<br><br>• Repair or replace harness as needed. |
| 2. **Check for short to positive (output signal)**<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_540_SW (output signal) between:<br><br>- pin 2 and ground<br><br>**Specification**<br><br>Voltage of the switch output signal: ……0 Volt | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Repair or replace the wiring harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module. |

## 10.1.1.2.27 E027 - Gear 2ND Engaged signal under threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| 1. **Check supply voltage signal on 540E/1000 PTO switch**<br><br>• Disconnect the connector P_TRAS_540E/1000_SW of the switch Z208.<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage at connector P_TRAS_540E/1000_SW between:<br>- pin 1 and ground<br><br>Specification<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br>• Disconnect connector P_MAIN_DASH of the control module (A101).<br>• Check continuity between:<br>- pin 36 of P_MAIN_DASH and pin 1 of P_TRAS_540E/1000_SW<br>- pin 73 of P_MAIN_DASH and pin 2 of P_TRAS_540E/1000_SW<br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>• If there is not continuity or the wiring is damaged, repair or replace harness as needed.<br>• Check for a short to ground.<br>Check continuity between:<br>- pin 1 of P_TRAS_540E/1000_SW and ground<br>If there is continuity, repair or replace the wiring as needed.<br>•<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check the resistance between:<br>- pin 1 and pin 2 of the switch Z208<br><br>**Specification**<br><br>Resistance value must be near to:<br>……1730 Ohms (±5%)<br><br>***NOTE:*** *The switch must be in open state (not operated).* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br>• Replace the switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.28 E028 - Gear 2ND Engaged signal inconsistent

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| 1. **Check supply voltage signal on 540E/1000 PTO switch**<br><br>• Disconnect the connector P_TRAS_540E/1000_SW of the switch Z208.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_540E/1000_SW between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101).<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace harness as needed.<br><br>• Check continuity on wiring between:<br><br>- pin 36 of P_MAIN_DASH and pin 1 of P_TRAS_540E/1000_SW<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.*<br><br>- If there is not continuity or an intermittent contact is indicated, repair or replace as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check that the resistance between pins 1 and 2 of the switch Z208 is approximately:<br><br>- 1730 Ohms (Switch not operated) (±5%)<br>- 530 Ohms (Switch operated) (±5%) | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check for continuity**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101)<br><br>• Check continuity on wiring between:<br><br>- pin 73 of P_MAIN_DASH and pin 2 of P_TRAS_540E/1000_SW<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.* | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• If there is not continuity or an intermittent contact is indicated, repair or replace as needed. |

| | |
|---|---|
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.29 E029 - Gear 2ND Engaged signal over threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on 540E/1000 PTO switch**<br><br>• Disconnect the connector P_TRAS_540E/1000_SW of the switch Z208.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_540E/1000_SW between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check for a short to positive.<br>Check the voltage between:<br><br>- pin 1 of P_TRAS_540E/1000_SW and ground<br><br>• If supply voltage is over 5 volts, check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace harness as needed. |
| 2. **Check for short to positive (output signal)**<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_540E/1000_SW (output signal) between:<br><br>- pin 2 and ground<br><br>**Specification**<br><br>Voltage of the switch output signal: ……0 Volt | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Repair or replace the wiring harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.30 E030 - Engaged Gear Speed detection failure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check correct resistance of the PTO speed switches selection**<br><br>• Disconnect the connectors P_TRAS_540_SW and P_TRAS_540E/1000_SW.<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and 2 of Z161 (switch not operated)<br><br>- pin 1 and 2 of Z208 (switch not operated)<br><br>**Specification:**<br><br>Resistance (switches not operated):<br>……1730 Ohms (±5%)<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and 2 of Z161 (switch operated)<br><br>- pin 1 and 2 of Z208 (switch operated)<br><br>**Specification**<br><br>Resistance (switches operated):<br>……530 Ohms (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace the faulty switch. |
| 2. **Check wiring harness, connectors and mechanical parts of the system**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Check for mechanical issues on PTO speed selection system. | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Repair or replace harness, connectors or mechanical part as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.31 E031 - Direct Mode Engaged signal under threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on direct PTO selector switch**<br><br>• Disconnect the connector P_TRAS_DIR_PTO_SW of the switch Z210.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_DIR_PTO_SW between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK**: Go to **2**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101).<br><br>• Check continuity between:<br><br>- pin 36 of P_MAIN_DASH and pin 1 of P_TRAS_DIR_PTO_SW<br>- pin 75 of P_MAIN_DASH and pin 2 of P_TRAS_DIR_PTO_SW<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• If there is not continuity or the wiring is damaged, repair or replace harness as needed.<br><br>• Check for a short to ground.<br>Check continuity between:<br><br>- pin 1 of P_TRAS_DIR_PTO_SW and ground<br><br>If there is continuity, repair or replace the wiring as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and pin 2 of the switch Z210<br><br>**Specification**<br><br>Resistance value must be near to:<br>……1730 Ohms (±5%)<br><br>***NOTE:*** *The switch must be in open state (not operated).* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.32 E032 - Direct Mode Engaged signal inconsistent

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed**. |

| | |
|---|---|
| 1. **Check supply voltage signal on direct PTO selector switch**<br><br>• Disconnect the connector P_TRAS_DIR_PTO_SW of the switch Z210.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_DIR_PTO_SW between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101).<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace harness as needed.<br><br>• Check continuity on wiring between:<br><br>- pin 36 of P_MAIN_DASH and pin 1 of P_TRAS_DIR_PTO_SW<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.*<br><br>If there is not continuity or an intermittent contact is indicated, repair or replace as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check that the resistance between pins 1 and 2 of the switch Z210 is approximately:<br><br>- 1730 Ohms (±5%) (Switch not operated)<br>- 530 Ohms (±5%) (Switch operated) | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check for continuity**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101).<br><br>• Check continuity on wiring between:<br><br>- pin 75 of P_MAIN_DASH and pin 2 of P_TRAS_DIR_PTO_SW<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.* | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• If there is not continuity or an intermittent contact is indicated, repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.33 E033 - Direct Mode Engaged signal over threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on direct PTO selector switch**<br>• Disconnect the connector P_TRAS_DIR_PTO_SW of the switch Z210.<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage at connector P_TRAS_DIR_PTO_SW between:<br>- pin 1 and ground<br>**Specification**<br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Check for a short to positive.<br>Check the voltage between:<br>- pin 1 pf P_TRAS_DIR_PTO_SW and ground<br>If supply voltage is over 5 volts, check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>•<br>• Repair or replace harness as needed. |
| 2. **Check for short to positive (output signal)**<br>• Use a multimeter to check the supply voltage at connector P_TRAS_DIR_PTO_SW (output signal) between:<br>- pin 2 and ground<br>**Specification**<br>Voltage of the switch output signal: ……0 Volt | **OK:** Go to **3**.<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Repair or replace the wiring harness as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.2.34 E034 - GD Mode Engaged signal under threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on ground PTO selector switch**<br><br>• Disconnect the connector P_TRAS_GD_PTO_SW of the switch Z162.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_GD_PTO_SW between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101).<br><br>• Check continuity between:<br><br>- pin 36 of P_MAIN_DASH and pin 1 of P_TRAS_GD_PTO_SW<br>- pin 76 of P_MAIN_DASH and pin 2 of P_TRAS_GD_PTO_SW<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• If there is not continuity or the wiring is damaged, repair or replace harness as needed.<br><br>• Check for a short to ground.<br>Check continuity between:<br><br>- pin 1 of P_TRAS_GD_PTO_SW and ground<br><br>If there is continuity, repair or replace the wiring as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check the resistance between:<br><br>- pin 1 and pin 2 of the switch Z162<br><br>**Specification**<br><br>Resistance value must be near to:<br>……1730 Ohms (±5%)<br><br>***NOTE:*** *The switch must be in open state (not operated).* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.35 E035 - GD Mode Engaged signal inconsistent

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on ground PTO selector switch**<br><br>• Disconnect the connector P_TRAS_GD_PTO_SW of the switch Z162.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_GD_PTO_SW between:<br><br>- pin 1 and ground<br><br>**Specification**<br><br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101).<br><br>• Also check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace harness as needed.<br><br>• Check continuity on wiring between:<br><br>- pin 36 of P_MAIN_DASH and pin 1 of P_TRAS_GD_PTO_SW<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.*<br><br>• If there is not continuity or an intermittent contact is indicated, repair or replace as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* |
| 2. **Check for correct resistance value**<br><br>• Use a multimeter to check that the resistance between pins 1 and 2 of the switch Z162 is approximately:<br><br>- 1730 Ohms (±5%) (Switch not operated)<br>- 530 Ohms (±5%) (Switch operated) | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Replace the switch. |
| 3. **Check for continuity**<br><br>• Switch OFF ignition.<br><br>• Disconnect connector P_MAIN_DASH of the control module (A101)<br><br>• Check continuity on wiring between:<br><br>- pin 76 of P_MAIN_DASH and pin 2 of P_TRAS_GD_PTO_SW<br><br>***NOTE:*** *During this test twist the wiring harness to find possible intermittent contacts.* | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• If there is not continuity or an intermittent contact is indicated, repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.36 E036 - GD Mode Engaged signal over threshold

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage signal on ground PTO selector switch**<br>• Disconnect the connector P_TRAS_GD_PTO_SW of the switch Z162.<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage at connector P_TRAS_GD_PTO_SW between:<br>- pin 1 and ground<br>**Specification**<br>Supply voltage of the switch: ……5 Volt (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Check for a short to positive.<br>Check the voltage between:<br>- pin 1 of P_TRAS_GD_PTO_SW and ground<br>• If supply voltage is over 5 volts, check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>•<br>• Repair or replace harness as needed. |
| 2. **Check for short to positive (output signal)**<br>• Use a multimeter to check the supply voltage at connector P_TRAS_GD_PTO_SW (output signal) between:<br>- pin 2 and ground<br>**Specification**<br>Voltage of the switch output signal: ……0 Volt | **OK:** Go to **3**.<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Repair or replace the wiring harness as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

## 10.1.1.2.37 E037 - Engaged Mode detection failure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

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| 1. **Check correct resistance of the PTO switches selection**<br>• Disconnect the connectors P_TRAS_GD_PTO_SW and P_TRAS_DIR_PTO_SW.<br>• Use a multimeter to check the resistance between:<br>- pin 1 and 2 of Z162 (switch not operated)<br>- pin 1 and 2 of Z210 (switch not operated)<br>**Specification:**<br>Resistance (switches not operated):<br>……1730 Ohms (±5%)<br>• Use a multimeter to check the resistance between:<br>- pin 1 and 2 of Z162 (switch operated)<br>- pin 1 and 2 of Z210 (switch operated)<br>**Specification**<br>Resistance (switches operated):<br>……530 Ohms (±5%) | **OK:** Go to **2.**<br>**NOT OK:**<br>• Replace the faulty switch. |
| 2. **Check wiring harness, connectors and mechanical parts of the system**<br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>• Check for mechanical issues on PTO selection system. | **OK:** Go to **3.**<br>**NOT OK:**<br>• Repair or replace harness, connectors or mechanical part as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

## 10.1.1.2.38 E041 - PTO pressure switch open signal failure

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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| 1. **Check the voltage on pressure switch Z175**<br><br>• Disconnect the connector P_TRAS_PTO_PSW of the pressure switch (Z175).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_PTO_PSW between:<br><br>- pin 1 and ground<br><br>**Specification:**<br><br>Voltage on pin 1: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check the presence of the continuity between:<br><br>- pin 1 and fuse (F6)<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 1 of P_TRAS_PTO_PSW and ground<br><br>• Check connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |
| 2. **Check pressure switch Z175**<br><br>• Use a multimeter to check the presence of continuity on pressure switch Z175 between:<br><br>- pin 1 and 2<br><br>***NOTE:*** *Switch is normally closed.*<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the pressure switch. |
| 3. **Check continuity between P_TRAS_PTO_PSW and P_MAIN_DASH**<br><br>• Disconnect the connector P_MAIN_DASH of the instrument panel (A101).<br><br>• Use a multimeter to check the presence of continuity between:<br><br>- pin 2 of P_TRAS_PTO_PSW and 72 of P_MAIN_DASH<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 2 of P_TRAS_PTO_PSW and ground<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **4.**<br><br>**NOT OK:**<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |
| 4. **Check that the pressure switch is not damaged doing hydraulic and mechanical tests (see relevant section)** | **OK:** Go to **5.**<br><br>**NOT OK:**<br><br>• Replace the pressure switch. |

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| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.2.39 E042 - PTO pressure switch closed signal failure

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
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| 1. **Check for short to positive**<br>• Disconnect the connector P_TRAS_PTO_PSW of the pressure switch (Z175).<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage at connector P_TRAS_PTO_PSW between:<br>- pin 2 and ground<br>**Specification:**<br>Voltage on pin 2: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 2. **Check that the pressure switch is not damaged doing hydraulic and mechanical tests (see relevant section)** | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the pressure switch. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.1.2.40 E043 - PTO Safety Valve stuck open

| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |
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| 1. **Check supply voltage signal on Y338 PTO safety valve**<br><br>• Disconnect the connector P_TRAS_PTO_ SAF_V of the safety valve (Y338).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the voltage at connector P_TRAS_PTO_SAF_V between:<br><br>- pin 1 and 2<br><br>**Specification:**<br><br>Voltage on the safety valve: ……0 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Disconnect the connectors P_MAIN_DASH.<br><br>• Check for short to positive.<br><br>• Switch ON ignition.<br><br>• Check the voltage between:<br><br>• pin 1 of P_TRAS_PTO_SAF_V and ground<br><br>**Specification:**<br><br>Voltage on pin 1 of P_TRAS_PTO_SAF_V: ……0 Volt<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed. |
| 2. **Check that the safety valve is not damaged doing hydraulic and mechanical tests (see relevant section)** | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the safety valve. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.41 E044 - PTO Main Valve stuck open

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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| 1. **Check supply voltage signal on Y325 PTO main valve**<br>• Disconnect the connector P_TRAS_PTO_MAIN_V of the main valve (Y325).<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage at connector P_TRAS_PTO_MAIN_V between:<br>- pin 1 and 2<br>**Specification:**<br>Voltage on the main valve: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Check that relay K6 (in main fuse box) is not damaged, and check supply line of relay.<br>• Check for short to positive.<br>Check the voltage between:<br>- pin 1 of P_TRAS_PTO_MAIN_V and ground<br>**Specification:**<br>Voltage on pin 1 of P_TRAS_PTO_MAIN_V: ……0 Volt<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 2. **Check that the main valve is not damaged doing hydraulic and mechanical tests (see relevant section)** | **OK:** Go to **3.**<br>**NOT OK:**<br>• Replace the main valve. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

## 10.1.1.2.42 E045 - PTO Clutch low pressure

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| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| ***NOTE:*** *Before starting with checks, verify the hydraulic circuit.*<br>1. **Check for short to positive**<br>• Disconnect the connector P_TRAS_PTO_PSW of the pressure switch (Z175).<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage at connector P_TRAS_PTO_PSW between:<br>- pin 2 and ground<br>**Specification:**<br>Voltage on pin 2: ……0 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Switch OFF ignition.<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |

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| 2. **Check that the pressure switch is not damaged doing hydraulic and mechanical tests (see relevant section)** | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Replace the pressure switch. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.43 E046 - PTO Output Shaft Speed signal failure

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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| ***NOTE:*** *Before starting with checks, verify the correct operation of the tachometer and that the clutch does not slip.*<br><br>1. **Check the supply voltage on sensor B142**<br><br>• Disconnect the connector P_TRAS_PTO_OUT_SENS of the sensor (B142).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_PTO_OUT_SENS between:<br><br>- pin 3 and 2<br><br>**Specification:**<br><br>Supply voltage on the sensor: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check that the line fuse (F6) is OK.<br><br>• Check the presence of continuity between:<br><br>• pin 3 of P_TRAS_PTO_OUT_SENS and fuse F6<br>• pin 2 of P_TRAS_PTO_OUT_SENS and ground<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>• pin 3 of P_TRAS_PTO_OUT_SENS and ground<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* |

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| 2. **Check wiring harness between P_TRAS_ PTO_OUT_SENS and P_MAIN_DASH**<br>• Switch OFF ignition.<br>• Disconnect the connector P_MAIN_DASH.<br>• Use a multimeter to check the presence of continuity between:<br>- pin 1 of P_TRAS_PTO_OUT_SENS and pin 56 of P_MAIN_DASH<br>• Check for short to ground.<br>Check the absence of continuity between:<br>- pin 1 of P_TRAS_PTO_OUT_SENS and ground<br>• Check for short to positive.<br>• Switch ON ignition.<br>• Check the voltage between:<br>- pin 1 of P_TRAS_PTO_OUT_SENS and ground<br>**Specification:**<br>Voltage on pin 1 of P_TRAS_PTO_OUT_SENS: ……0 Volt<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 3. **Check of the sensor**<br>• Check that the sensor is not damaged.<br>• Remove the sensor from work location.<br>• Connect the connector P_TRAS_PTO_ OUT_SENS to the sensor.<br>• Check the voltage between:<br>- pin 2 and 1 of P_TRAS_PTO_OUT_SENS<br>**Specification:**<br>Voltage between pin 2 and 1: ……4,7 Volt (±5%) | **OK:** Go to **4.**<br>**NOT OK:**<br>• Replace the sensor. |
| 4. **Check of the mechanical component (pulse wheel)**<br>• Verify that the pulse wheel is not damaged and that it is correctly assembled. | **OK:** Go to **5.**<br>**NOT OK:**<br>• Repair or replace mechanical component. |

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| 5. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.44 E047 - Cruise Control SET2 Switch short circuit to GND or stuck

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| ***NOTE:*** *This error can also be caused by prolonged pressure of button for more than 15 seconds.*<br><br>1. **Check of the engine speed 2 storage button**<br><br>• Check that the engine speed 2 storage button (S179) is not stuck.<br><br>• Disconnect the connector P_CRT_MEM2 of the push button.<br><br>• Check the absence of continuity on push button between:<br><br>- pin 1 and 2 | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Replace the push button. |
| 2. **Check for short to ground**<br><br>• Disconnect the connector P_MAIN_DASH.<br><br>• Check the absence of continuity between:<br><br>- pin 1 of P_CRT_MEM2 and ground | **OK:** Go to **3.**<br><br>**NOT OK:**<br><br>• Check connectors, pins and wiring.<br><br>Repair or replace harness as needed. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.45 E141 - EEPROM corrupted

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

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| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.46 E142 - MMC to SMC communication error

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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| 1. **Check supply voltage signal on P_MAIN_ DASH connector**<br><br>• Disconnect the P_MAIN_DASH connector from instrument panel control module A101.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage on P_MAIN_DASH connector between:<br><br>- pin 1 and 20<br>- pin 2 and 20<br>- pin 21 and 20<br><br>**Specification:**<br><br>Supply voltage: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Only if voltage is low use a multimeter to check the voltage on battery between:<br><br>- positive pole and negative pole<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±10%)<br><br>If the voltage is not as per specification:<br><br>• Replace or recharge the battery as needed.<br><br>• Switch OFF ignition.<br><br>• Check that the line fuses F7 and F8 are OK.<br><br>If any fuse is broken, check for short to ground on affected line of the circuit.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_MAIN_DASH and fuse F8 pin A<br>- pin 21 of P_MAIN_DASH and fuse F8 pin A<br>- pin 2 of P_MAIN_DASH and fuse F7 pin A<br>- pin 20 of P_MAIN_DASH and the negative pole of the battery<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.47 E143 - MMC and SMC SW version are different

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.48 E144 - MMC dead or not responding

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed**. |
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| 1. **Check supply voltage signal on P_MAIN_ DASH connector**<br><br>• Disconnect the P_MAIN_DASH connector from instrument panel control module A101.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage on P_MAIN_DASH connector between:<br><br>- pin 1 and 20<br>- pin 2 and 20<br>- pin 21 and 20<br><br>**Specification:**<br><br>Supply voltage: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Only if voltage is low use a multimeter to check the voltage on battery between:<br><br>- positive pole and negative pole<br><br>**Specification:**<br>Supply voltage: ……12 Volt (±10%)<br><br>If the voltage is not as per specification:<br><br>• Replace or recharge the battery as needed.<br><br>• Switch OFF ignition.<br><br>• Check that the line fuses F7 and F8 are OK.<br><br>If any fuse is broken, check for short to ground on affected line of the circuit.<br><br>• Check the presence of continuity between:<br><br>- pin 1 of P_MAIN_DASH and fuse F8 pin A<br>- pin 21 of P_MAIN_DASH and fuse F8 pin A<br>- pin 2 of P_MAIN_DASH and fuse F7 pin A<br>- pin 20 of P_MAIN_DASH and the negative pole of the battery<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.49 E145 - Error on CAN BUS

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed**.

1. **Check the value of CAN bus resistance on diagnosis socket**

   - Switch OFF ignition.
   - Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CRT_D_SKT connector) between:

   - pin C and D

**Specification:**

CAN bus resistance: ……60 Ohms (±5%)

**OK:** Go to **2.**

**NOT OK:**

- Disconnect the CAN bus terminator (R994) from P_CRT_CAN_TERM connector and use a multimeter to check the value of resistance on terminator between:

  - pin A and B

If resistance does not respect the specific:

- Replace resistance.

**Specification:**
CAN bus resistance: ……120 Ohms (±5%)

- Disconnect the connector P_MAIN_DASH.
- Check the absence of continuity between:

  - pin 19 and 38 of P_MAIN_DASH

- Check the presence of continuity between:

  - pin 19 of P_MAIN_DASH and any pins of the CAN-H line
  - pin 38 of P_MAIN_DASH and any pins of the CAN-L line

***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*

- Check for short to ground.
  Check the absence of continuity between:

  - pin 19 of P_MAIN_DASH and ground
  - pin 38 of P_MAIN_DASH and ground

- Check for short to positive.
- Switch ON ignition.
- Check the voltage between:

  - pin 19 of P_MAIN_DASH and ground
  - pin 38 of P_MAIN_DASH and ground

**Specification:**
Voltage on pin 19 and 38: ……0 Volt

- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.
- Repair or replace harnesses as needed.

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| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.50 E148 - Steering function 4WD Set Switch Fault

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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| 1. **Check supply voltage of the 4WD steering switch (S996)**<br><br>• Disconnect connector P_CRT_4WD_STEERING_SW of the 4WD steering switch.<br><br>• Disconnect connector P_MAIN_DASH of the instrument panel control module.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_CRT_4WD_STEERING_SW between pins:<br><br>- 1 and ground<br><br>**Specification**<br><br>Supply voltage of 4WD steering switch: ….12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the line fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Switch OFF ignition.<br>Check for short to ground:<br>Check continuity between pins:<br><br>- 1 of P_CRT_4WD_STEERING_SW and ground<br><br>• Repair or replace if needed.<br><br>• Check that the components S996 is not damaged. |
| 2. **Check continuity between 4WD steering switch and instrument panel control module**<br><br>• Check continuity between:<br><br>- pin 4 of P_CRT_4WD_STEERING_SW and pin 52 of P_MAIN_DASH<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Check for short to ground.<br>Check continuity between pins:<br><br>- 4 of P_CRT_4WD_STEERING_SW and ground<br><br>If continuity is detected, repair or replace.<br><br>• Check for short to positive.<br>Check continuity between pins:<br><br>- 4 of P_CRT_4WD_STEERING_SW and the positive pole of the battery<br><br>If continuity is detected, repair or replace. |

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| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Change the control module |

### 10.1.1.2.51 E150 - Steering function 4WD angular sensor Fault

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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| 1. **Check supply voltage of the 4WD steering sensor B999, channel 1**<br><br>• Disconnect the connector P475 of the 4WD steering sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P475 between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Supply voltage of foot throttle sensor: ……12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check that the line fuse (F6) is OK.<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Switch OFF ignition.<br><br>• Check for short to ground.<br>Check the absence of continuity between pins:<br><br>- 2 and 3, of P475, and ground<br><br>• If continuity is detected, repair or replace if needed.<br><br>• Check for short to positive.<br>Check the absence of continuity between pins:<br><br>- 1 and 3, of P475, and F6<br><br>• If continuity is detected, repair or replace if needed.<br><br>• Check that the component B999 is not damaged. |
| 2. **Check continuity between 4WD steering sensor B999, channel 1, and instrument panel control module**<br><br>• Switch OFF ignition.<br><br>• Disconnect P_MAIN_DASH.<br><br>• Check continuity between:<br><br>- pin 3 of P475 and pin 50 of P_MAIN_DASH<br><br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |

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| 3. **Check supply voltage of the 4WD steering sensor B999, channel 2**<br>• Disconnect the connector P475 of the 4WD steering sensor.<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage at connector P475 between pins:<br>- 4 and 5<br>**Specification**<br>Supply voltage of foot throttle sensor: ……12 Volt | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check that the line fuse (F6) is OK.<br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>• Switch OFF ignition.<br>• Check for short to ground.<br>Check the absence of continuity between pins:<br>- 5 and 6, of P475, and ground<br>• If continuity is detected, repair or replace if needed.<br>• Check for short to positive.<br>Check the absence of continuity between pins:<br>- 4 and 6, of P475, and F6<br>• If continuity is detected, repair or replace if needed.<br>• Check that the component B999 is not damaged. |
| 4. **Check continuity between 4WD steering sensor B999, channel 2, and instrument panel control module**<br>• Switch OFF ignition.<br>• Disconnect P_MAIN_DASH.<br>• Check continuity between:<br>- pin 6 of P475 and pin 51 of P_MAIN_DASH<br>***NOTE:*** *Verify that the resistance is near to 0 ohms.* | **OK:** Go to **5.**<br>**NOT OK:**<br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br>• Repair or replace if needed. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Change the control module. |

### 10.1.1.2.52 E152 - Front PTO HSD Feedback error

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check supply voltage of the front PTO relay KFPTO3**<br><br>• Disconnect the connector P433 of the front PTO relay KFPTO3.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P433 between pins:<br><br>- 85 and 86<br><br>**Specification**<br><br>Supply voltage of front PTO relay: ……5 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Check the leads and connecting points for bad, widened, slid-back, or corroded (loose) contacts.<br><br>• Switch OFF ignition.<br>Check for short to ground.<br>Check continuity between pin:<br><br>- 86 of P433 and ground<br><br>• If continuity is detected, repair or replace if needed.<br><br>• Check that the component KFPTO3, front PTO relay, is not damaged. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.53 E154 - Wheel Speed Sensor Out of Range

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

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|---|---|
| ***NOTE:*** *Before starting with checks verify the correct operation of the tachometer and that the clutch does not slip.*<br><br>1. **Check the supply voltage on sensor B227**<br><br>• Disconnect the connector P_TRAS_SPD_SENS of the sensor (B227).<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_TRAS_SPD_SENS between:<br><br>- pin 2 and 3<br><br>**Specification:**<br><br>Supply voltage on the sensor: ……12 Volt (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Check that the line fuse (F4) is OK.<br><br>• Check the presence of continuity between:<br><br>• pin 3 of P_TRAS_SPD_SENS and fuse F4<br>• pin 2 of P_TRAS_SPD_SENS and ground<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>• pin 3 of P_TRAS_SPD_SENS and ground<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harness as needed.<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* |

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|---|---|
| 2. **Check wiring harness between P_TRAS_ SPD_SENS and P_MAIN_DASH**<br>• Switch OFF ignition.<br>• Disconnect the connector P_MAIN_DASH.<br>• Use a multimeter to check the presence of continuity between:<br>- pin 1 of P_TRAS_SPD_SENS and pin 49 of P_MAIN_DASH<br>• Check for short to ground.<br>Check the absence of continuity between:<br>- pin 1 of P_TRAS_SPD_SENS and ground<br>• Check for short to positive.<br>• Switch ON ignition<br>• Check the voltage between:<br>- pin 1 of P_TRAS_SPD_SENS and ground<br>**Specification:**<br>Voltage on pin 1 of P_TRAS_SPD_SENS: ……0 Volt<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3.**<br>**NOT OK:**<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harness as needed. |
| 3. **Check of the sensor**<br>• Check that the sensor is not damaged.<br>• Remove the sensor from work location.<br>• Connect the connector P_TRAS_SPD_ SENS to the sensor.<br>• Check the voltage between:<br>- pin 2 and 1 of P_TRAS_SPD_SENS<br>**Specification:**<br>Voltage on sensor: ……4,7 Volt (±5%) | **OK:** Go to **4.**<br>**NOT OK:**<br>• Replace the sensor. |
| 4. **Check of the mechanical component (pulse wheel)**<br>• Verify that the pulse wheel is not damaged and that it is correctly assembled. | **OK:** Go to **5.**<br>**NOT OK:**<br>• Repair or replace mechanical component. |
| 5. **Check control module revision level**<br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

## 10.1.1.2.54 E158 - Self adaptation strategy fails

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the value of CAN bus resistance on diagnosis socket**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CRT_D_SKT connector) between:<br><br>- pin C and D<br><br>**Specification:**<br><br>CAN bus resistance: ……60 Ohms (±5%) | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect the CAN bus terminator (R994) from P_ CRT_CAN_TERM connector and use a multimeter to check the value of resistance on terminator between:<br><br>- pin A and B<br><br>If resistance does not respect the specific:<br><br>• Replace resistance.<br><br>**Specification:**<br>CAN bus resistance: ……120 Ohms (±5%)<br><br>• Disconnect the connector P_MAIN_DASH.<br><br>• Check the absence of continuity between:<br><br>- pin 19 and 38 of P_MAIN_DASH<br><br>• Check the presence of continuity between:<br><br>- pin 19 of P_MAIN_DASH and any pins of the CAN-H line<br>- pin 38 of P_MAIN_DASH and any pins of the CAN-L line<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin 19 of P_MAIN_DASH and ground<br>- pin 38 of P_MAIN_DASH and ground<br><br>• Check for short to positive.<br><br>• Switch ON ignition.<br><br>• Check the voltage between:<br><br>- pin 19 of P_MAIN_DASH and ground<br>- pin 38 of P_MAIN_DASH and ground<br><br>**Specification:**<br>Voltage on pin 19 and 38: ……0 Volt<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.1.2.55 E159 - Self adaptation strategy fails

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

1. **Check the value of CAN bus resistance on diagnosis socket**

   - Switch OFF ignition.
   - Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 (J_CRT_D_SKT connector) between:

- pin C and D

**Specification:**

CAN bus resistance: ……60 Ohms (±5%)

**OK:** Go to **2.**

**NOT OK:**

- Disconnect the CAN bus terminator (R994) from P_CRT_CAN_TERM connector and use a multimeter to check the value of resistance on terminator between:

  - pin A and B

If resistance does not respect the specific:

- Replace resistance.

**Specification:**
CAN bus resistance: ……120 Ohms (±5%)

- Disconnect the connector P_MAIN_DASH.
- Check the absence of continuity between:

  - pin 19 and 38 of P_MAIN_DASH

- Check the presence of continuity between:

  - pin 19 of P_MAIN_DASH and any pins of the CAN-H line
  - pin 38 of P_MAIN_DASH and any pins of the CAN-L line

***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*

- Check for short to ground.
  Check the absence of continuity between:

  - pin 19 of P_MAIN_DASH and ground
  - pin 38 of P_MAIN_DASH and ground

- Check for short to positive.
- Switch ON ignition.
- Check the voltage between:

  - pin 19 of P_MAIN_DASH and ground
  - pin 38 of P_MAIN_DASH and ground

**Specification:**
Voltage on pin 19 and 38: ……0 Volt

- Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.
- Repair or replace harnesses as needed.

| | |
|---|---|
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.1.2.56 Driver Seat Switch stuck

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of Z005 – Seat switch**<br><br>• Disconnect the connector P_MAIN_SEAT_SW of the seat switch.<br>• Switch ON ignition.<br>• Use a multimeter to check the voltage between:<br>– Pin 1 of P_MAIN_SEAT_SW and ground<br><br>**Specification**<br>Supply voltage: ……12 Volt | **OK:** Go to **2.**<br><br>**NOT OK:** Check that the fuse F8 is not damaged.<br>Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>Repair or replace if needed. |
| 2. **Check for continuity**<br><br>• Switch OFF ignition.<br>• Disconnect the connector P_MAIN_DASH from the A101 control unit.<br>• Use a multimeter to check the continuity between:<br>– Pin 2 of P_MAIN_SEAT_SW and pin 48 of P_MAIN_DASH<br><br>**Specification**<br>Continuity: ……Present<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.* | **OK:** Go to **3**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |
| 3. **Check for short to positive**<br><br>• Use a multimeter to check the voltage between:<br>– Pin 48 of P_MAIN_DASH and ground<br><br>**Specification**<br>Supply voltage: ……0 Volt | **OK:** Go to **4**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |

| | |
|---|---|
| 4. **Check for short to ground**<br><br>• Use a multimeter to check the absence of continuity between:<br><br>– Pin 1 of P_MAIN_SEAT_SW and ground<br>– Pin 2 of P_MAIN_SEAT_SW and ground<br><br>**Specification**<br><br>Continuity: ……Absent | **OK:** Go to **5**.<br><br>**NOT OK:**<br>Refer to schematic.<br>Repair or replace the circuit if needed. |
| 5. **Check component**<br><br>• Check that the component seat switch Z005 is not damaged and functions properly. | **OK:** End of test.<br><br>**NOT OK:**<br><br>Repair or replace as needed. |

# 10.1.2. DTCs – Front Suspended Axle (IFAS)

## 10.1.2.1 CAB Models

### 10.1.2.1.1 597\9 - Vehicle Speed Message not received on CAN

**CAN message containing the Vehicle Speed signal has not been received for 2.000 seconds; this error will clear when the message is received and if no other errors are present, then the controller will enter the Start-Up state.**

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| Check CAN Hi and CAN Lo voltages<br><br>Disconnect connector P_MAIN_IFAS_ECU of front axle control unit.<br><br>• Switch ON ignition<br><br>• Use a multimeter to check CAN High and CAN Low voltages at connector P_MAIN_IFAS_ECU between:<br><br>• pin 32 (CAN High) and pin 26, 29 or 30 (GND)<br><br>Specification:<br>Supply voltage of CAN High:.....2.50 - 3.50 Volts<br><br>• pin 33 (CAN Low) and pin 26, 29 or 30 (GND)<br><br>**Specification**<br>Supply voltage of CAN Low:.....1.50 - 2.50 Volts | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Check wiring harness.<br><br>• Repair or replace as needed, see the “Controller Area Network (CAN) diagnostic procedure”. |

| | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.2 628\12 - Control unit failure

**Controller memory failure.**

| |
|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.3 628\13 - Calibration is needed

**Calibration has never been completed successfully.**

| |
|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |
| **1. Calibrate the system.** |

### 10.1.2.1.4 701\5 - Front Axle Raise Solenoid Valve, Fault

**Desired current differs from feedback by more the 500 milliamps for more the 300 milliseconds.**

| |
|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check resistance of raise solenoid valve Y993**<br><br>• Disconnect the connector P_IFAS_UP of the solenoid valve.<br><br>• Use a multimeter to check the resistance on the solenoid valve between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Solenoid valve resistance: ……8,8 Ω | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Replace the solenoid valve. |
| 2. **Check for short to ground**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the continuity at connector P_IFAS_UP between:<br><br>- 1 and any point of chassis | **OK:** If continuity is detected:<br><br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed.<br><br>**NOT OK:** If continuity is not detected, Go to **3**. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.5 701\7 - Raise commanded but does not occur during calibration

**During calibration, Suspension did not raise above 85 mm within 60 seconds of command.**

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check resistance of raise solenoid valve Y993**<br><br>• Disconnect the connector P_IFAS_UP of the solenoid valve.<br><br>• Use a multimeter to check the resistance on the solenoid valve between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Solenoid valve resistance: ……8,8 Ω | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Replace the solenoid valve. |

| | |
|---|---|
| 2. **Check for short to ground**<br><br>• Switch OFF ignition.<br>• Use a multimeter to check the continuity at connector P_IFAS_UP between:<br>- 1 and any point of chassis | **OK:** If continuity is detected:<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed.<br><br>**NOT OK:** If continuity is not detected, Go to **3**. |
| 3. **Check the correct connection of the pump** | **OK:** Go to **4**.<br><br>**NOT OK:**<br>• Repair or replace as needed. |
| 4. **Check the correct functionality of the priority valve** | **OK:** Go to **5**.<br><br>**NOT OK:**<br>• Replace or replace as needed. |
| 5. **Check the front axle hydraulic valve** | **OK:** Go to **6**.<br><br>**NOT OK:**<br>• Replace or replace as needed. |
| 6. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.6 701\13 - System does not respond to raise as expected during operation

**During calibration, Suspension did not raise above 85 mm within 60 seconds of command.**

| |
|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check the mechanical linkage of position sensor** | **OK:** Go to **2**.<br><br>**NOT OK:**<br>• Check wiring harness and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br>• Check that the component (B998) is not damaged, normal functionality when installed: …0,5 – 4,5 V.<br>Repair or replace if needed. |
| 2. **Check resistance of raise solenoid valve Y993**<br><br>• Disconnect the connector P_IFAS_UP of the solenoid valve.<br>• Use a multimeter to check the resistance on the solenoid valve between pins:<br>- 1 and 2<br><br>**Specification**<br><br>Solenoid valve resistance: ……8,8 Ω | **OK:** Go to **3**.<br><br>**NOT OK:**<br>• Replace the solenoid valve. |
| 3. **Check for short to ground**<br><br>• Switch OFF ignition.<br>• Use a multimeter to check the continuity at connector P_IFAS_UP between:<br>- 1 and any point of chassis | **OK:** If continuity is detected:<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed.<br><br>**NOT OK:** If continuity is not detected, Go to **4**. |
| 4. **Check the correct connection of the pump** | **OK:** Go to **5**.<br><br>**NOT OK:**<br>• Repair or replace as needed. |
| 5. **Check the correct functionality of the priority valve** | **OK:** Go to **6**.<br><br>**NOT OK:**<br>• Replace or replace as needed. |

| | |
|---|---|
| 6. **Check the front axle hydraulic valve** | **OK:** Go to **7**.<br><br>**NOT OK:**<br><br>• Replace or replace as needed. |
| 7. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

701\14 - Calibration aborted due to vehicle moving

**Calibration Aborted due to Vehicle Speed <> 0.**

| |
|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |
| **1. Stop machine and rerun calibration.** |

### 10.1.2.1.7 702\5 - Front Axle Lower Solenoid Valve, Fault

**Desired current differs from feedback by more the 500 milliamps for more the 300 milliseconds.**

| | |
|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check resistance of lower solenoid valve Y994**<br><br>• Disconnect the connector P_IFAS_LOWER of the solenoid valve.<br><br>• Use a multimeter to check the resistance on the solenoid valve between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Solenoid valve resistance: …….8,8 Ω | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Replace the solenoid valve. |

| | |
|---|---|
| 2. **Check for short to ground**<br><br>• Switch OFF ignition.<br>• Use a multimeter to check the continuity at connector P_IFAS_LOWER between:<br>- 1 and any point of chassis | **OK:** If continuity is detected:<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed.<br><br>**NOT OK:** If continuity is not detected, Go to **3**. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.8 702\7 - Lower commanded but does not occur during calibration

**During calibration, Suspension did not lower below 85 mm within 60 seconds of command.**

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check resistance of lower solenoid valve Y994**<br><br>• Disconnect the connector P_IFAS_LOWER of the solenoid valve.<br>• Use a multimeter to check the resistance on the solenoid valve between pins:<br>- 1 and 2<br><br>**Specification**<br><br>Solenoid valve resistance: ……..8,8 Ω | **OK:** Go to **2**.<br><br>**NOT OK:**<br>• Replace the solenoid valve. |
| 2. **Check for short to ground**<br><br>• Switch OFF ignition.<br>• Use a multimeter to check the continuity at connector P_IFAS_LOWER between:<br>- 1 and any point of chassis | **OK:** If continuity is detected:<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed.<br><br>**NOT OK:** If continuity is not detected, Go to **3**. |

| | |
|---|---|
| 3. **Check the front axle hydraulic valve** | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Repair or replace as needed. |
| 4. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.9 702\13 - System does not respond to lower as expected during operation

**During calibration, Suspension did not lower below 85 mm within 60 seconds of command.**

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check the mechanical linkage of position sensor** | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Check wiring harness and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br><br>• Check that the component (B998) is not damaged, normal functionality when installed: …0,5 – 4,5 V. Repair or replace if needed. |
| 2. **Check resistance of lower solenoid valve Y994**<br><br>• Disconnect the connector P_IFAS_LOWER of the solenoid valve.<br><br>• Use a multimeter to check the resistance on the solenoid valve between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Solenoid valve resistance: …….8,8 Ω | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Replace the solenoid valve. |

| | |
|---|---|
| 3. **Check for short to ground**<br><br>• Switch OFF ignition.<br>• Use a multimeter to check the continuity at connector P_IFAS_LOWER between:<br>- 1 and any point of chassis | **OK:** If continuity is detected:<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed.<br><br>**NOT OK:** If continuity is not detected, Go to **4**. |
| 4. **Check the front axle hydraulic valve** | **OK:** Go to **5**.<br><br>**NOT OK:**<br>• Repair or replace as needed. |
| 5. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.10 703\5 - Front Axle Piston Lockout Solenoid Valve, Fault

**Desired current differs from feedback by more the 500 milliamps for more the 300 milliseconds.**

| | |
|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check resistance of front axle piston lockout solenoid valve Y995**<br><br>• Disconnect the connector P_IFAS_PISTON_L/O of the solenoid valve.<br>• Use a multimeter to check the resistance on the solenoid valve between pins:<br>- 1 and 2<br><br>**Specification**<br><br>Solenoid valve resistance: ……8,8 Ω | **OK:** Go to **2**.<br><br>**NOT OK:**<br>• Replace the solenoid valve. |

| | |
|---|---|
| 2. **Check for short to ground**<br><br>• Switch OFF ignition.<br>• Use a multimeter to check the continuity at connector P_IFAS_PISTON_L/O between:<br>- 1 and any point of chassis | **OK:** If continuity is detected:<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed.<br>**NOT OK:** If continuity is not detected, Go to **3**. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.11 704\5 - Front Axle Rod Lockout Solenoid Valve, Fault

**Desired current differs from feedback by more the 500 milliamps for more the 300 milliseconds.**

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check resistance of front axle rod lockout solenoid valve Y996**<br><br>• Disconnect the connector P_IFAS_ROD_L/O (Power reverser version) or P_IFAS_RPD_L/O (Mechanical version) of the solenoid valve.<br>• Use a multimeter to check the resistance on the solenoid valve between pins:<br>- 1 and 2<br>**Specification**<br>Solenoid valve resistance: ……..8,8 Ω | **OK:** Go to **2**.<br>**NOT OK:**<br>• Replace the solenoid valve. |
| 2. **Check for short to ground**<br><br>• Switch OFF ignition.<br>• Use a multimeter to check the continuity at connector P_IFAS_ROD_L/O (Power reverser version) or P_IFAS_RPD_L/O (Mechanical version) between:<br>- 1 and any point of chassis | **OK:** If continuity is detected:<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed.<br>**NOT OK:** If continuity is not detected, Go to **3**. |

| | |
|---|---|
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.12 709\0 - Failed Linkage-Vehicle Mechanics

**During calibration, Lower Stop is below 10 mm.**

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| **Position sensor out of range during calibration**<br>1. **Check the mechanical linkage of position sensor** | **OK:** Go to **2**.<br>**NOT OK:**<br>• Check wiring harness and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br>• Check that the component (B998) is not damaged, normal functionality when installed: …0,5 – 4,5 V. Repair or replace if needed. |
| 2. **Check control module revision level**<br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.13 709\1 - Failed Linkage-Vehicle Mechanics

**During calibration, Upper Stop is above 160 mm.**

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|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| **Position sensor out of range during calibration**<br><br>1. **Check the mechanical linkage of position sensor** | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Check wiring harness and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br><br>• Check that the component (B998) is not damaged, normal functionality when installed: …0,5 – 4,5 V.<br>Repair or replace if needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.14 709\3 - Failed Position Sensor - Signal too low

**Position Sensor Voltage is below 0 mm (approximately 0.040 Volts).**

| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**<br>**The fault memory must be cleared once the circuit / harness test has been completed.** | |
|---|---|
| 1. **Check supply voltage of B998 – Position sensor**<br><br>• Disconnect the connector P_IFAS_ANG_SENS of the position sensor.<br><br>• Switch ON ignition.<br><br>• Use a multimeter to check the supply voltage at connector P_IFAS_ANG_SENS between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Supply voltage of position sensor: ……5 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>Check wiring harness and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br><br>• Switch OFF ignition.<br>Check for short to ground (check the continuity between):<br>- pin 2 of P_IFAS_ANG_SENS and ground<br>- pin 3 of P_IFAS_ANG_SENS and ground<br>Repair or replace if needed.<br><br>• Check that the component (B998) is not damaged, normal functionality when installed: …0,5 – 4,5 V.<br>Repair or replace if needed. |

| | |
|---|---|
| 2. **Check continuity between position sensor and front axle control unit**<br><br>• Switch OFF ignition.<br><br>• Disconnect P_MAIN_IFAS_ECU.<br><br>• Check continuity between:<br><br>- P_MAIN_IFAS_ECU pin 20 and P_IFAS_ANG_SENS pin 2<br>- P_MAIN_IFAS_ECU pin 31 and P_IFAS_ANG_SENS pin 1<br>- P_MAIN_IFAS_ECU pin 1 and P_IFAS_ANG_SENS pin 3<br><br>***NOTE:*** Verify that the resistance is near to 0 ohms | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Check wiring harness and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br><br>• Repair or replace if needed. |
| 3. **Check the mechanical linkage of position sensor** | **OK:** Go to **4**.<br><br>**NOT OK:**<br><br>• Repair or replace if needed. |
| 4. **Check for correct calibration of the position sensor**<br><br>• Reconnect all connectors.<br><br>• Perform front axle calibration. | **OK:** Go to **5**.<br><br>**NOT OK:**<br><br>• Check for a mechanical / hydraulic issue. |
| 5. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

## 10.1.2.1.15 709\4 - Failed Position Sensor - Signal too high

**Position Sensor Voltage is above 175 mm (approximately 4.70 Volts).**

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| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check supply voltage of B998 – Position sensor**<br><br>• Disconnect the connector P_IFAS_ANG_SENS of the position sensor.<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage at connector P_IFAS_ANG_SENS between pins:<br>- 1 and 2<br><br>**Specification**<br><br>Supply voltage of position sensor: ……5 Volt | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>Check wiring harness and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br>• Switch OFF ignition.<br>Check for short to battery (check the continuity between):<br>- pin 2 of P_IFAS_ANG_SENS and +battery<br>- pin 3 of P_IFAS_ANG_SENS and +battery<br>Repair or replace if needed.<br>• Check that the component (B998) is not damaged, normal functionality when installed: …0,5 – 4,5 V.<br>Repair or replace if needed. |
| 2. **Check continuity between position sensor and front axle control unit**<br><br>• Switch OFF ignition.<br>• Disconnect P_MAIN_IFAS_ECU.<br>• Check continuity between:<br>- P_MAIN_IFAS_ECU pin 20 and P_IFAS_ANG_SENS pin 2<br>- P_MAIN_IFAS_ECU pin 31 and P_IFAS_ANG_SENS pin 1<br>- P_MAIN_IFAS_ECU pin 1 and P_IFAS_ANG_SENS pin 3<br><br>***NOTE:*** Verify that the resistance is near to 0 ohms | **OK:** Go to **3**.<br><br>**NOT OK:**<br>• Check wiring harness and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br>• Repair or replace if needed. |
| 3. **Check the mechanical linkage of position sensor** | **OK:** Go to **4**.<br><br>**NOT OK:**<br>• Repair or replace if needed. |
| 4. **Check for correct calibration of the position sensor**<br><br>• Reconnect all connectors.<br>• Perform front axle calibration. | **OK:** Go to **5**.<br><br>**NOT OK:**<br>• Check for a mechanical / hydraulic issue. |

| | |
|---|---|
| 5. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.16 709\16 - System does not respond to raise as expected during operation

**During Suspension operation, did not return to upper target band within 60 seconds of raise command.**

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the mechanical linkage of position sensor** | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Check wiring harness and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br><br>• Check that the component (B998) is not damaged, normal functionality when installed: …0,5 – 4,5 V. Repair or replace if needed. |
| 2. **Check resistance of raise solenoid valve Y993**<br><br>• Disconnect the connector P_IFAS_UP of the solenoid valve.<br><br>• Use a multimeter to check the resistance on the solenoid valve between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Solenoid valve resistance: ……8,8 Ω | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Replace the solenoid valve. |
| 3. **Check for short to ground**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the continuity at connector P_IFAS_UP between:<br><br>- 1 and any point of chassis | **OK:** If continuity is detected:<br><br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed.<br><br>**NOT OK:** If continuity is not detected, Go to **4**. |

| | |
|---|---|
| 4. **Check the correct connection of the pump** | **OK:** Go to **5**.<br><br>**NOT OK:**<br><br>• Repair or replace as needed. |
| 5. **Check the correct functionality of the priority valve** | **OK:** Go to **6**.<br><br>**NOT OK:**<br><br>• Replace or replace as needed. |
| 6. **Check the front axle hydraulic valve** | **OK:** Go to **7**.<br><br>**NOT OK:**<br><br>• Replace or replace as needed. |
| 7. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.17 709\18 - System does not respond to lower as expected during operation

**During Suspension operation, did not return to lower target band within 60 seconds of lower command.**

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the mechanical linkage of position sensor** | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Check wiring harness and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br><br>• Check that the component (B998) is not damaged, normal functionality when installed: …0,5 – 4,5 V. Repair or replace if needed. |

| | |
|---|---|
| 2. **Check resistance of lower solenoid valve Y994**<br><br>• Disconnect the connector P_IFAS_LOWER of the solenoid valve.<br><br>• Use a multimeter to check the resistance on the solenoid valve between pins:<br><br>- 1 and 2<br><br>**Specification**<br><br>Solenoid valve resistance: ……8,8 Ω | **OK:** Go to **3**.<br><br>**NOT OK:**<br><br>• Replace the solenoid valve. |
| 3. **Check for short to ground**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the continuity at connector P_IFAS_LOWER between:<br><br>- 1 and any point of chassis | **OK:** If continuity is detected:<br><br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed.<br><br>**NOT OK:** If continuity is not detected, Go to **4**. |
| 4. **Check the front axle hydraulic valve** | **OK:** Go to **5**.<br><br>**NOT OK:**<br><br>• Repair or replace as needed. |
| 5. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.2.1.18 710\6 - Manual active for too long

**Manual switch was held for more than 2 minutes.**

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the correct movement of the mode switch** | **OK:** Go to **2**.<br>**NOT OK:**<br>• Repair or replace as needed. |
| 2. **Check wiring harness**<br>• Disconnect the connector P_MAIN_IFAS_MOD_ SW of the mode switch.<br>• Switch OFF ignition.<br>• Use a multimeter to check the continuity at connector P_MAIN_IFAS_MOD_SW between:<br>- 1 and any point of the chassis<br>- 3 and any point of the chassis<br>**Specification:** ……No continuity | **OK:** Go to **3**.<br>**NOT OK:**<br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br>• Repair or replace as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.2.1.19 710\11 - Manual and Lock Out are both active

**Switch error, both Manual and Lock out switches are active simultaneously.**

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|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** |

| | |
|---|---|
| 1. **Check for short to positive**<br><br>• Disconnect the connector P_MAIN_IFAS_MOD_ SW of the mode switch.<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the continuity at connector P_MAIN_IFAS_MOD_SW between pins:<br><br>- 1 and positive pole of battery<br>- 2 and positive pole of battery<br>- 3 and positive pole of battery<br><br>**Specification:** ……No continuity | **OK:** Go to **2**.<br><br>**NOT OK:**<br><br>• Check wiring to detect the presence of broken connectors, bent pins or damaged lines.<br><br>• Repair or replace as needed. |
| 2. **Check/replace the mode switch** | **OK:** END of process.<br><br>**NOT OK:** Go to **3**. |
| 3. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br><br>**NOT OK:**<br><br>• Replace the control module. |

# 10.1.3. DTCs – Electronic Rear Hitch (ERH)

## 10.1.3.1 CAB Models

### 10.1.3.1.1 168\15 - Main supply Voltage Above Normal Operating Range
### 10.1.3.1.2 168\17 - Main supply Voltage Below Normal Operating Range

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|---|---|
| **Circuit / harness test**<br><br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check the alternator**<br><br>• Start the vehicle.<br><br>• Use a multimeter to check the supply voltage on battery between:<br><br>• positive pole and negative pole of the battery<br><br>**Specification:**<br>Supply voltage on battery: ……14 Volt (±5%). | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Switch OFF ignition.<br><br>• Repair or replace alternator. |

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|---|---|
| 2. **Check supply voltage signal on the EHC control unit**<br>• Switch OFF ignition.<br>• Disconnect the connector P_CRT_EHC_ ECU of the EHC control unit (A058).<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage on P_CRT_EHC_ECU connector between:<br>• pin 3 and ground<br>**Specification:**<br>Supply voltage: ……...12 Volt (±5%). | **OK:** Go to **3.**<br>**NOT OK:**<br>• Only if voltage is low use a multimeter to check the voltage on battery between:<br>- The positive pole and the negative pole<br>**Specification:**<br>Supply voltage: ……...12 Volt (±5%).<br>• If the voltage is not as per specification, replace or recharge the battery as needed.<br>• Switch OFF ignition.<br>• Check that the line fuse F19 is OK.<br>• If the fuse is broken, check for short to ground on affected line of the circuit.<br>• Check the presence of continuity between:<br>- pin 3 of P_CRT_EHC_ECU and fuse F19<br>- pin 12 of P_CRT_EHC_ECU and negative pole of the battery (-)<br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br>• Repair or replace harnesses as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.3.1.3 628\12 - Flash memory error
### 10.1.3.1.4 629\12 - Checksum error

| | |
|---|---|
| **Circuit / harness test**<br>**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.** | |
| 1. **Check control module revision level**<br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.3.1.5 630\13 - Missing Calibration

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Calibration of the EHC**<br>• Perform the calibration of the EHC. | If the problem are not resolved, before replacing the EHC control unit, download the correct software revision level, perform again the calibration of the EHC and verify that the system functions properly.<br><br>If the system does not function properly<br><br>• Replace the control module.<br>• Remake the calibration of the parameters. |

### 10.1.3.1.6 639\9 - RPM message not received for at least 500ms

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes.**
**The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the value of CAN bus resistance on diagnosis socket**<br><br>• Switch OFF ignition.<br><br>• Use a multimeter to check the value of CAN bus resistance on diagnosis socket X101 between:<br><br>• pin C and D<br><br>**Specification:**<br>CAN bus resistance: ……60 Ohms (±5%). | **OK:** Go to **2.**<br><br>**NOT OK:**<br><br>• Disconnect the CAN bus terminator from P_CRT_CAN_TERM connector and use a multimeter to check the value of resistance on terminator between:<br><br>- pin A and B of R994<br><br>**Specification:**<br>CAN bus resistance: ……120 Ohms (±5%).<br><br>If resistance does not respect the specific:<br><br>• Replace resistance.<br><br>• Disconnect the connectors P_CRT_EHC_CAN, X101 and P_CRT_CAN_TERM.<br><br>• Check the absence of continuity between:<br><br>- pin A and B of P_CRT_EHC_CAN<br><br>• Check the presence of continuity between:<br><br>- pin A of P_CRT_EHC_CAN and any pin of the CAN-H line (connected in this moment)<br>- pin B of P_CRT_EHC_CAN and any pin of the CAN-L line (connected in this moment)<br><br>***NOTE:*** *When a continuity check is done, verify that the resistance is near to 0 ohm.*<br><br>• Check for short to ground.<br>Check the absence of continuity between:<br><br>- pin A of P_CRT_EHC_CAN and ground<br>- pin B of P_CRT_EHC_CAN and ground<br><br>• Check for short to positive.<br>Switch ON ignition.<br>Check the voltage between:<br><br>- pin A of P_CRT_EHC_CAN and ground<br>- pin B of P_CRT_EHC_CAN and ground<br><br>**Specification:**<br>Voltage on pin A and B: ……0 Volt.<br><br>• Check all connectors, pins and wiring to detect the presence of broken connectors, corroded contacts, bent pins or line breaks.<br><br>• Repair or replace harnesses as needed. |
| 2. **Check control module revision level**<br><br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process**.**<br><br>**NOT OK:**<br><br>• Replace the control module. |

### 10.1.3.1.7 703\11 - Descend error (the lifter doesn't reach the set position after 4 seconds)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the coil of the e-valve down solenoid valve Y337 on another circuit.**<br>• Disconnect the connectors P_EHC_UP_V and P_EHC_DOWN_V from their solenoid valves.<br>• Remove and reverse the coils from their solenoid valves.<br>• Reconnect the connectors P_EHC_UP_V and P_EHC_DOWN_V to the solenoid valves of their circuits.<br>• Start the vehicle.<br>• Try to operate the lifter.<br>• Check that the error code 704\12 is not displayed. | **OK (error code 703\11 is displayed):** Go to **2.**<br>**NOT OK (error code 704\12 is displayed): The coil is broken.**<br>• Replace the coil of the e-valve. |
| 2. **Check the circuit**<br>• Switch OFF ignition.<br>• Disconnect the EHC control unit connector P_CRT_EHC_ECU.<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Check the line resistance between:<br>• pin 1 of P_EHC_DOWN_V and 10 of P_CRT_EHC_ECU<br>• pin 2 of P_EHC_DOWN_V and 6 of P_CRT_EHC_ECU<br>**Specification:**<br>Line resistance near: ……0 Ohm. | **OK:** Go to **3.**<br>**NOT OK:**<br>• Repair or replace the harness as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the control module. |

## 10.1.3.1.8 704\12 - Rise error (the lifter doesn't reach the set position after 4 seconds)

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check the coil of the e-valve down solenoid valve Y336 on another circuit.**<br>• Disconnect the connectors P_EHC_DOWN_V and P_EHC_UP_V from their solenoid valves.<br>• Remove and reverse the coils from their solenoid valves.<br>• Reconnect the connectors P_EHC_DOWN_V and P_EHC_UP_V to the solenoid valves of their circuits.<br>• Start the vehicle.<br>• Try to operate the lifter.<br>• Check that the error code 703\11 is not displayed. | **OK (error code 704\12 is displayed):** Go to **2.**<br>**NOT OK (error code 703\11 is displayed): The coil is broken.**<br>• Replace the coil of the e-valve. |
| 2. **Check the circuit**<br>• Switch OFF ignition.<br>• Disconnect the EHC control unit connector P660.<br>• Check the wiring to detect the presence of broken connectors, slid-back or corroded contacts, bent pins or damaged lines.<br>• Check the line resistance between:<br>• pin 1 of P_EHC_UP_V and 7 of P_CRT_EHC_ECU<br>• pin 2 of P_EHC_UP_V and 8 of P_CRT_EHC_ECU<br>**Specification:**<br>Line resistance near: ……0 Ohm. | **OK:** Go to **3.**<br>**NOT OK:**<br>• Repair or replace the harness as needed. |
| 3. **Check control module revision level**<br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the control module. |

### 10.1.3.1.9 1873\3 – Position sensor error, Input Voltage Above Normal
### 10.1.3.1.10 1873\4 – Position sensor error, Input Voltage Below Normal

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of the Position Sensor B139.**<br>• Disconnect the connector P_EHC_POS_S of the Position Sensor.<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage at connector P_EHC_POS_S between:<br>  • Pin 1 and Pin 2<br>**Specification**<br>Supply voltage of the sensor: …….5 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Check the leads and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br>• Switch OFF ignition.<br>• Check for short to ground.<br>Check the absence of continuity between pins:<br>- 1 and 4, of P_EHC_POS_S and ground<br>• If continuity is detected, repair or replace if needed.<br>• Check for short to positive.<br>Disconnect the connector P_CRT_EHC_POS_SENS of the EHC controller A058.<br>Switch ON ignition.<br>Use a multimeter to check the supply voltage at connector P_EHC_POS_S between pins:<br>- 1 and ground<br>- 4 and ground<br>• If voltage is indicated, repair or replace if needed.<br>• Check that the component B139 is not damaged. |
| 2. **Check the Position Sensor B139.**<br>• Switch OFF ignition.<br>• Check the presence of continuity on sensor B139 between:<br>  • Pin 1 and Pin 2 | **OK:** Go to **3**.<br>**NOT OK:**<br>• Replace the component B139. |

| | |
|---|---|
| 3. **Check the presence of continuity between Position Sensor B139 and EHC control module A058**<br>• Switch OFF ignition.<br>• Disconnect P_CRT_EHC_POS_SENS.<br>• Check continuity between:<br>  • pin 1 of P_EHC_POS_S and pin 1 of P_CRT_EHC_POS_SENS<br>  • pin 2 of P_EHC_POS_S and pin 3 of P_CRT_EHC_POS_SENS<br>  • pin 4 of P_EHC_POS_S and pin 2 of P_CRT_EHC_POS_SENS<br>***NOTE:*** Verify that the resistance is near to 0 ohms. | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check the leads and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br>• Repair or replace if needed. |
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process**.**<br>**NOT OK:**<br>• Replace the EHC control module A058. |

### 10.1.3.1.11 1881\3 – Draft sensor error, Input Voltage Above Normal
### 10.1.3.1.12 1881\4 – Draft sensor error, Input Voltage Below Normal

**Circuit / harness test**

**IMPORTANT: when ignition is ON, disconnected connectors may cause additional diagnostic trouble codes. The fault memory must be cleared once the circuit / harness test has been completed.**

| | |
|---|---|
| 1. **Check supply voltage of the Draft Sensor B144.**<br>• Disconnect the connector P_EHC_DRAFT_S of the Draft Sensor.<br>• Switch ON ignition.<br>• Use a multimeter to check the supply voltage at connector P_EHC_DRAFT_S between:<br>  • Pin 1 and Pin 2<br>**Specification**<br>Supply voltage of the sensor: ……5 Volt | **OK:** Go to **2.**<br>**NOT OK:**<br>• Check the leads and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br>• Switch OFF ignition.<br>• Check for short to ground.<br>Check the absence of continuity between pins:<br>  - 1 and 4, of P_EHC_DRAFT_S and ground<br>• If continuity is detected, repair or replace if needed.<br>• Check for short to positive.<br>Disconnect the connector P_CRT_EHC_DRAFT_SENS of the EHC controller A058.<br>Switch ON ignition.<br>Use a multimeter to check the supply voltage at connector P_EHC_DRAFT_S between pins:<br>  - 1 and ground<br>  - 4 and ground<br>• If voltage is indicated, repair or replace if needed.<br>• Check that the component B144 is not damaged. |
| 2. **Check the Draft Sensor B144.**<br>• Switch OFF ignition.<br>• Check the presence of continuity on sensor B144 between:<br>  • Pin 1 and Pin 2 | **OK:** Go to **3**.<br>**NOT OK:**<br>• Replace the component B144. |
| 3. **Check the presence of continuity between Draft Sensor B144 and EHC control module A058**<br>• Switch OFF ignition.<br>• Disconnect P_CRT_EHC_DRAFT_SENS.<br>• Check continuity between:<br>  • pin 1 of P_EHC_DRAFT_S and pin 3 of P_CRT_EHC_DRAFT_SENS<br>  • pin 2 of P_EHC_DRAFT_S and pin 1 of P_CRT_EHC_DRAFT_SENS<br>  • pin 4 of P_EHC_DRAFT_S and pin 2 of P_CRT_EHC_DRAFT_SENS<br>***NOTE:*** Verify that the resistance is near to 0 ohms. | **OK:** Go to **4.**<br>**NOT OK:**<br>• Check the leads and connecting points for bad, widened, slidback, or corroded (loose) contacts.<br>• Repair or replace if needed. |

| | |
|---|---|
| 4. **Check control module revision level**<br>• Download the correct software revision level on the control module, and verify that the system functions properly. | **OK:** END of process.<br>**NOT OK:**<br>• Replace the EHC control module A058. |

## 10.1.4. DTCs – Electro-hydraulic Selective Control Valves (eSCV)

| DTC [hex] | DTC [dec] | LED - Code SRC | Components in fault | Reaction |
|---|---|---|---|---|
| 0xD000 | 53248 | FC 11 | Oil limitation device Pin 68 | Oil set point = 0 been sent to valve |
| 0xD001 | 53249 | FC 12 | Set point device Pin 10 | Neutral been sent to valve |
| 0xD002 | 53250 | FC 14 | EHS-Valve4 not connected or faulty: See also flash code at valve block | If valve flash code ϵ {26, 31, 32, 41, 42, 43, 81, 82, 83} → Neutral been sent to valve. Else System continues to work. See valve -TKU: Y 520 700 021 |
| 0xD003 | 53251 | FC 21 | Oil limitation device Pin 71 | Oil set point = 0 been sent to valve |
| 0xD004 | 53252 | FC 22 | Set point device Pin 22 | Neutral been sent to valve |
| 0xD005 | 53253 | FC 24 | EHS-Valve3 not connected or faulty: See also flash code at valve block | If valve flash code ϵ {26, 31, 32, 41, 42, 43, 81, 82, 83} → Neutral been sent to valve. Else System continues to work. See valve -TKU: Y 520 700 021 |
| 0xD006 | 53254 | FC 31 | Oil limitation device Pin 58 | Oil set point = 0 been sent to valve |
| 0xD007 | 53255 | FC 32 | Set point device Pin 75 | Neutral been sent to valve |
| 0xD008 | 53256 | FC 34 | EHS-Valve2 not connected or faulty: See also flash code at valve block | If valve flash code ϵ {26, 31, 32, 41, 42, 43, 81, 82, 83} → Neutral been sent to valve. Else System continues to work. See valve -TKU: Y 520 700 021 |
| 0xD009 | 53257 | FC 41 | Oil limitation device Pin 69 | Oil set point = 0 been sent to valve |
| 0xD00a | 53258 | FC 42 | Set point device Pin 70 | Neutral been sent to valve |
| 0xD00b | 53259 | FC 44 | EHS-Valve1 not connected or faulty: See also flash code at valve block | If valve flash code ϵ {26, 31, 32, 41, 42, 43, 81, 82, 83} → Neutral been sent to valve. Else System continues to work. See valve -TKU: Y 520 700 021 |
| 0xD00c | 53260 | FC 71 | Emergency shutdown pin 56 | System locked. |
| 0xD00d | 53261 | FC 72 | Battery voltage to high pin 1, 27 | System locked. ( Voltage > 19,0 Volt ) |
| 0xD00e | 53262 | FC 73 | Battery voltage to low pin 1, 27 | System locked. ( Voltage < 8,0 Volt ) |
| 0xD00f | 53263 | FC 74 | 5V-supply voltage pin 67 | System locked. ( Voltage smaller 4,0 Volt, or larger 5,55 Volt ) |
| 0xD010 | 53264 | FC 75 | Pressure-reducing valve, pin 29 | System locked. |
| 0xD011 | 53265 | FC 11 | EHS-Valve N°4 | NO_RECEIVE_MESSAGE_1: See valve -TKU: Y 520 700 021 chapter 3.3 |

| DTC [hex] | DTC [dec] | LED - Code SRC | Components in fault | Reaction |
|---|---|---|---|---|
| 0xD012 | 53266 | FC 12 | “ | NO_RECEIVE_MESSAGE_2 See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD013 | 53267 | FC 13 | “ | RECEIVE_MESSAGE_1_NOT_SANE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD014 | 53268 | FC 14 | “ | RECEIVE_MESSAGE_2_NOT_SANE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD015 | 53269 | FC 15 | “ | POTI_PWM_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD016 | 53270 | FC 16 | “ | EEPROM_INCONSISTENT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD017 | 53271 | FC 17 | “ | MOVE_LEVER_TO_NEUTRAL See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD018 | 53272 | FC 21 | “ | UNDERVOLTAGE_CUSTOMER See valve -TKU: Y 520 700 021 chapter 3.3 ( = 8,2 Volt ) |
| 0xD019 | 53273 | FC 22 | “ | OVERVOLTAGE_CUSTOMER See valve -TKU: Y 520 700 021 chap. 3.3 ( = 18,1 Volt ) |
| 0xD01a | 53274 | FC 23 | “ | SPOOL_DEFLECTION_TOO_SHORT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD01b | 53275 | FC 24 | “ | SPOOL_DEFLECTION_EXCESSIVE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD01c | 53276 | FC 25 | “ | OPEN_CENTRE_POS_NOT_REACHED See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD01d | 53277 | FC 26 | “ | MANUAL_OPERATION See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD01e | 53278 | FC 31 | “ | UNDERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 ( = 8,2 Volt ) |
| 0xD01f | 53279 | FC 32 | “ | OVERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 ( = 36-45 Volt ) |
| 0xD020 | 53280 | FC 41 | “ | HIGH_OVERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 ( = 45 Volt ) |
| 0xD021 | 53281 | FC 42 | “ | OUTPUT_STAGE_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD022 | 53282 | FC 43 | “ | POSITION_TRANSDUCER_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD023 | 53283 | FC 81 | “ | SPOOL_NOT_BACK_2_NEUTRAL See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD024 | 53284 | FC 82 | “ | SPOOL_NOT_NEUTRAL_SWITCH_ON See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD025 | 53285 | FC 83 | “ | CHECKSUM_ERROR See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD026 | 53286 | FC 11 | EHS-Valve N°3 | NO_RECEIVE_MESSAGE_1: See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD027 | 53287 | FC 12 | “ | NO_RECEIVE_MESSAGE_2 See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD028 | 53288 | FC 13 | “ | RECEIVE_MESSAGE_1_NOT_SANE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD029 | 53289 | FC 14 | “ | RECEIVE_MESSAGE_2_NOT_SANE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD02a | 53290 | FC 15 | “ | POTI_PWM_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD02b | 53291 | FC 16 | “ | EEPROM_INCONSISTENT See valve -TKU: Y 520 700 021 chapter 3.3 |

| DTC [hex] | DTC [dec] | LED - Code SRC | Components in fault | Reaction |
|---|---|---|---|---|
| 0xD02c | 53292 | FC 17 | “ | MOVE_LEVER_TO_NEUTRAL See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD02d | 53293 | FC 21 | “ | UNDERVOLTAGE_CUSTOMER See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD02e | 53294 | FC 22 | “ | OVERVOLTAGE_CUSTOMER See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD02f | 53295 | FC 23 | “ | SPOOL_DEFLECTION_TOO_SHORT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD030 | 53296 | FC 24 | “ | SPOOL_DEFLECTION_EXCESSIVE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD031 | 53297 | FC 25 | “ | OPEN_CENTRE_POS_NOT_REACHED See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD032 | 53298 | FC 26 | “ | MANUAL_OPERATION See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD033 | 53299 | FC 31 | “ | UNDERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD034 | 53300 | FC 32 | “ | OVERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD035 | 53301 | FC 41 | “ | HIGH_OVERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD036 | 53302 | FC 42 | “ | OUTPUT_STAGE_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD037 | 53303 | FC 43 | “ | POSITION_TRANSDUCER_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD038 | 53304 | FC 81 | “ | SPOOL_NOT_BACK_2_NEUTRAL See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD039 | 53305 | FC 82 | “ | SPOOL_NOT_NEUTRAL_SWITCH_ON See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD03a | 53306 | FC 83 | “ | CHECKSUM_ERROR See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD03b | 53307 | FC 11 | EHS-Valve N°2 | NO_RECEIVE_MESSAGE_1: See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD03c | 53308 | FC 12 | “ | NO_RECEIVE_MESSAGE_2 See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD03d | 53309 | FC 13 | “ | RECEIVE_MESSAGE_1_NOT_SANE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD03e | 53310 | FC 14 | “ | RECEIVE_MESSAGE_2_NOT_SANE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD03f | 53311 | FC 15 | “ | POTI_PWM_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD040 | 53312 | FC 16 | “ | EEPROM_INCONSISTENT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD041 | 53313 | FC 17 | “ | MOVE_LEVER_TO_NEUTRAL See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD042 | 53314 | FC 21 | “ | UNDERVOLTAGE_CUSTOMER See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD043 | 53315 | FC 22 | “ | OVERVOLTAGE_CUSTOMER See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD044 | 53316 | FC 23 | “ | SPOOL_DEFLECTION_TOO_SHORT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD045 | 53317 | FC 24 | “ | SPOOL_DEFLECTION_EXCESSIVE See valve -TKU: Y 520 700 021 chapter 3.3 |

| DTC [hex] | DTC [dec] | LED - Code SRC | Components in fault | Reaction |
|---|---|---|---|---|
| 0xD046 | 53318 | FC 25 | “ | OPEN_CENTRE_POS_NOT_REACHED See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD047 | 53319 | FC 26 | “ | MANUAL_OPERATION See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD048 | 53320 | FC 31 | “ | UNDERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD049 | 53321 | FC 32 | “ | OVERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD04a | 53322 | FC 41 | “ | HIGH_OVERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD04b | 53323 | FC 42 | “ | OUTPUT_STAGE_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD04c | 53324 | FC 43 | “ | POSITION_TRANSDUCER_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD04d | 53325 | FC 81 | “ | SPOOL_NOT_BACK_2_NEUTRAL See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD04e | 53326 | FC 82 | “ | SPOOL_NOT_NEUTRAL_SWITCH_ON See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD04f | 53327 | FC 83 | “ | CHECKSUM_ERROR See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD050 | 53328 | FC 11 | EHS-Valve N°1 | NO_RECEIVE_MESSAGE_1: See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD051 | 53329 | FC 12 | “ | NO_RECEIVE_MESSAGE_2 See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD052 | 53330 | FC 13 | “ | RECEIVE_MESSAGE_1_NOT_SANE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD053 | 53331 | FC 14 | “ | RECEIVE_MESSAGE_2_NOT_SANE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD054 | 53332 | FC 15 | “ | POTI_PWM_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD055 | 53333 | FC 16 | “ | EEPROM_INCONSISTENT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD056 | 53334 | FC 17 | “ | MOVE_LEVER_TO_NEUTRAL See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD057 | 53335 | FC 21 | “ | UNDERVOLTAGE_CUSTOMER See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD058 | 53336 | FC 22 | “ | OVERVOLTAGE_CUSTOMER See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD059 | 53337 | FC 23 | “ | SPOOL_DEFLECTION_TOO_SHORT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD05a | 53338 | FC 24 | “ | SPOOL_DEFLECTION_EXCESSIVE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD05b | 53339 | FC 25 | “ | OPEN_CENTRE_POS_NOT_REACHED See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD05c | 53340 | FC 26 | “ | MANUAL_OPERATION See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD05d | 53341 | FC 31 | “ | UNDERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD05e | 53342 | FC 32 | “ | OVERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD05f | 53343 | FC 41 | “ | HIGH_OVERVOLTAGE See valve -TKU: Y 520 700 021 chapter 3.3 |

| DTC [hex] | DTC [dec] | LED - Code SRC | Components in fault | Reaction |
|---|---|---|---|---|
| 0xD060 | 53344 | FC 42 | “ | OUTPUT_STAGE_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD061 | 53345 | FC 43 | “ | POSITION_TRANSDUCER_FAULT See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD062 | 53346 | FC 81 | “ | SPOOL_NOT_BACK_2_NEUTRAL See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD063 | 53347 | FC 82 | “ | SPOOL_NOT_NEUTRAL_SWITCH_ON See valve -TKU: Y 520 700 021 chapter 3.3 |
| 0xD064 | 53348 | FC 83 | “ | CHECKSUM_ERROR See valve -TKU: Y 520 700 021 chapter 3.3 |

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# 11 Engine

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# 11.1. DIAGNOSTIC SERVICE MANUAL 75HP MODELS

# SERVICE MANUAL

# CARRARO

## F6BFL413A F6BFL413A*V003

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# 540110 ENGINE - Test Visual check crankcase system

## Preparation

- Ignition switch set to OFF position.

## Check oil filler cap

1. Visually check the oil filler cap
   - Visually check for pollution and blow by (oil filler cap dismounted)
   - Go to **2**
2. Check oil filler cap
   - If no pollution or blow by, go to **4**
   - If pollution or blow by is present, go to **3**
3. Possible root cause
   - Vapour coming out
   - Emulsion (condensation and fuel) visible: oil mist clogged and/or incorrect oil type or viscosity

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check ventilation crankcase system

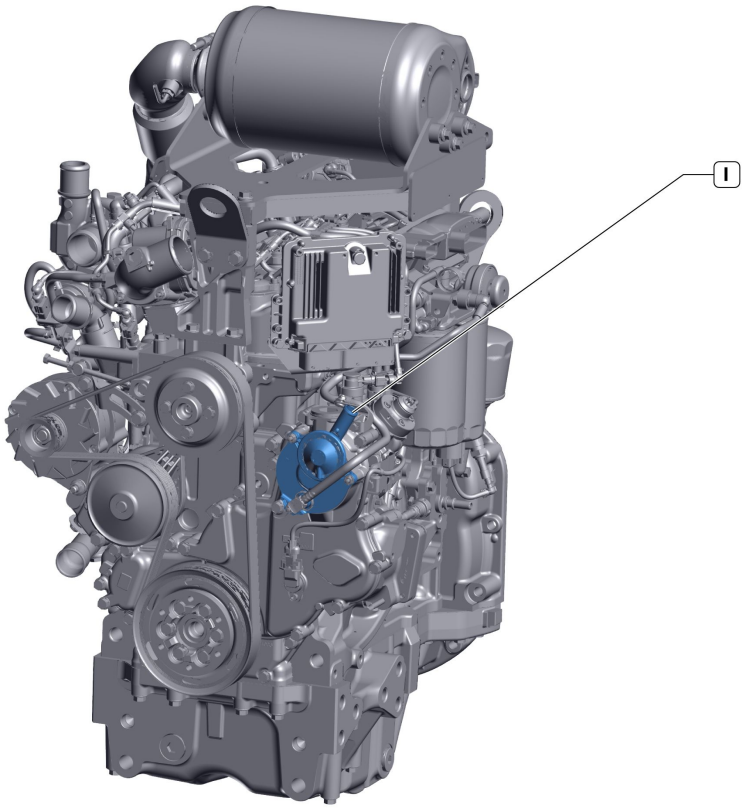
4. Visually check the ventilation lines
   - Check ventilation lines for damage, leaks, pollution and blockage
   - See figures below for aid and go to **5**




275059 1

**Connection from crankcase to intake air system**

| Ref. | Description |
|---|---|
| **(1)** | Pipe from crankcase system |
| **(2)** | Connector to intake air system |




275060 2

**Blow-by valve pipe connector**

| Ref. | Description |
|---|---|
| **(1)** | Blow-by valve connector |

5. Check ventilation crankcase system
   - No damage or leaks
   - No blockage (blockages in the crankcase system may lead to higher boost pressure)
   - If the ventilation crankcase system is OK, go to **7**
   - If the ventilation crankcase system is NOT OK, go to **6**
6. Possible root cause
   - Oil separator clogged
   - Lines damaged, cracked, aged or clogged
   - Rubber seals are damaged or aged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

7. The crankcase system works properly.

# 540610 CYLINDER HEAD - Test Check cylinder mechanics

## Preparation

General checks

- Battery voltage is sufficient
- Vehicle fuses are OK
- Engine oil level correct
- Engine is warm, if possible
- No deposits on the undersides of the valve heads
- Offboard tools: cylinder compression tester tool and cylinder pressure loss tester tool

## Check cylinder compression

Preparation

- Ignition switch set to OFF position
- Remove the fuel injectors
- With suitable piping fixtures, seal off the fuel rail outlets to the fuel injectors
- Unplug the connectors of the crankshaft and camshaft speed sensors

***NOTE:*** *The compression test is used to compare the pressure conditions in the individual combustion chambers.*

1. Check cylinder compression
   - Follow the Cylinder compression tester tool operator manual to connect the pressure gauge to cylinder number 1
   - Crank the engine for **8 s** and record the maximum pressure reached
   - Repeat steps 1 and 2 for all the cylinders.
   - Perform compression test for each cylinder twice
   - Calculate average compression pressure for each cylinder and compare the results
   - See the figure below for indications and go to **2**




271860 1

**Example of cylinder compression tester tool**

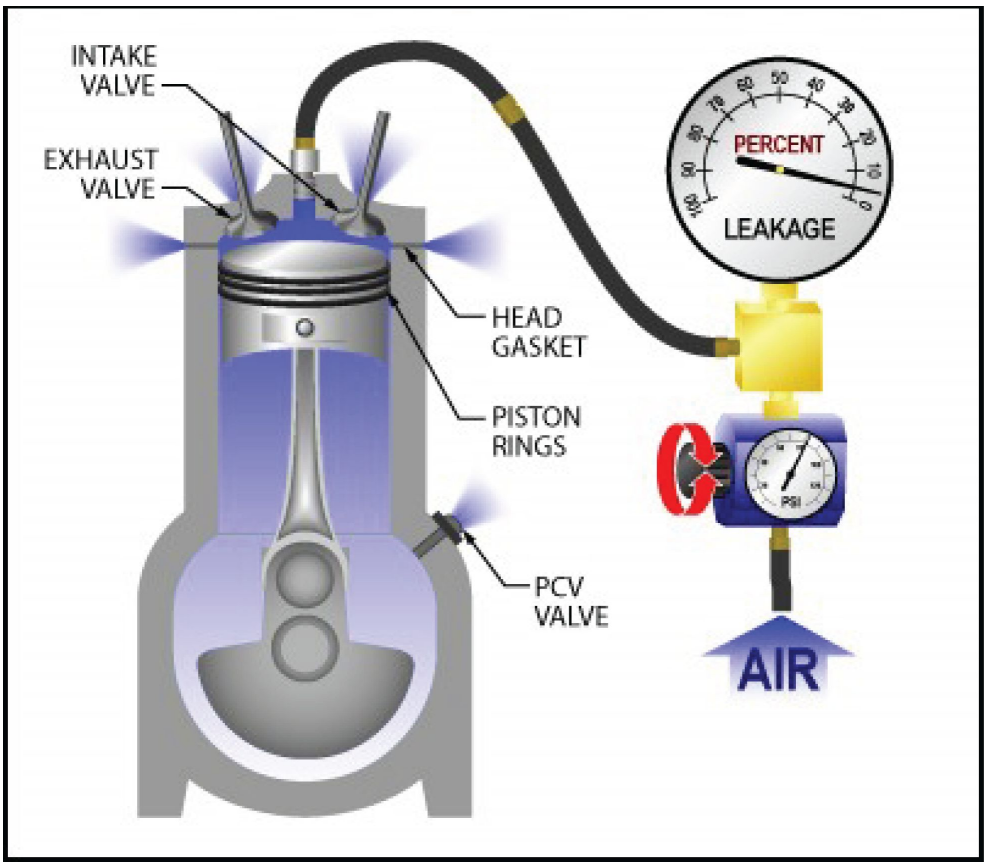
2. Check cylinder compression
   A. Compression should build up quickly in a healthy engine
   B. Similar compression pressure values between all cylinders
   C. If the cylinder compression is OK, go to **4**
   D. If the cylinder compression is NOT OK, go to **3**
3. Possible root cause
   - Low compression reading on the first stroke, followed by gradually increasing pressure on successive strokes: worn piston rings and/or cylinder
   - Low compression reading on the first stroke, which does not build up during successive strokes: leaking valves or a faulty head gasket
   - Low reading from two adjacent cylinders: faulty head gasket between the two cylinders
   - Engine mechanical failure. Deviating compression in one or more cylinders
   - Further check with pressure loss test

***NOTE:*** *After having eliminated the cause of the error, delete the fault memory and repeat the reading.*

## Check cylinder pressure loss

4. Preparation
   - Ignition switch set to OFF position
   - Remove the fuel injectors
   - With suitable piping fixtures, seal off the fuel rail outlets to the fuel injectors
   - The piston must be exactly in the TDC of the compression stroke using a TDC indicator tool
   - Connect the pressure loss tester to the compressed air network ( from **5 bar** to **10 bar**) and calibrate the tester
5. Check cylinder pressure loss
   - Follow the Cylinder pressure loss tester tool operator manual to connect the tool to the suspicious cylinder
   - The pressure loss resulting from leakage is indicated in percent on the Pressure Gauge
   - Check for leaks and noises
   - See the figure below for indications and go to **6**

***NOTE:*** *The expected value for the pressure loss is displayed as a percentage.*




271861 2

**Schematic of the pressure loss test**

6. Check cylinder pressure loss
   - If the indicated air leakage percentage is in the OK area, go to **8**
   - If the indicated air leakage percentage is not in the OK area, go to **7**

7. Possible root cause
   - Noises in the exhaust – Exhaust valve leaking
   - Noises in the intake tract – Inlet valve leaking
   - Noises on crankcase ventilation, oil filler cap or oil dipstick – Wear of cylinder track, piston rings, crack or hole in the piston, defective cylinder head gasket
   - Noises at the injector opening of the adjacent cylinder – cylinder head gasket leaking
   - Bubble formation in the cooling system – cylinder head gasket leaks, crack(s) in the cylinder head

***NOTE:*** *After having eliminated the cause of the error, delete the fault memory and repeat the reading.*

8. The cylinder works properly.

# 540744 EGR VALVE - Test Check the EGR valve actuator

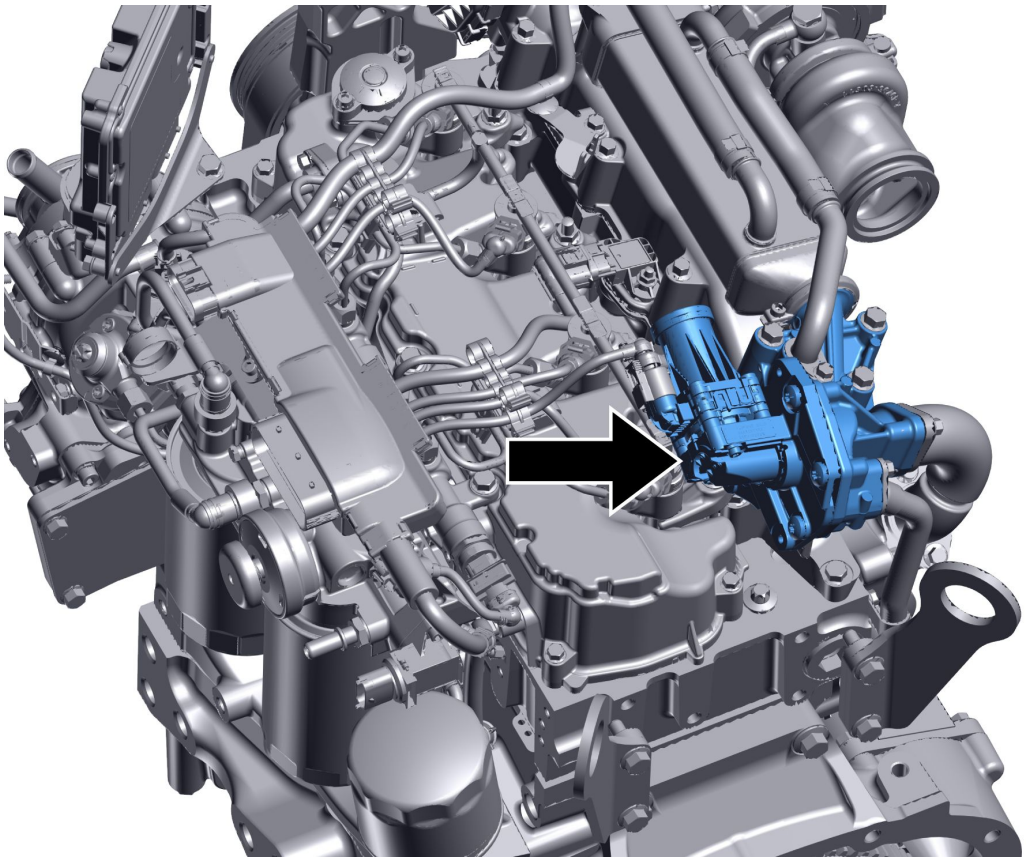
## Preparation

General checks

- Ignition switch set to OFF position

## Check

1. Check the EGR system
   - Visually check for damage or leaks in the fittings and in the pipes of the EGR valve
   - Remove the pipes to allow a visual check of the EGR valve
   - Manually check that the EGR valve is working correctly
   - See the figure below for the location of the EGR valve, then go to **2**



275038 1

**EGR valve location**

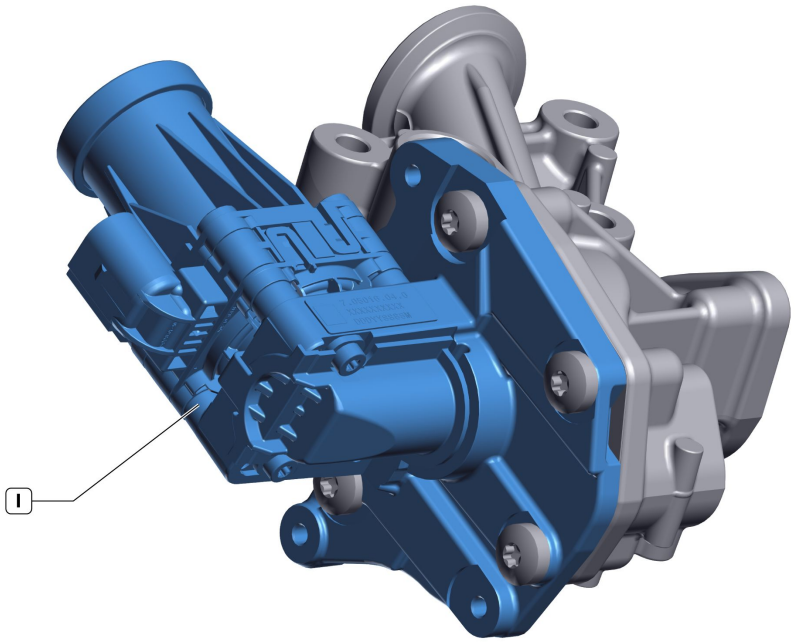
2. Check the EGR valve
   A. Fittings, flanges and pipes correctly fastened
   B. No sticking or damage to the EGR valve
   C. If the EGR valve is working correctly, go to **4**
   D. If the EGR valve is NOT working correctly, go to **3**

3. Possible root cause
   - Fittings, flanges and pipes not fastened correctly
   - EGR valve blocked or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check operation of the EGR valve

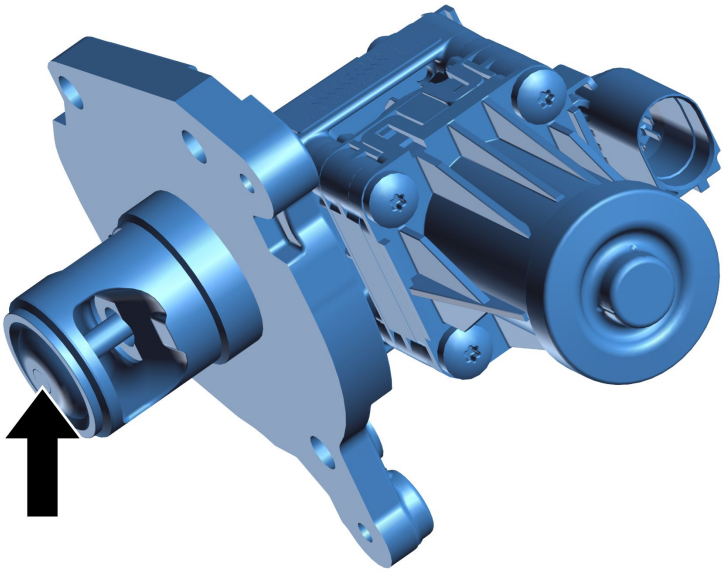
4. Check operation of the EGR valve
   - Remove the EGR valve from the engine
   - Operate the EGR valve by powering it with battery voltage
   - Use a dial gauge to check that the stroke completed by the EGR valve corresponds to the nominal value of **6 mm**
   - See the figure below and go to **5**




275039 2

**EGR valve actuator**

| Ref. | Description |
|---|---|
| (1) | EGR valve actuator module |



275040 3

**Location of EGR valve throttle**

5. Check operation of the EGR valve
   A. No sticking or damage to the EGR valve throttle
   B. No faults or damage to the EGR valve actuator module
   C. Complete opening of the EGR valve ( **6 mm**)
   D. If the EGR valve is operating correctly, go to **7**
   E. If the EGR valve is NOT operating correctly, go to **6**
6. Possible root cause
   - EGR valve throttle blocked or damaged
   - Actuator module of the EGR valve faulty or damaged
   - Electrical fault in the component. Check the wiring and the component electrically

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

7. The EGR valve is working correctly, .

# 542010 FILTER ASSEMBLY - Test Check external fuel leakage engine area

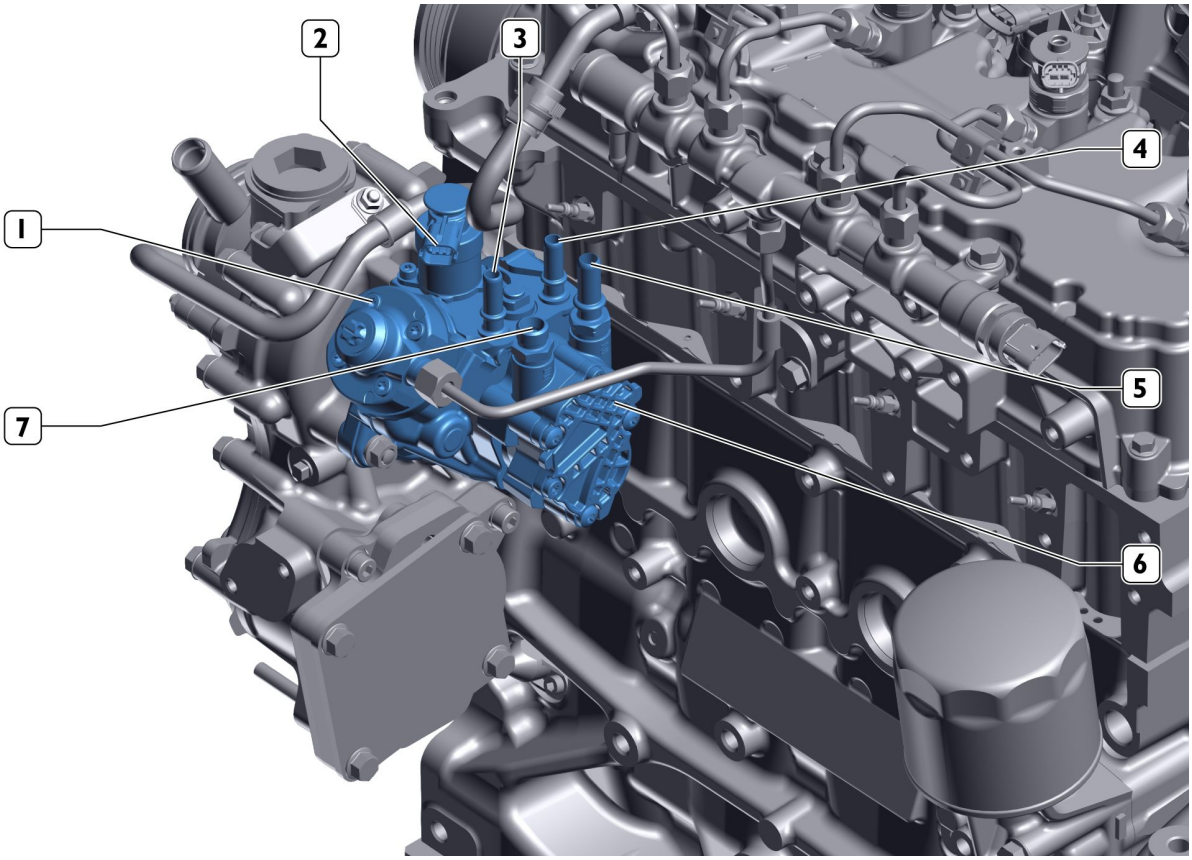
## Preparation

- Run the engine till it reaches normal operating temperature.

## Check

Check external fuel leakage engine area

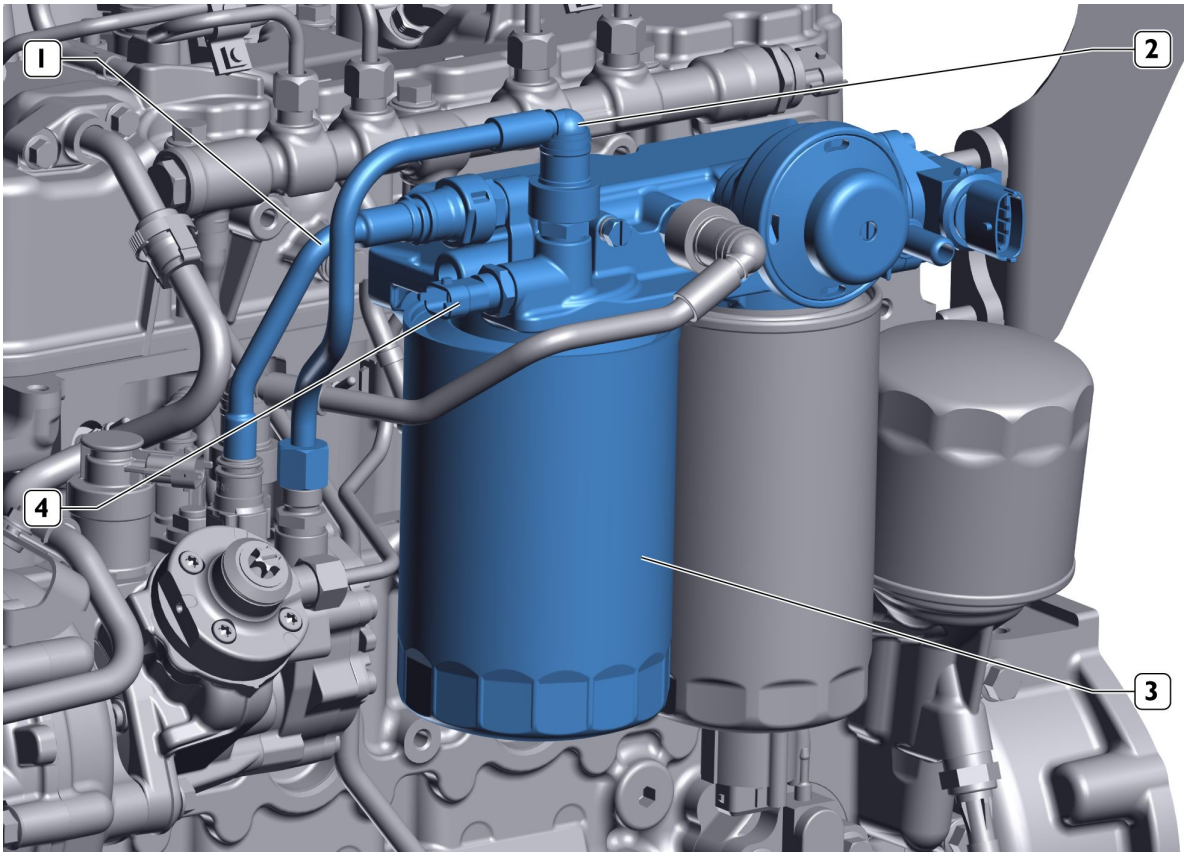
- Check for fuel leakage at low pressure hose connectors
- Check connectors of the fuel filter
- Check connectors of the high pressure pump
- Check connectors of the metering unit
- Check for kinked fuel hoses
- See figures below for explanation and go to **1**




275054 1

**Location of the main components of the fuel pump**

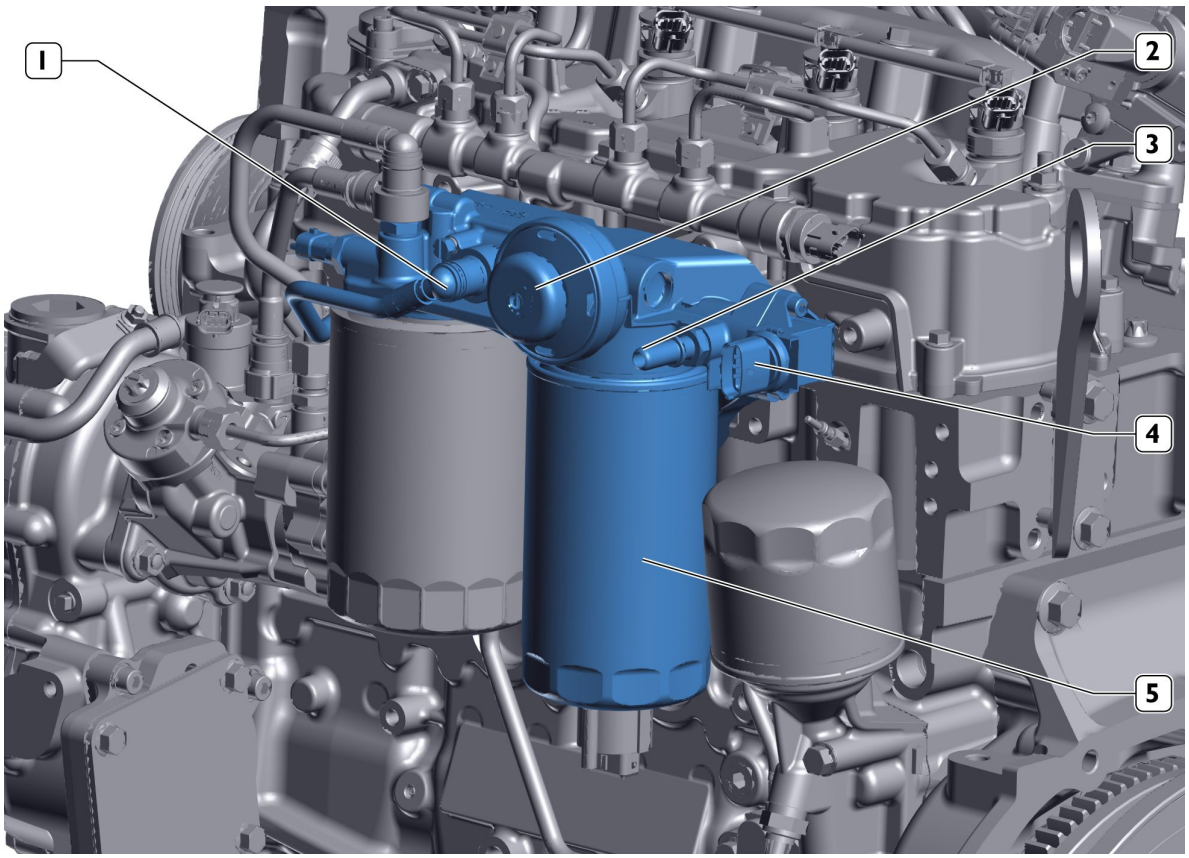
| Ref. | Description |
|---|---|
| **(1)** | High-pressure pump |
| **(2)** | Pressure regulator valve (fuel metering unit) |
| **(3)** | High pressure pump from main filter |
| **(4)** | Return to reservoir |
| **(5)** | Low pressure pump intake from pre-filter |
| **(6)** | Gear low pressure pump |
| **(7)** | Delivery from low pressure pump to main filter |




276359 2

**Location of the main filter components**

| Ref. | Description |
|---|---|
| **(1)** | Outlet from main filter outlet to high pressure pump |
| **(2)** | Main filter inlet from low pressure pump |
| **(3)** | Main fuel filter |
| **(4)** | Fuel temperature sensor |




276358 3

**Location of pre-filter components**

| Ref. | Description |
|---|---|
| **(1)** | Outlet from pre-filter to low pressure pump |
| **(2)** | Manual priming pump |
| **(3)** | Pre-filter inlet |
| **(4)** | Fuel heater |
| **(5)** | Pre-filter |

1. Check for visible external fuel leakage in the engine area
   A. If no external fuel leakage in the engine area is visible, go to **3**
   B. If external fuel leakage in the engine area is visible, go to **2**
2. Possible root cause
   - Connectors loose or worn
   - Hoses are damaged

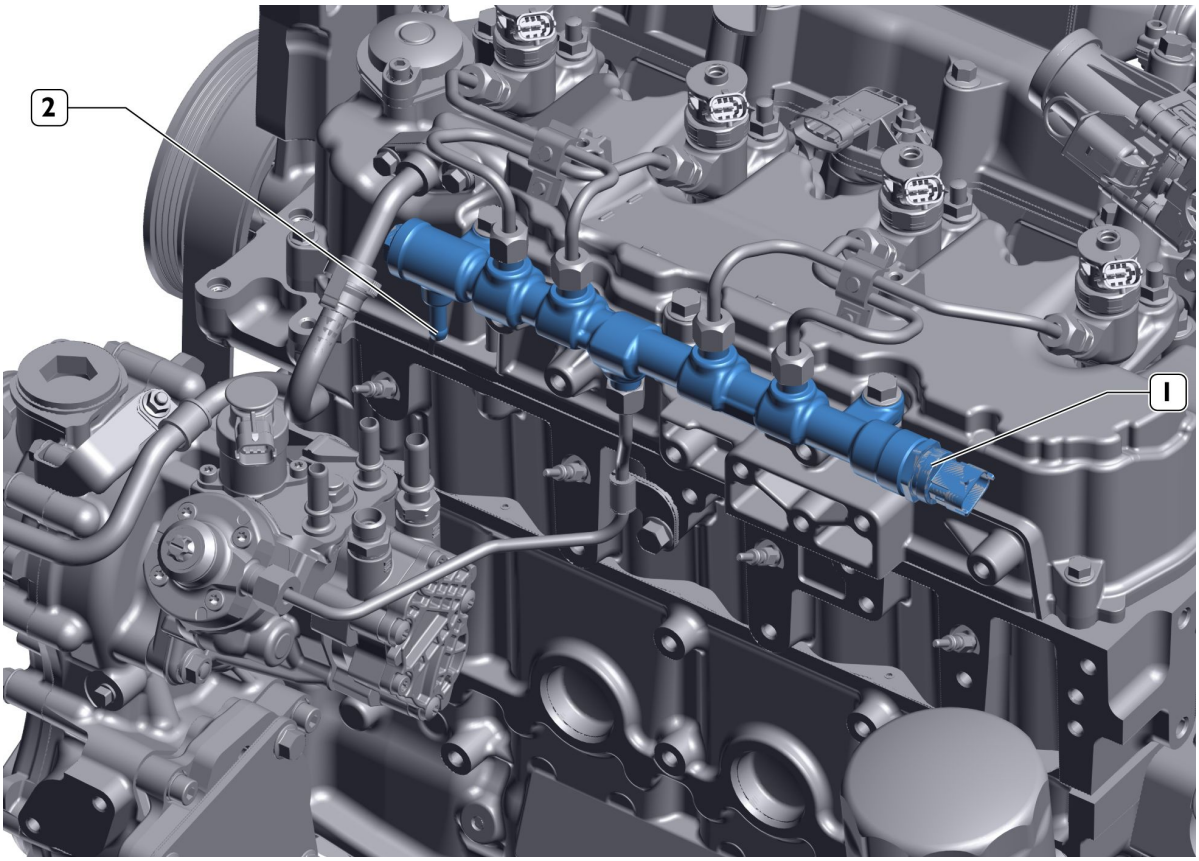
***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The fuel system works properly.

# 542024 ONE-WAY FEED PIPE - Test Check pressure limiting valve (PLV) backflow rate

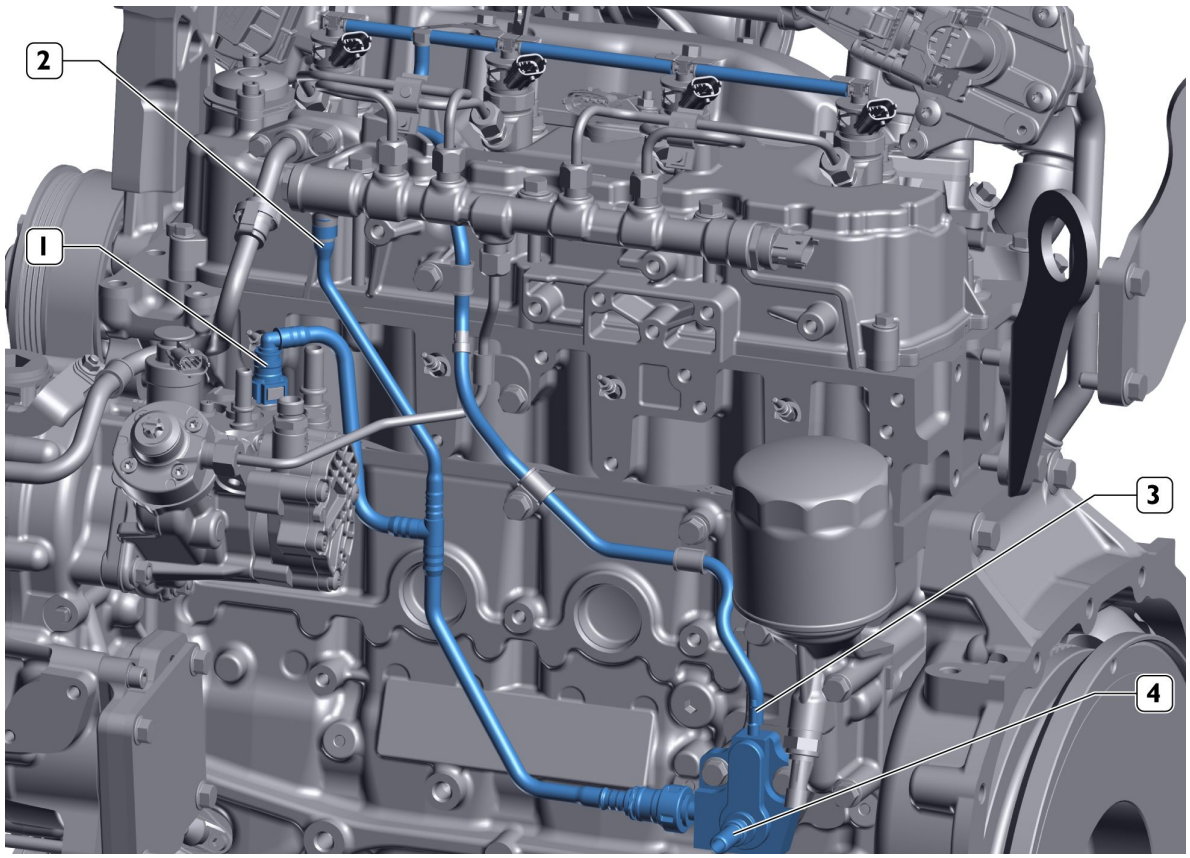
## Preparation

- Disconnect the connection pipe to the pressure limiting valve fitting (PLV)
- Connect the adaptor and hose to the pressure limiting valve backflow line (PLV)
- Plug the fitting on the connecting pipe to the pressure limiting valve (PLV)
- Tighten the system (ensure that there is no leakage)
- Prepare the measuring cup
- To prepare for the operation, observe the figures below:




275052 1

| Ref. | Description |
|---|---|
| (1) | Pressure sensor |
| (2) | Pressure limiting valve |




276360 2

**Location of the backflow line**

| Ref. | Description |
|---|---|
| **(1)** | Backflow fitting to tank from high pressure pump |
| **(2)** | Pressure limiting valve backflow fitting |
| **(3)** | Injectors total backflow fitting |
| **(4)** | Total backflow to tank |

## Check

Offboard tools

- Hose and adapter at the fitting on the PLV valve
- Plug the fitting on the connecting pipe to the pressure limiting valve (PLV)
- Measuring cup (minimum **250 mL**)

Check: Engine can start.

- If possible second person should increase speed to **1500 RPM** and go to **1**

Check: Engine cannot start.

- Turn the ignition to ON position and use the starter to crank the engine and go to **1**

***NOTE:*** *For the measurement of backflow in **60 s** under cranking condition, crank the engine for 5-6 times, and **10 s - 12 s** each time is recommended. The starter may be damaged if works continuously for a long time.*

1. Check there is no return flow into the pressure limiting valve outlet (PLV).
   A. If there is no return flow into the pressure limiting valve outlet (PLV), go to **3**
   B. If there is a return flow into the pressure limiting valve outlet (PLV), go to **2**
2. Possible root cause
   - Pressure limiting valve (PLV) in the opening position
   - Leak in the pressure limiting valve (PLV)

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The pressure limiting valve (PLV) works properly.

# 542410 TURBO CHARGER - Test Check turbo system

## Preparation

- This check requires the pressure hand pump as off-board tool



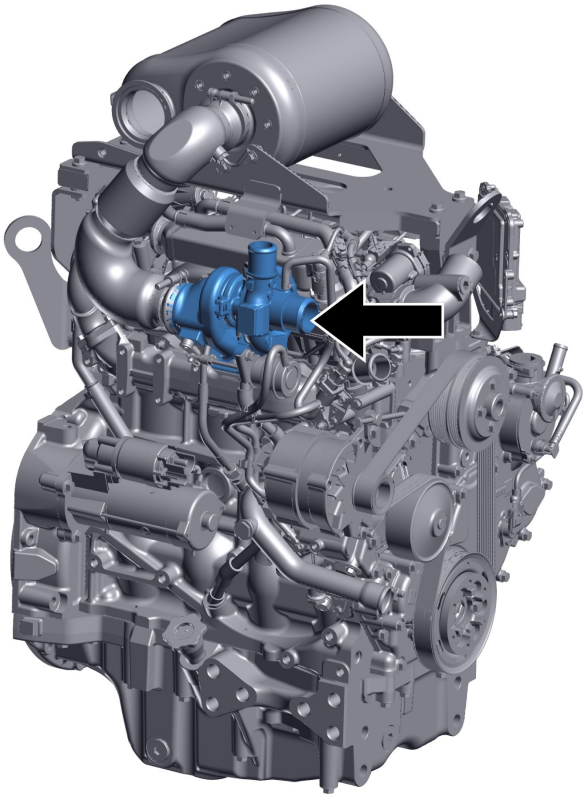
271746 1

**Example of pressure hand pump**

## Check turbo charger

1. Check turbo charger.
   - Start engine in low idle
   - Check the turbo charger mechanical sounds
   - Turn the ignition switch to OFF position
   - Dismount the air intake and boost pressure pipes to get access to the turbo charger blades
   - Visually check the turbo charger for debris
   - Check manually the rotation of the turbo charger wheel by moving it
   - Check manually the bearing of the turbo charger by feel if it is moving under pressure
   - See figure below for aid and go to **2**

***NOTE:*** *Please take special care/attention to not damage the turbo. Use clean gloves when touching the turbo wheel blade. Only use small amount of force to move the wheel.*



275030 2
**Air turbo charger**

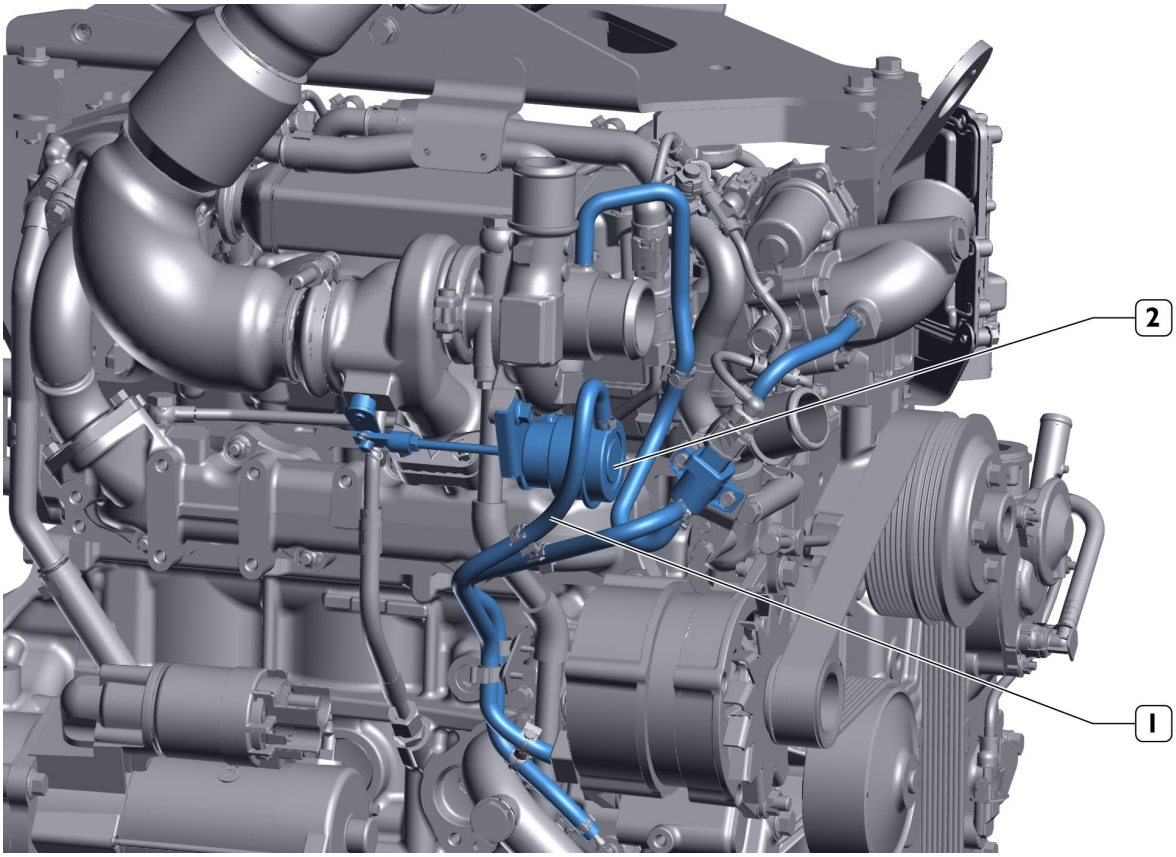
2. Check turbo charger
   A. Bearing of the turbo charger not damaged
   B. Compressor and/or turbine wheels of the turbo charger not blocked or stiff
   C. Turbo charger not damaged
   D. If turbo charger is not damaged, go to **4**
   E. If turbo charger is damaged, go to **3**
3. Possible root cause
   - Bearing of the turbo charger damaged
   - Compressor and/or turbine wheels of the turbo charger blocked or stiff
   - Turbo charger damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check wastegate valve

4. Check wastegate valve.
   - Visually check the wastegate valve for debris
   - Check if the hose of the wastegate valve is lose or damaged
   - Use a pressure hand pump to check the correct actuation of the wastegate valve
   - See figure below for aid and go to **5**

***NOTE:*** *Pump and monitor gradually the pressure at wastegate valve in order to check if the actuation of the valve is reached at lower pressure than* ***2.5 bar****(absolute pressure). The air pressure changes constantly depending on altitude or weather conditions. Therefore, the pressure is absolutely measured during our tests. The pressure is always related to absolute zero - the absolute vacuum p(abs)= p(amb) +p(bar).*




275031 3

**Wastegate valve**

| Ref. | Description |
|---|---|
| **(1)** | Wastegate valve hose |
| **(2)** | Wastegate valve |

5. Check wastegate valve.
   A. Wastegate valve hose not lose and not damaged
   B. Wastegate valve leverage not blocked and not damaged
   C. Wastegate valve not blocked and not damaged
   D. Check the moving of the wastegate rod at approximately **2.5 bar** (absolute pressure) for the actuation of the valve
   E. If wastegate valve is not damaged, go to **7**
   F. If wastegate valve is damaged, go to **6**
6. Possible root cause
   - Wastegate valve hose lose or damaged
   - Wastegate valve leverage blocked or damaged
   - Wastegate valve blocked or damaged (probably caused by damaged valve spring)

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

7. The turbo charger works properly.

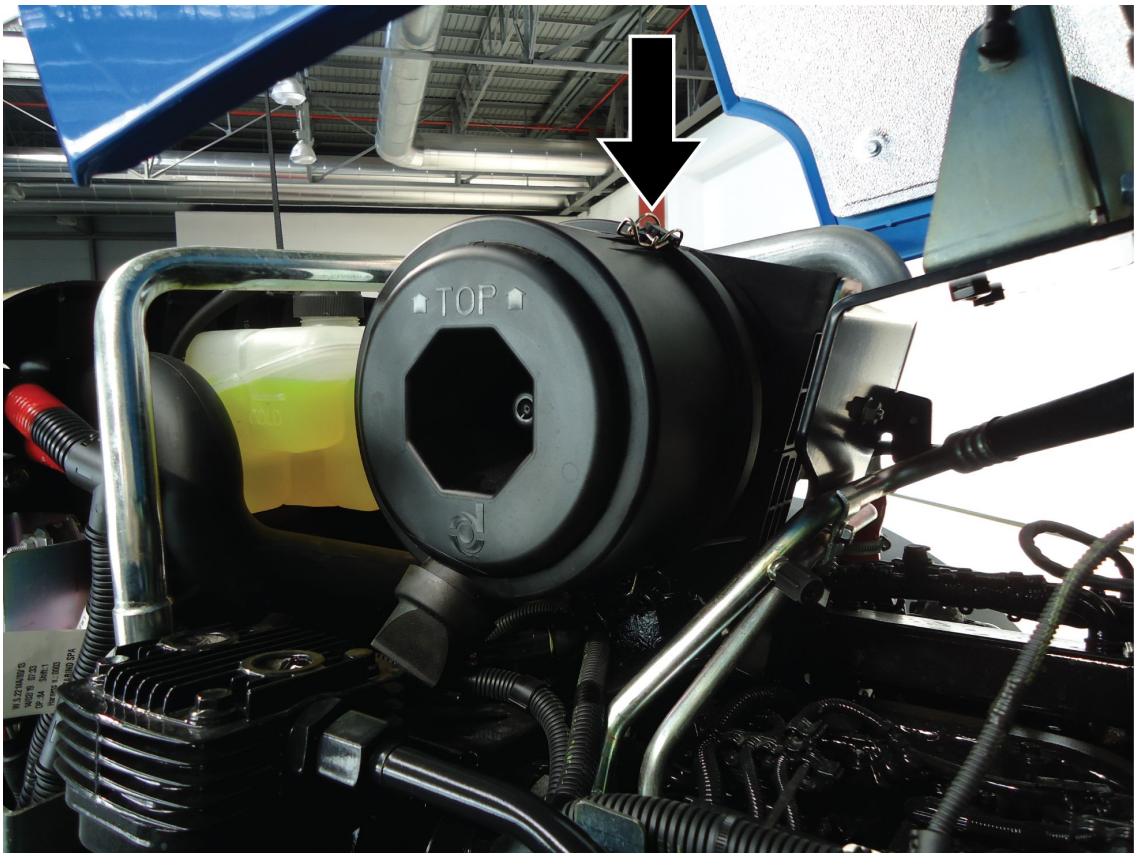
# 542420 AIR DELIVERY PIPES - Test Check intake air system

## Preparation

- Ignition switch set to OFF position.
- Air filter clean.

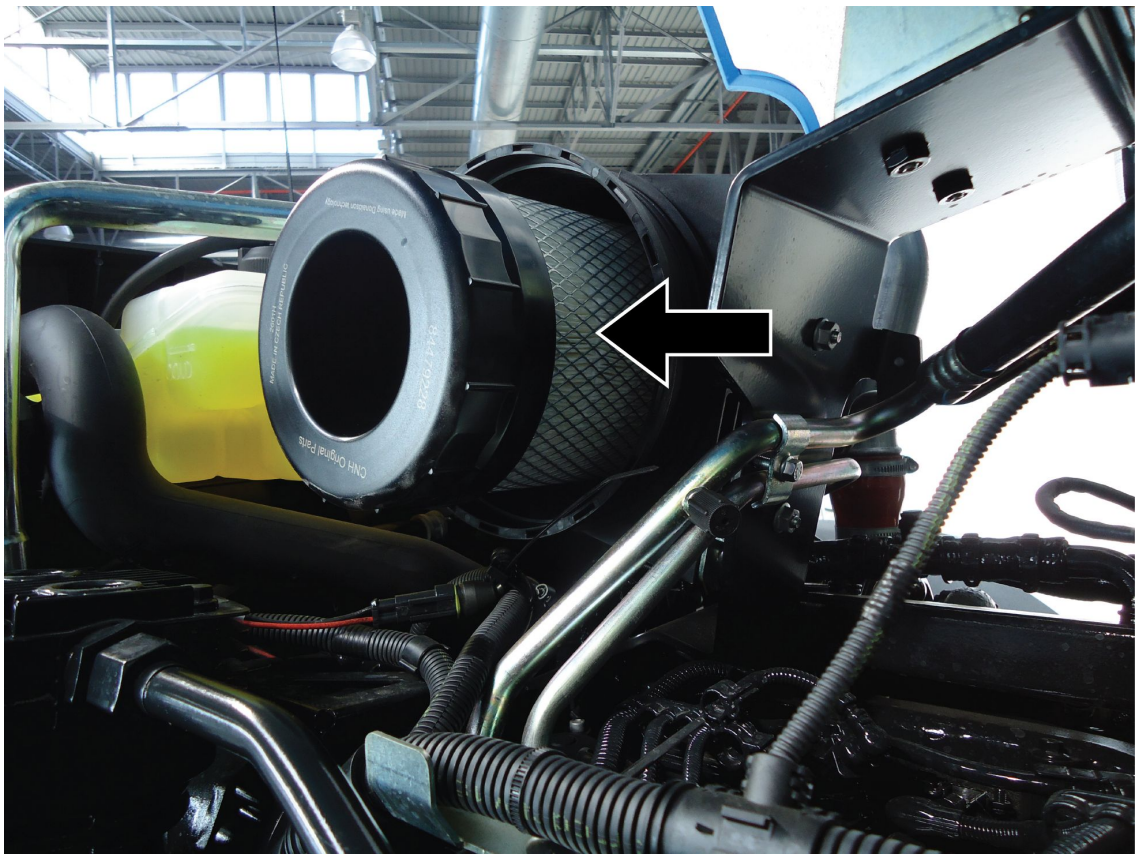
## Visually check air filter and housing

1. Visually check air filter and housing.
   - Check air filter cover/housing clamps for correct fitting and tightness.
   - Open the air filter and housing.
   - Visually check air filter and housing for any contamination.
   - Visually check air filter and housing for physical damage.
   - See figures below for aid and go to **2**




275023 1

**Air filter housing clamps**



275024 2

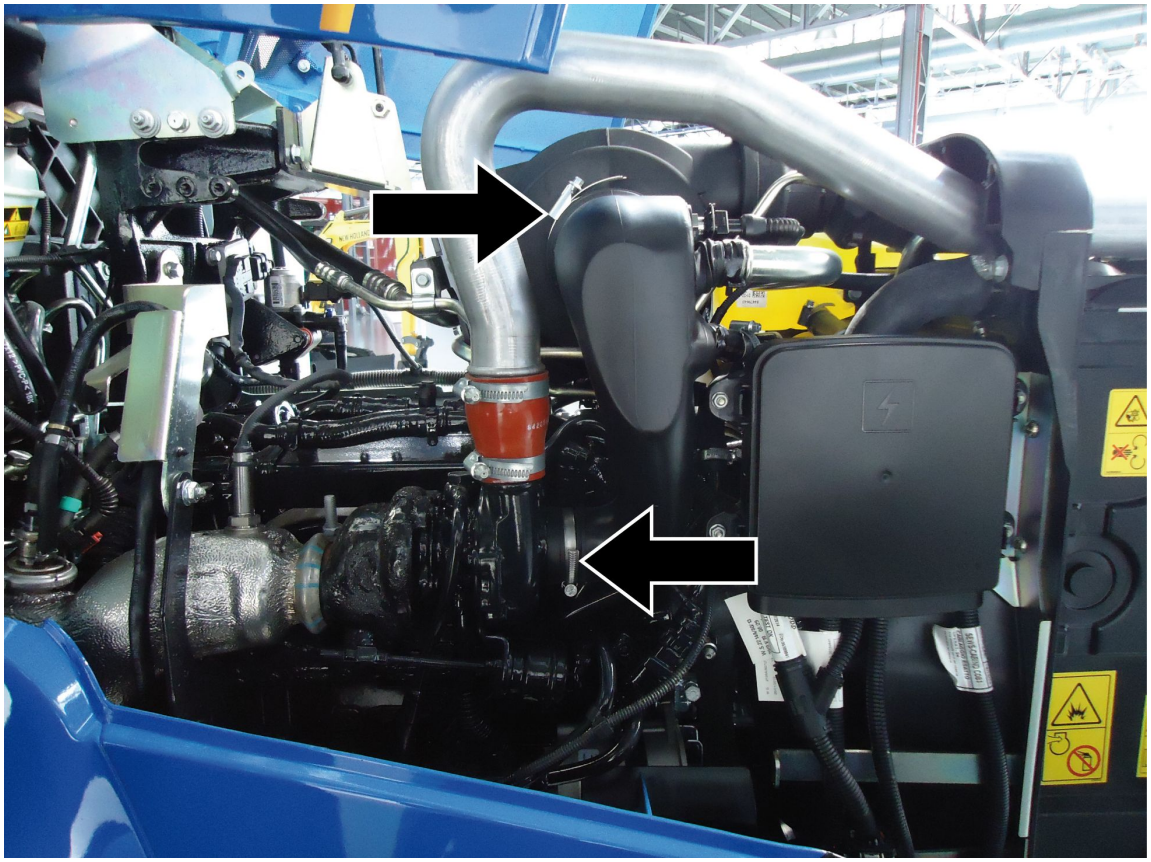
**Intake air filter**

2. Check if air filter and housing are OK.
   A. No loose clamps.
   B. Air filter are not clogged.
   C. Air filter housing are not damaged.
   D. If air filter and housing are OK, go to **4**.
   E. If air filter and housing are NOT OK, go to **3**.
3. Possible root cause
   - Loose clamps.
   - Air filter clogged, causing too low air flow.
   - Damaged air filter housing.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Visually check air pipes

4. Visually check air pipes.
   - Visually check intake air pipes for correct fittings and tightness.
   - See figures below for aid and go to **5**



275025 3

**Intake air pipe upstream of the turbocharger**

5. Check if air pipes are OK.
   A. Air pipes are not damaged.
   B. Air pipes are installed correctly.
   C. If air pipes are OK, go to **7**.
   D. If air pipes are NOT OK, go to **6**.
6. Possible root cause
   - Air pipes are damaged.
   - Air pipes are not installed correctly.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

7. The intake air system works properly.

# 542420 AIR DELIVERY PIPES - Test Check charge air system

## Preparation

- Ignition switch set to OFF position.
- Air filter is clean
- Offboard tools: recommended tools BOSCH SMT 300




271804 1

**Example of smoke test tool (Bosch SMT 300)**

## Visually check air charge piping

1. Visually check the following air charge piping for damages, loose fittings, tightness:
   - Air charge pipes upstream and downstream the turbo charger.
   - Pipes upstream and downstream the charge air cooler.
   - Pipe from the charge air cooler to the intake air manifold.
   - See figures below for aid and go to **2**




275026 2

**Boost pressure lines**

| Ref. | Description |
|---|---|
| (1) | Exhaust pipe outlet from Turbocharger |
| (2) | Supercharging air pipe to heat exchanger |




275027 3

**Boost pressure lines to intake air manifold**

| Ref. | Description |
|---|---|
| **(1)** | Pipe from the charge air cooler to intake air manifold |

2. Check air charge piping:
   A. Charge pipes are not damaged.
   B. No loose clamps.
   C. If air charge piping is not damaged, go to **4**.
   D. If air charge piping is damaged, go to **3**.
3. Possible root cause
   - Charge pipes damaged.
   - Loose clamps.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check air cooler and pressure pipes with smoke test tool

***NOTE:*** *Basic Testing Procedure*

4. The following procedure **5** describe how to perform a basic testing procedure in order to detect air cooler and/or pressure pipes leakages. Through this procedure is possible to check the following components:
   - Gasket leak.
   - Clamps leak.
   - Pipe/manifold damages.
   - Charge air cooler damages.

5. Procedure:
   - Connect the smoke test tool to workshop air supply.
   - Connect the smoke test tool to battery supply terminals.
   - Connect smoke supply hose to system being tested (flow control valve full opened).
   - Press “ON” button and fill system with smoke for **5 min**.
   - Use white light supplied and look for exiting smoke or use ultraviolet light supplied to look for fluorescent dye deposit at exact location of a leak.
   - See figures below for aid and go to **6**



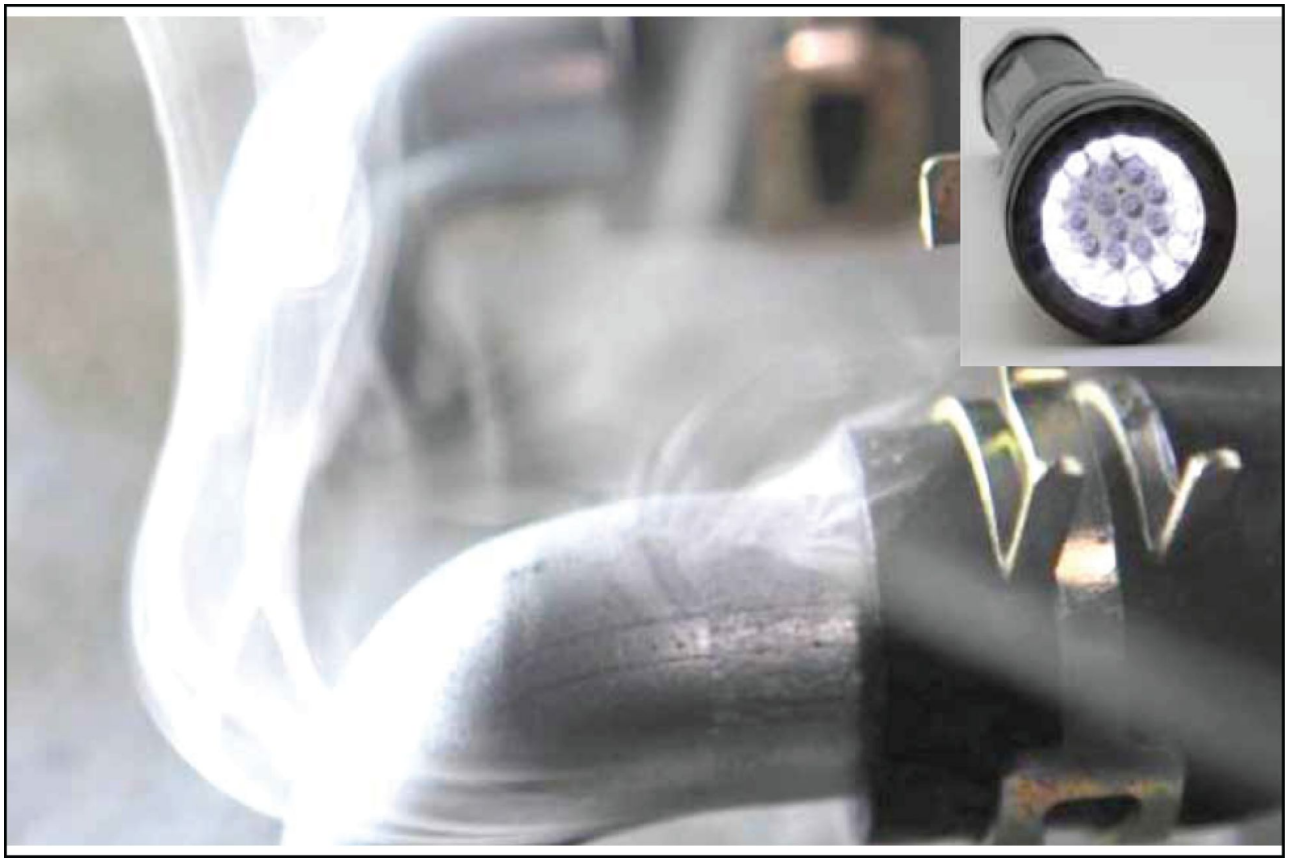
271808 4

**Example of smoke test tool for air intake leakage check**



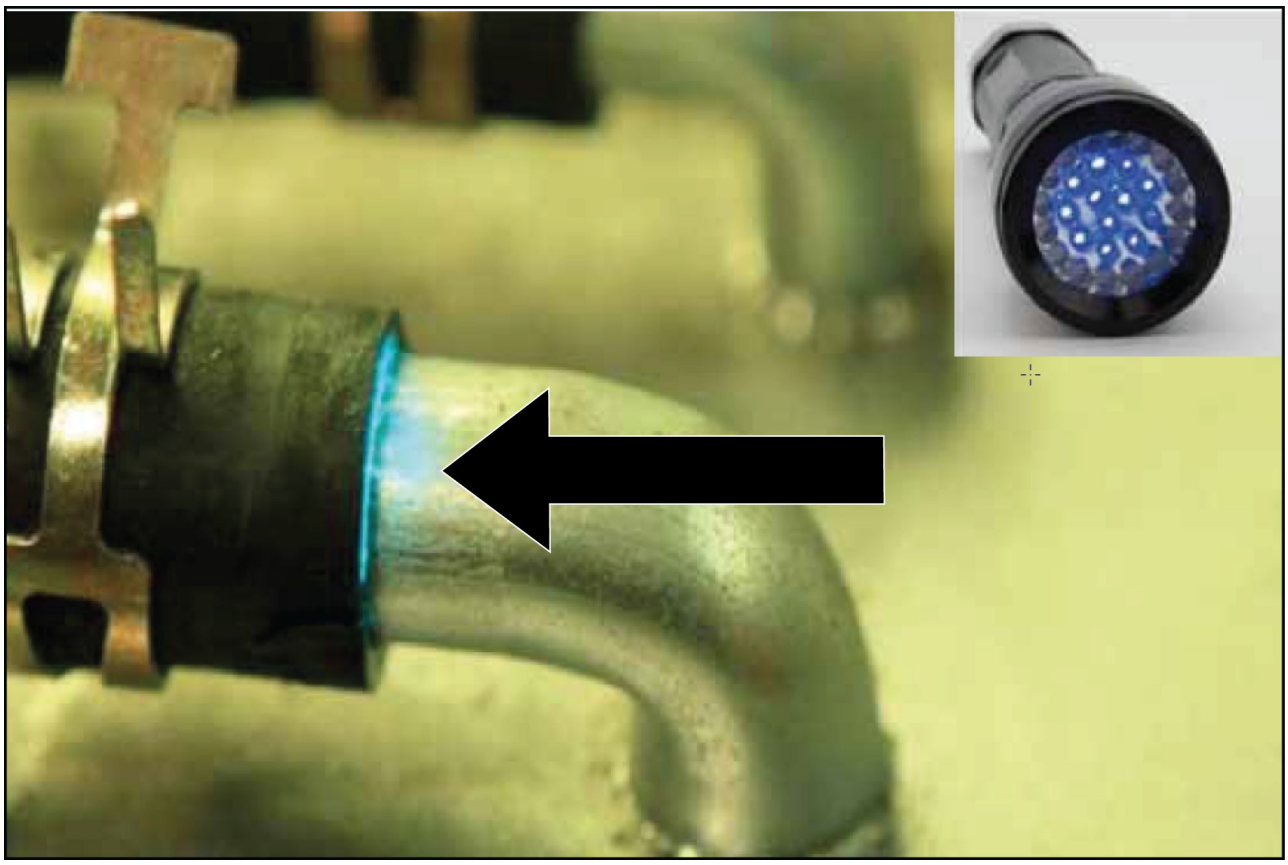
271809 5

**Example of leakage detection with smoke test tool**



271810 6

**Vapours can be identified under white light (example)**



271811 7

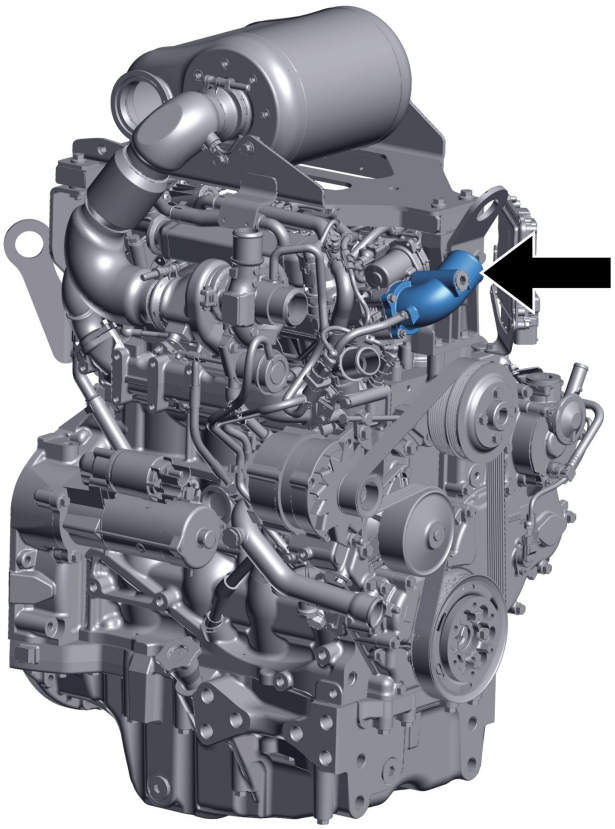
**Dye can be identified under UV light with yellow glass**

6. Smoke leak test the air cooler and charged air pipes with smoke leak tester
   A. Charge air pipes are not damaged
   B. Charge air pipes are correctly fitted
   C. Charge air cooler pipes are not damaged
   D. Charge air cooler pipes are correctly fitted
   E. Charge air cooler is not damaged
   F. Gasket/seals are not damaged
   G. If charge air cooler is not damaged, go to **8**.
   H. If charge air cooler is damaged, go to **7**.
7. Possible root cause
   - Charge air pipes are damaged
   - Charge air pipes are not correctly fitted
   - Charge air cooler pipes are damaged
   - Charge air cooler pipes are not correctly fitted
   - Gasket/seals are damaged
   - Intake air manifold is not correctly fitted and/or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Visually check intake air manifold

8. Visually check intake air manifold
   - Start engine and run the engine in idle.
   - Visually check the intake air manifold for leaks/wall cracks.
   - See figure below for aid and go to **9**



275028 8

**Intake air manifold location**

9. Visually check intake air manifold
   A. Intake air manifold correctly fixed and not damaged.
   B. If intake air manifold is OK, go to **11**.
   C. If intake air manifold is NOT OK, go to **10**.
10. Possible root cause
    - Intake air manifold is not correctly fixed or damaged.
    - Damaged gasket.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Visually check charge air cooler air leakage

11. Check charge air cooler
    - Ignition switch set to OFF position
    - Check charge air cooler for cracks and damages
    - Check the charge air pipes to/from the air cooler for damage/spits/loose fitting
    - Check on air leakage using pressurized air
    - Ignition switch set to ON position and start engine
    - Check on air leakage during idle
    - See figure below for aid and go to **12**




275029 9

**Charge air cooler pipes**

| Ref. | Description |
|---|---|
| **(1)** | Pipe from turbocharger to supercharging air heat exchanger |
| **(2)** | Charge air cooler pipe to intake air manifold |

12. Check charge air cooler
    A. Charge air cooler is neither damaged nor cracked.
    B. Charge air cooler pipes are neither damaged nor cracked.
    C. If charge air cooler is not damaged, go to **14**.
    D. If charge air cooler is damaged, go to **13**.

13. Possible root cause
    - Damaged charge air cooler
    - Damaged charge air cooler pipes

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

14. The charge air system works properly.

# 543420 FAN - Test Check cooling system

## Preparation

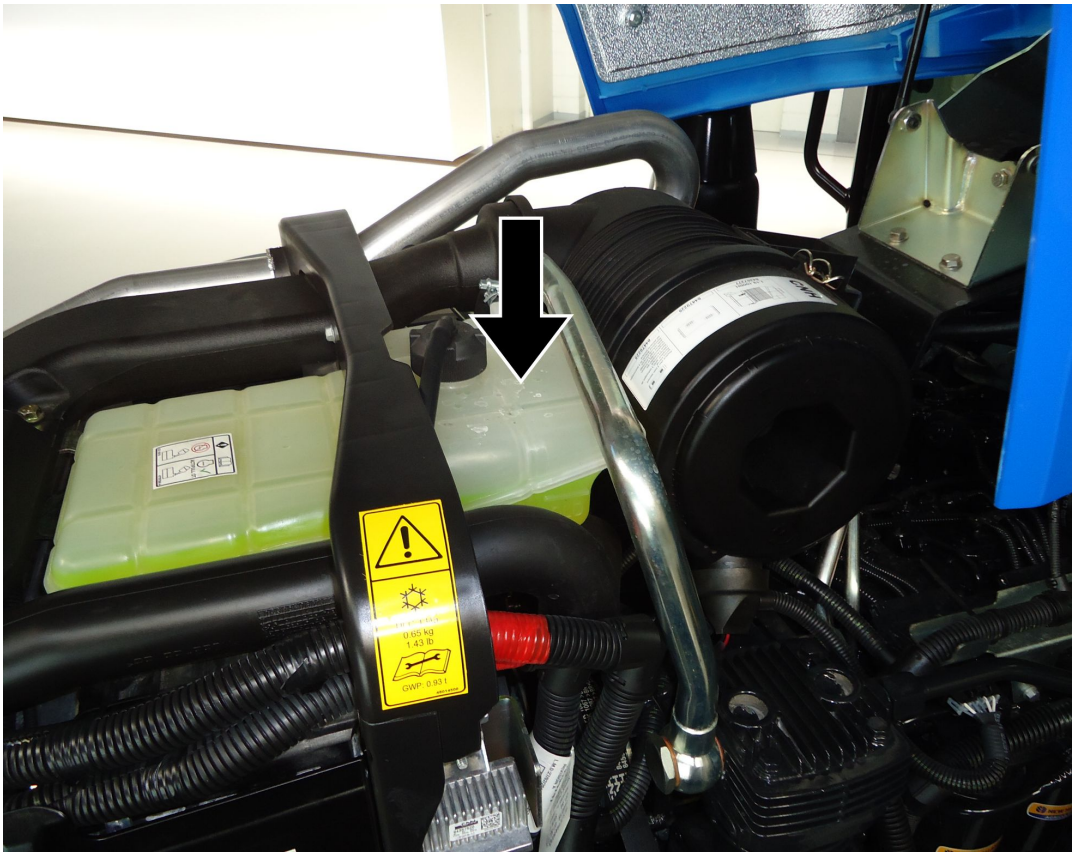
- Ignition switch set OFF position
- Sufficient coolant liquid available at coolant reservoir

## Check coolant reservoir

1. Static pressure test with engine OFF
   - Turn the engine OFF and make sure that the engine is not hot
   - Carefully remove the coolant cap from the expansion coolant bottle, be aware of any trapped/ hot coolant
   - Make sure that coolant is at the recommended level in the expansion coolant bottle
   - Select a suitable cap adapter, wet its rubber gasket with water/ coolant and fit it carefully to the expansion coolant bottle, make sure that the adapter cap properly seals the expansion coolant bottle
   - Install the pressure pump onto the adapter using the quick-connect
   - Using the pump, pressurise the system to the customer specified value
   - When the pressure reach the determined pressure value, stop pumping and watch the pump pressure gauge. If the pressure start to decrease, this indicate a leak in the system
   - With the system kept pressurised, check the radiator and housing for external leak and also check engine oil cooler for internal leakage
   - After the test is completed, depressurised the coolant system and fill the coolant to the correct level, refit the coolant cap
   - If static pressure test with engine OFF is OK, go to **2**
   - If static pressure test with engine OFF is not OK, go to **3**

2. Dynamic pressure test with engine ON
   - Turn the engine ON at idle and make sure that the engine is not hot
   - Carefully remove the coolant cap from the expansion coolant bottle, be aware of the any trapped/ hot coolant
   - Make sure that coolant is at the recommended level in the expansion coolant bottle
   - Select a suitable cap adapter, wet its rubber gasket with water/ coolant and fit it carefully to the expansion coolant bottle, make sure that the adapter cap properly seals the expansion coolant bottle
   - Install the pressure gauge onto the adapter using the quick-connect
   - Start the engine and monitor the pressure gauge. A rapid increase in coolant pressure indicate a damage cylinder head or cylinder head gasket, which leaks cylinder pressure to the coolant system
   - After the test is completed, stop the engine and depressurised the coolant system and fill the coolant to the correct level, refit the coolant cap
   - See figure below for aid and go to **3**

***NOTE:*** *The pressure pump, the adapter and the quick-connect are included in the coolant system pressure testing tool and they should useful for both cooling pressure test procedures.*



275034 1

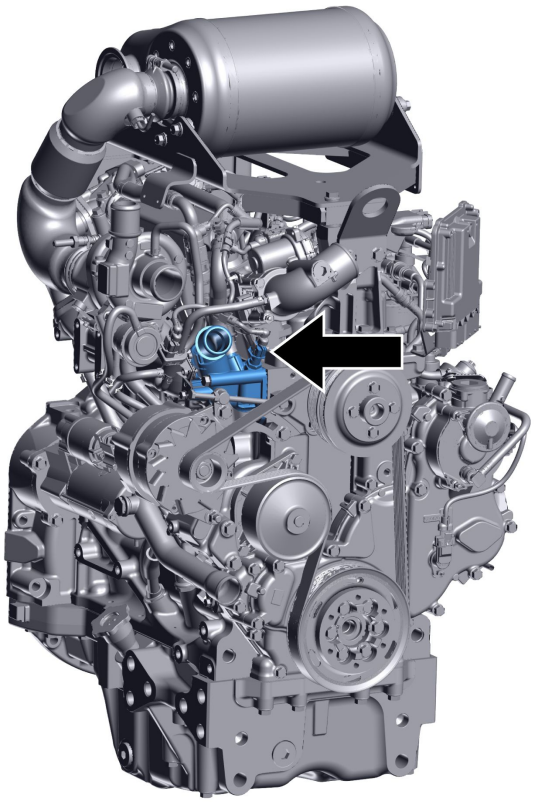
**Location of coolant tank**

3. Check coolant reservoir
   A. No coolant leakage recognizable during static check
   B. No indication of damaged cylinder head gasket during dynamic check
   C. If coolant reservoir is not damaged, go to **5**
   D. If coolant reservoir is damaged, go to **4**
4. Possible root cause
   - Coolant leakage
   - Damaged cylinder head gasket

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

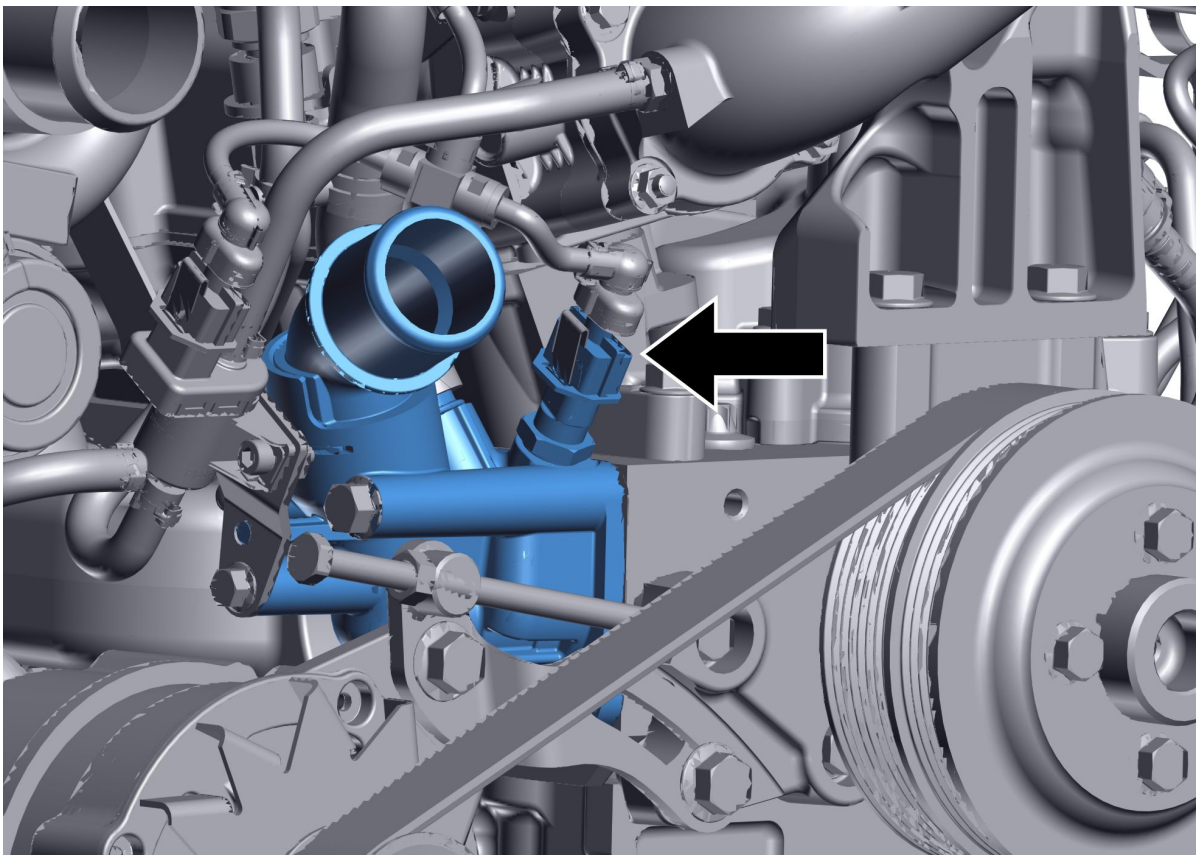
## Visually check coolant temperature sensor

5. Check coolant temperature sensor
   - Visually check the connector of the sensor
   - Check if the sensor is installed correctly
   - Check the sensor assembly to the engine body
   - See figures below for aid and go to **6**



275035 2

**Engine coolant temperature sensor location**



275036 3

**Engine coolant temperature sensor**

6. Check coolant temperature sensor.
   A. Connector of the sensor not damaged and not contaminated
   B. The sensor is mounted in the correct orientation
   C. The sensor is correctly fitted to the engine body
   D. If connector of the sensor is not damaged, go to **8**
   E. If connector of the sensor is damaged, go to **7**
7. Possible root cause
   - Connector of the sensor damaged and/or contaminated
   - The sensor is not mounted in the correct orientation
   - The sensor is loosely fitted to the engine body

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Read out coolant temperature sensor value

## Preparation

8. - Cold engine
   - Diagnosis tester connected to vehicle
   - Ignition On
   - Engine Off.
   - Offboard tool Diagnosis tester

9. • Read out coolant temperature value with diagnostic tester.
   • Go to **10**
10. Read out coolant temperature sensor value
    A. Coolant temperature sensor value equal environment temperature
    B. If coolant temperature sensor is not damaged, go to **12**
    C. If coolant temperature sensor is damaged, go to **11**
11. Possible root cause
    • Offset error coolant temperature sensor.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

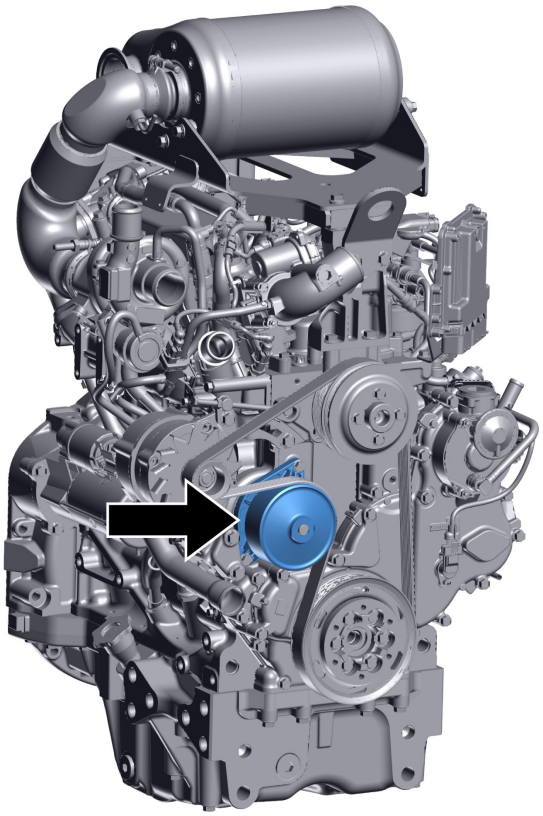
## Visually check cooling system

12. Check fan
    • Start the engine and check if the fan is working correctly
    • Check the fan for damage and pollution
    • Go to **13**
13. Visually check cooling system
    A. Drive belt not damaged, if present
    B. No leaks from actuating hydraulic circuit, if present
    C. If cooling system is not damaged, go to **15**
    D. If cooling system is damaged, go to **14**
14. Possible root cause
    • Drive belt could be damaged
    • Actuating hydraulic circuit (if present) could be damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify*

## Mechanically check water pump

15. Check water pump
    • Set ignition OFF
    • Check water pump for tightness
    • Ignition switch set to ON position and start engine
    • Check the water pump mechanical sounds
    • See figure below for aid and go to **16**



275037 4

**Location of water pump**

16. Check water pump
    A. Water pump not damaged or leak
    B. If water pump is not damaged, go to **18**
    C. If water pump is damaged, go to **17**
17. Possible root cause
    - Water pump damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## FAN activation check

18. General checks
    - Battery voltage is sufficient
    - Vehicle fuses are OK
    - Connectors/plugs OK. No loose contact or corrosion.
    - Offboard tool Diagnosis tester

## Preparation

19. - Connect the diagnostic tester
    - Start the engine and keep in idle

20. • Activate the fan and change its speed
    • Set successive the three activation modes: Full, Medium and Idle
    • Check for modified fan speed for each activation mode
    • Go to **21**
21. FAN activation check
    A. The FAN speed is respectively Full, Medium and Idle speed
    B. If Fan is not damaged, go to **23**
    C. If Fan is damaged, go to **22**
22. Possible root cause
    • Communication loss with diagnosis tester
    • Electrical connection could be damaged
    • FAN could be defective or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Visco FAN activation check

23. General checks
    • Battery voltage is sufficient
    • Vehicle fuses are OK
    • Connectors/plugs OK. No loose contact or corrosion.
    • Offboard tool Diagnosis tester

## Preparation

24. • Connect the diagnostic tester
    • Start the engine and keep in idle
25. • Activate the fan and change its speed
    • Check for visco FAN speed on different settings: it can be varied from **10%** to **90%**
    • Check for modified visco FAN speed
    • Go to **26**
26. Visco FAN activation check
    A. The visco FAN speed can be ranged from **10%** to **90%** of its maximum speed
    B. If the visco fan is not damaged, go to **25**
    C. If the visco fan is damaged, go to **27**
27. Possible root cause
    • Communication loss with diagnosis tester
    • Electrical connection could be damaged
    • Visco FAN could be defective or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Engine temperature adjustment check

28. General checks
    - Battery voltage is sufficient
    - Vehicle fuses are OK
    - Connectors/plugs OK. No loose contact or corrosion.
    - Offboard tool Diagnosis tester

## Preparation

29. • Set the key to ON.
    - Connect the diagnostic tester
30. • Through diagnosis tester simulate the change of coolant temperature
    - Adjustment is possible in the range from **-40 °C** to **-110 °C**.
    - Go to **31**
31. This coolant temperature modification could have the following feedbacks:
    A. Increasing/decreasing of temperature indicator on cluster
    B. Pop up of excessive temperature
    C. At high temperatures: activation of fan at max speed.
    D. If the coolant temperature have this feedbacks, go to **33**
    E. If the coolant temperature don't have this feedbacks, go to **32**
32. Possible root cause
    - Communication loss with diagnosis tester
    - Electrical connection could be damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

33. The cooling system works properly.

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SERVICE

INJECTOR

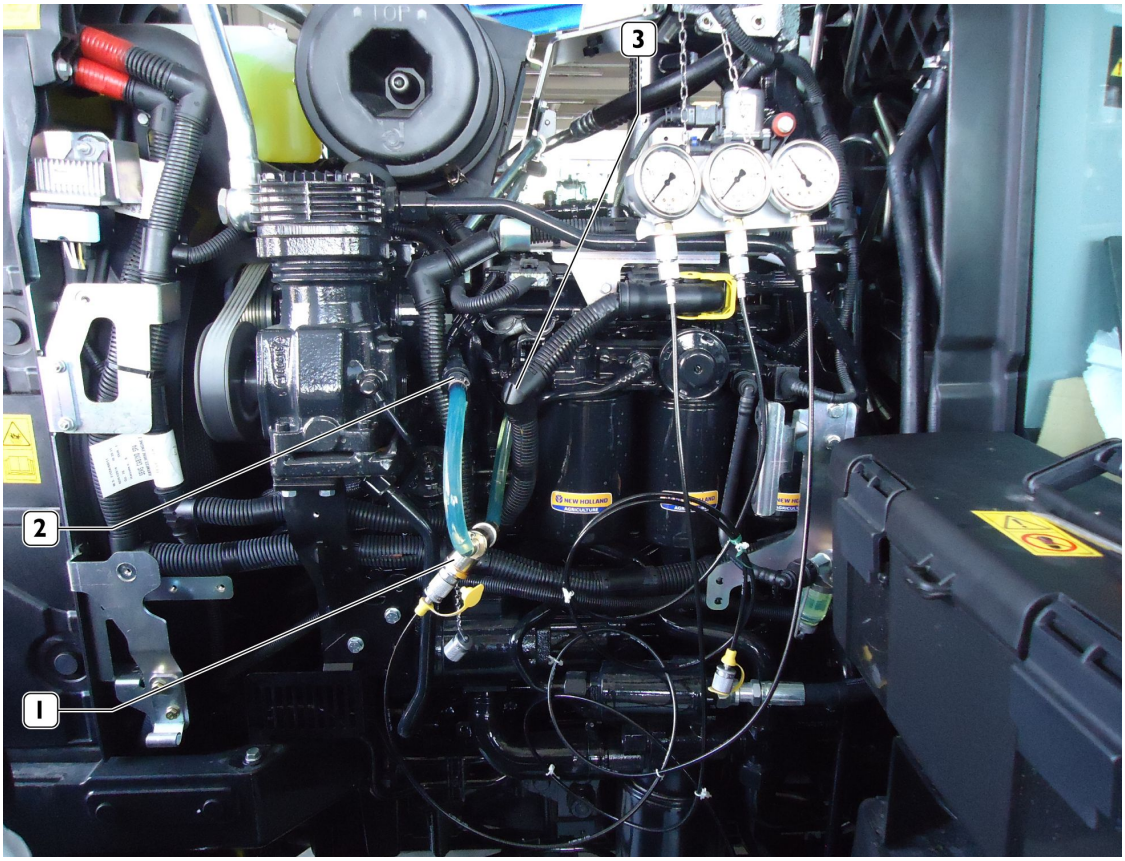
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# 771010 INJECTION PUMP ASSY - Pressure test Check pressure between main filter and high pressure pump

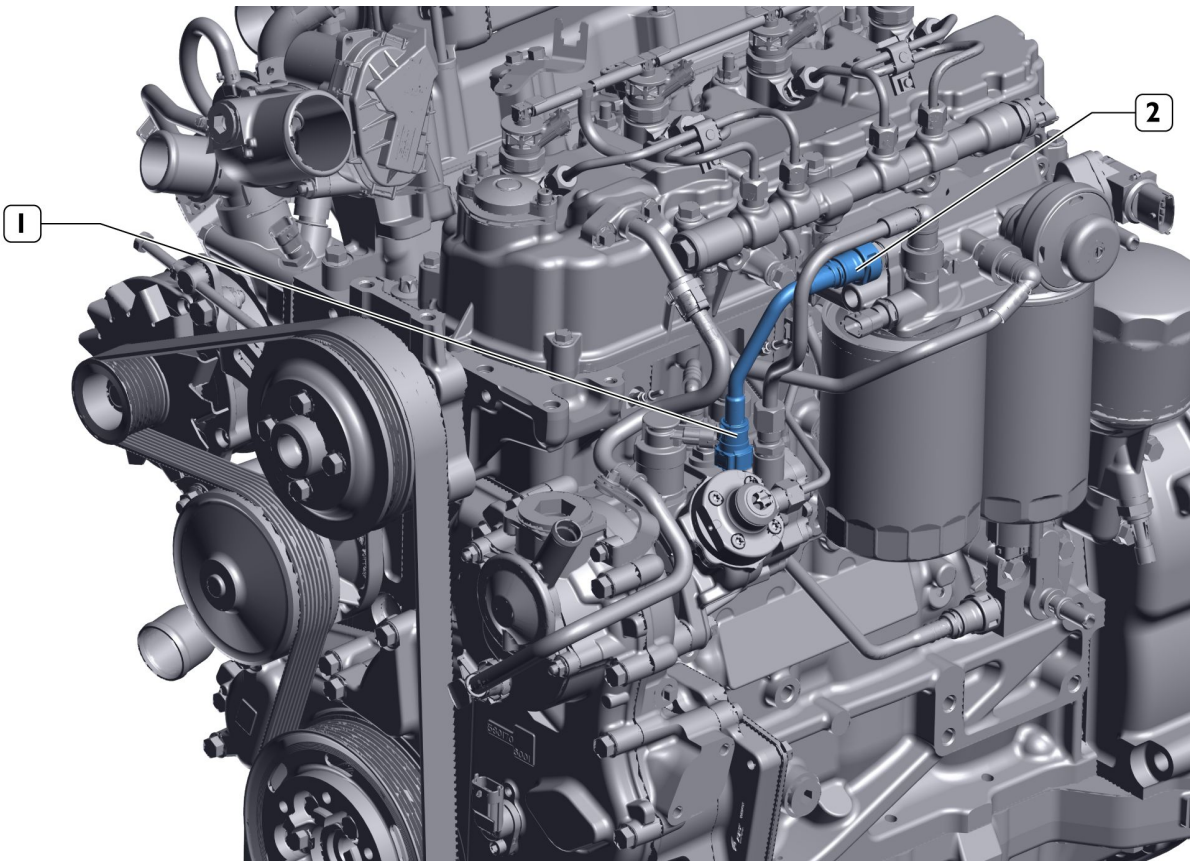
## Preparation

- Visually check all related components for any signs of leakage
- Disconnected the pipe between main filter outlet and high pressure pump inlet
- Connect the flexible tube to the two terminal (main filter outlet and high pressure pump inlet)
- Install the pressure gauge between the main filter and high pressure pump
- Tighten the system (ensure that there is no leakage)
- To prepare for the operation, observe the figures below:




275046 1

| Ref. | Description |
|---|---|
| (1) | T-connector to manometer |
| (2) | High-pressure pump intake |
| (3) | Main filter outlet to high pressure pump |




276361 2

**Locations of high-pressure pump intake**

| Ref. | Description |
|---|---|
| **(1)** | High-pressure pump intake |
| **(2)** | Main filter outlet to high pressure pump |

## Check pressure between main filter and high pressure pump

Offboard tools

- Low pressure vacuum gauge
- Adaptors
- Hose

Check pressure between main filter and high pressure pump

- Start or crank engine and let run for several minutes (please wait at least **30 s** while engine cranking sessions)
- Observe pressure built up in several engine conditions and note values
- See table below for a list of expected results and go to **1**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than* ***10 s ~ 12 s*** *each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Pressure value (rel.) bar | | Remark |
|---|---|---|---|
| | Minimum | Maximum | |
| Low idle speed | **3,0 bar** | **6,2 bar** | At **850 RPM** |
| High idle | **3,0 bar** | **6,2 bar** | At **1500 RPM** |

1. Check if the pressures measured are in the range explained in the table above.
   A. If the expected results are OK, go to **4**
   B. If the expected results are NOT OK (Gear pump pressure too low, below minimum values), go to **2**
   C. If the expected results are NOT OK (Gear pump pressure too high, above maximum values), go to **3**

***NOTE:*** *The pressure difference between at the main filter inlet and outlet should be less than* ***2.0 bar****. Otherwise replace main filter*

2. Possible root cause (Gear pump pressure too low, below minimum values):
   - check tightness of tubes, connectors. Any small defect in tightness will lead to a reduced suction pressure. Air will be sucked into the system and the diesel flow will be reduced (check that there are no air bubbles in the backflow from the pump)
   - Main filter blocked or damaged
   - Pre-filter blocked or damaged
   - Tubes/connectors are damaged
   - Overflow-valve in high pressure pump sticking in open position (check the high pressure pump backflow rate)
   - Rare but possible: defective gear pump (exclude the possibility of other fuel delivery component problems before making this conclusion)
3. Possible root cause (Gear pump pressure too high, above maximum values):
   - Tubes/connectors between main-filter and high pressure pump blocked or damaged (check main filter blocked or damaged)
   - Overflow valve in high-pressure-pump blocked, dirty, sticking in closed position (check the high pressure pump backflow rate)
   - Inlet high pressure pump blocked (check the filter in the inlet bolt of the pump)
   - Backflow pipe blocked or damaged

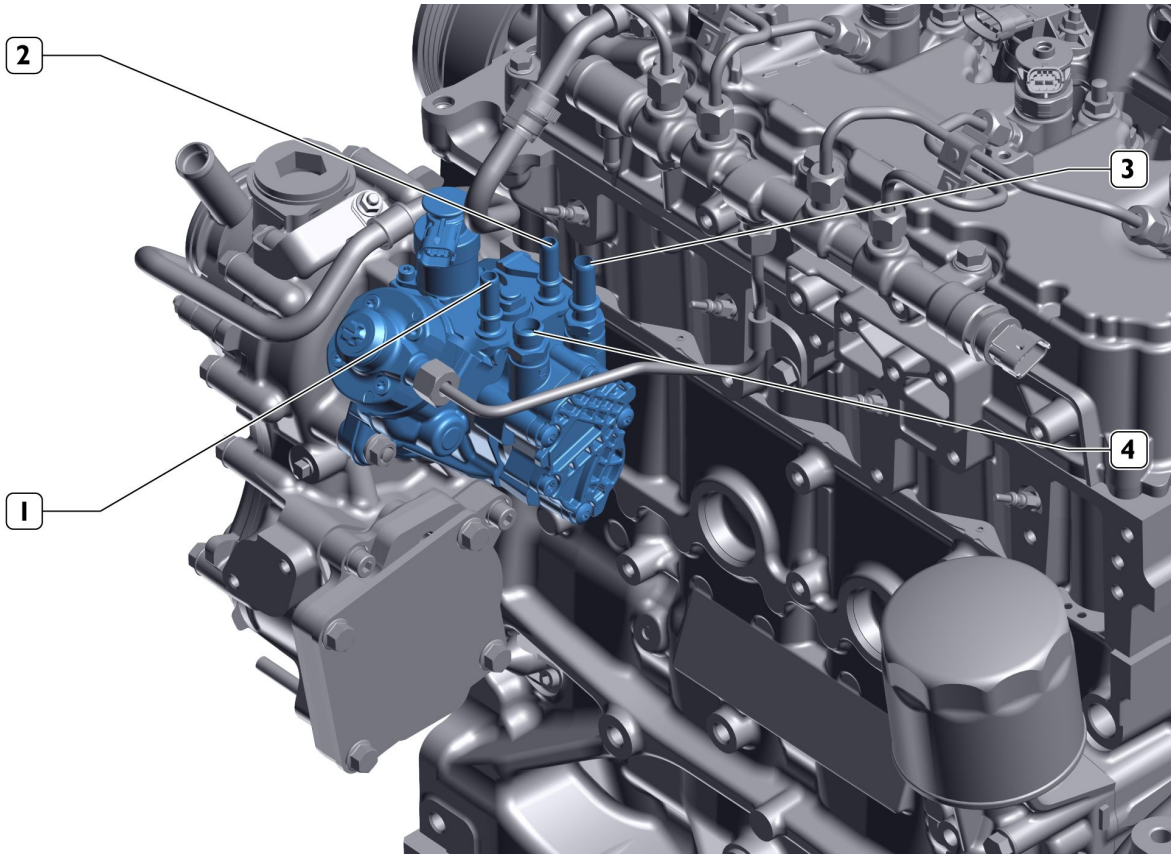
***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The system works properly.

# 771010 INJECTION PUMP ASSY - Test Check high pressure pump backflow rate

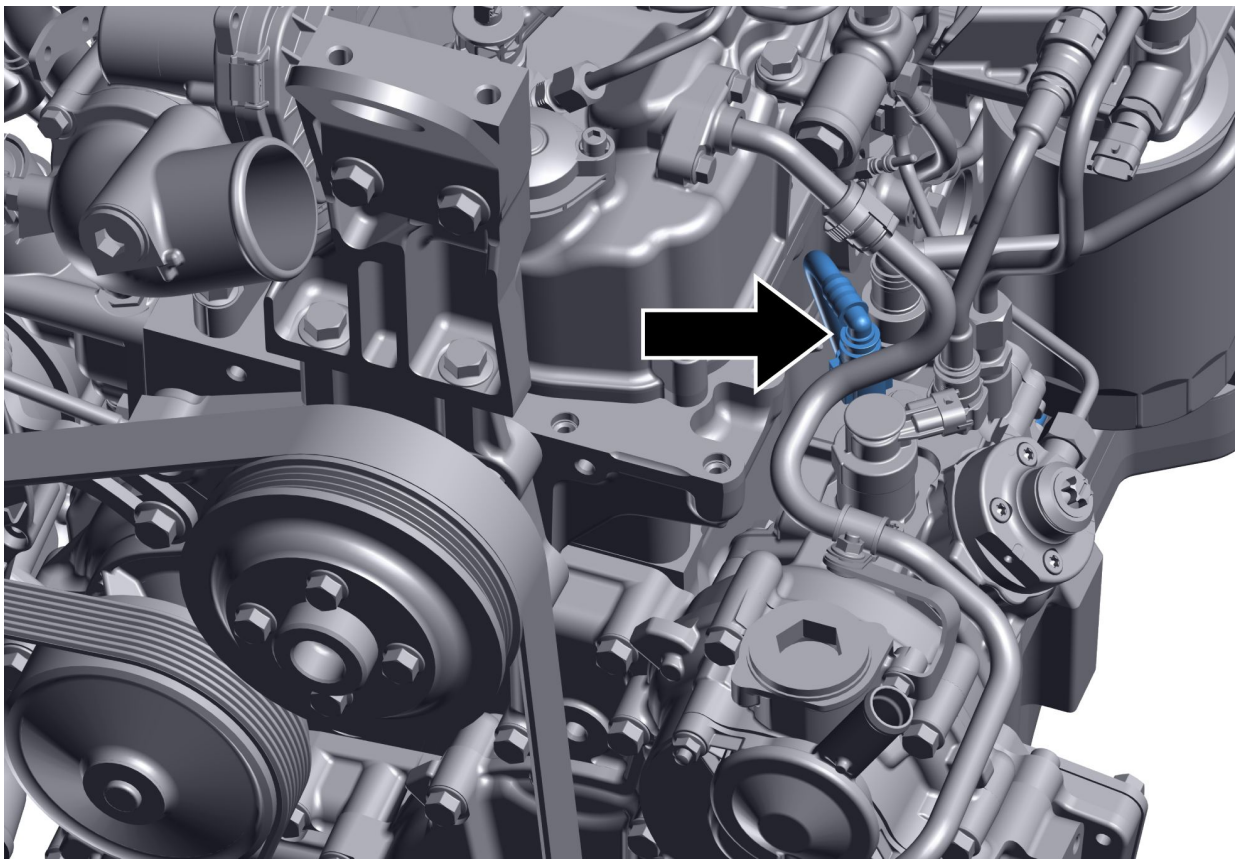
## Preparation

- Visually check all related components for any signs of leakage
- Disconnect the pipe between the backflow outlet of the high pressure pump
- Install a closing plug to prevent any leak from the high pressure pump backflow
- Connect the flexible tube with the high pressure pump backflow outlet
- Prepare the measuring cup and stopwatch
- To prepare for the operation, observe the figures below.




275048 1

| Ref. | Description |
|---|---|
| (1) | High pressure pump from main filter |
| (2) | Return to reservoir |
| (3) | Low pressure pump intake from pre-filter |
| (4) | Delivery from low pressure pump to main filter |



275049 2

**Location of the high pressure pump return**

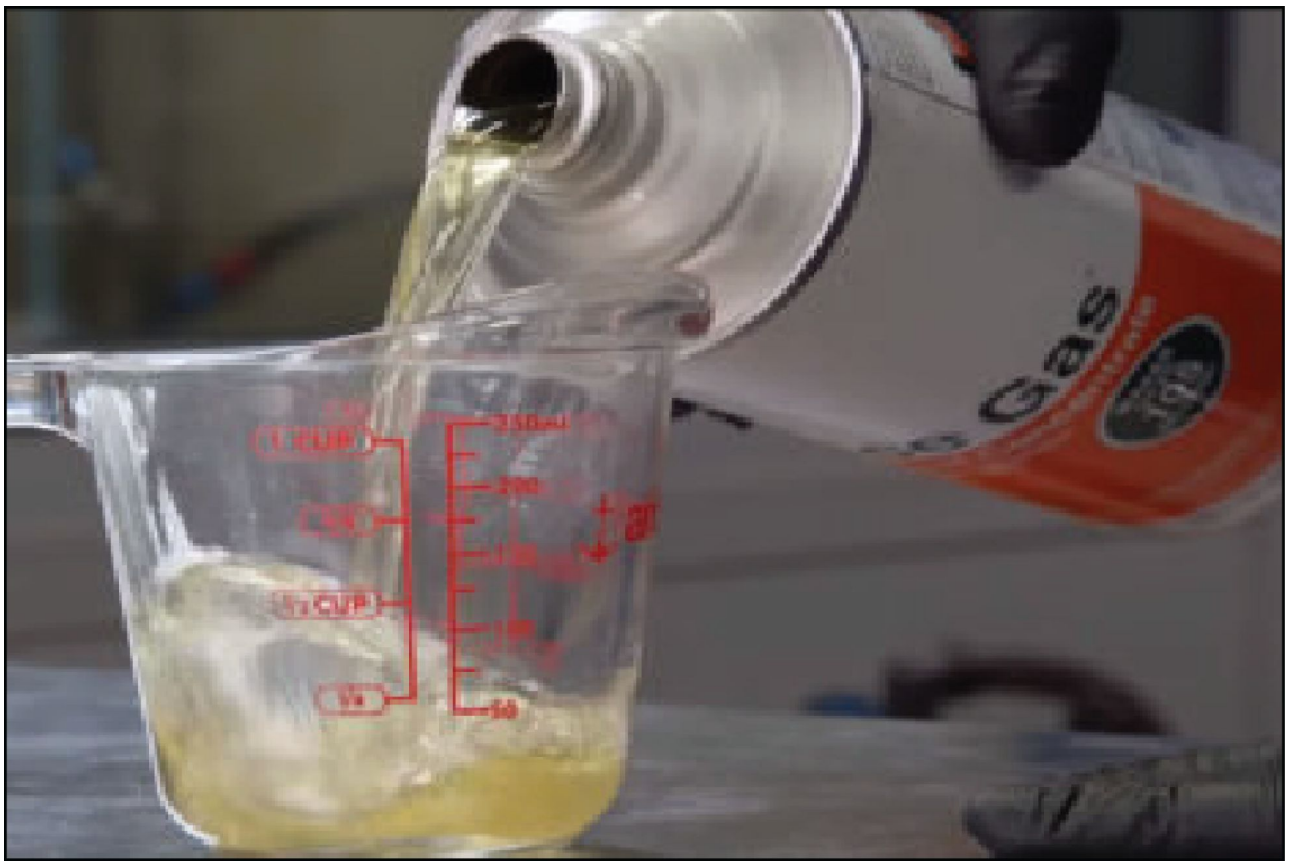
## Check

Offboard tools

- Measuring cup
  (minimum capacity **1,5 L**)
- Adaptors/blanking plug
- Hose
- Stopwatch

Check high pressure pump backflow rate

- Start engine until diesel runs out the flexible tube from pump
- In case of non-starter: crank until diesel runs out the flexible tube from pump
- Use empty measuring cup
- Start to fill the cup while the engine runs for specific time period
- In case of non-starter: crank multiple times (max **10 s** per cranking) until requested time period is reached
- Note the diesel volume of measuring cup
- See figure and table below for a list of expected results and go to **1**



271842 3

**Example of transfer diesel from collecting container to measurement cup**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than 10~12 seconds each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Volume mL | Remark |
|---|---|---|
| Idle **60 s** | **500 mL** - **800 mL** | At **850 RPM** |

1. Check if the volumes measured are in the range explained in the table above.
   A. If the expected results are OK, go to **3**
   B. If the expected results are NOT OK, go to **2**
2. Possible root cause (volume rate is noticeable too low)
   - Insufficient fuel
   - Check tightness of tubes and connectors. Any small defect in tightness will lead to a reduced suction pressure. Air will be sucked into the system and the diesel flow will be reduced. (Check that there are no air bubbles in the backflow from the pump)
   - Check tubes, connectors squeezed/damaged/wrong diameter. (If there are no bubble in the backflow, check the pipeline)
   - Main filter blocked. (If delta pressure over than **40 kPa**, replace main filter)
   - Tank ventilation is blocked or restricted. Open the tank cap, and listen to sucking sound

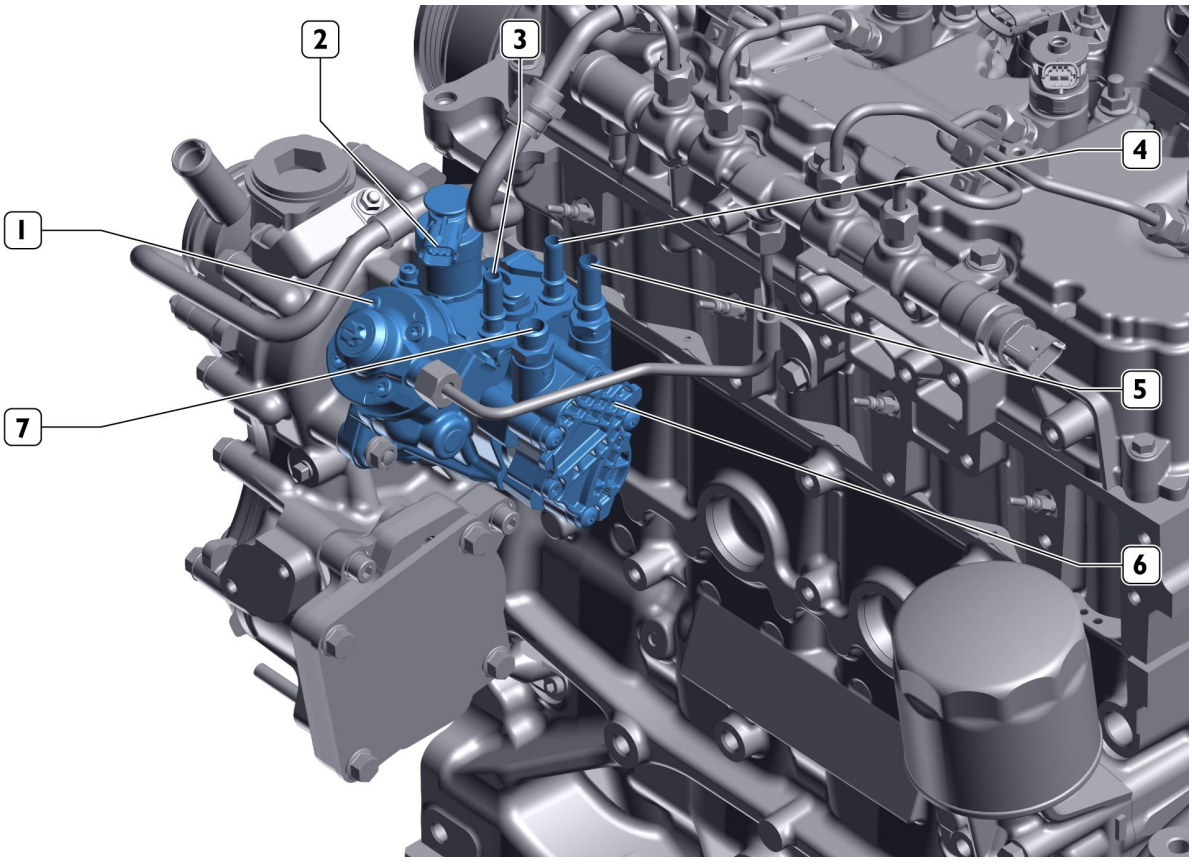
***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The high pressure pump works properly.

# 771010 INJECTION PUMP ASSY - Test Check high pressure system backflow rate

## Preparation

- Visually check the components to ensure there are no external fuel leaks
- Disconnect the backflow pipe to the tank from the high pressure pump
- Install second tube as a provisional backflow line from the high-pressure-pump backflow and the tank
- Fit the plug to close the backflow fitting to the tank from the high pressure pump
- Disconnect the total backflow pipe to the tank
- Connect a second hose between the total backflow line and the measuring cup
- Provide stop watch and measuring cup (minimum **250 mL**).
- To prepare for the operation, observe the figures below:

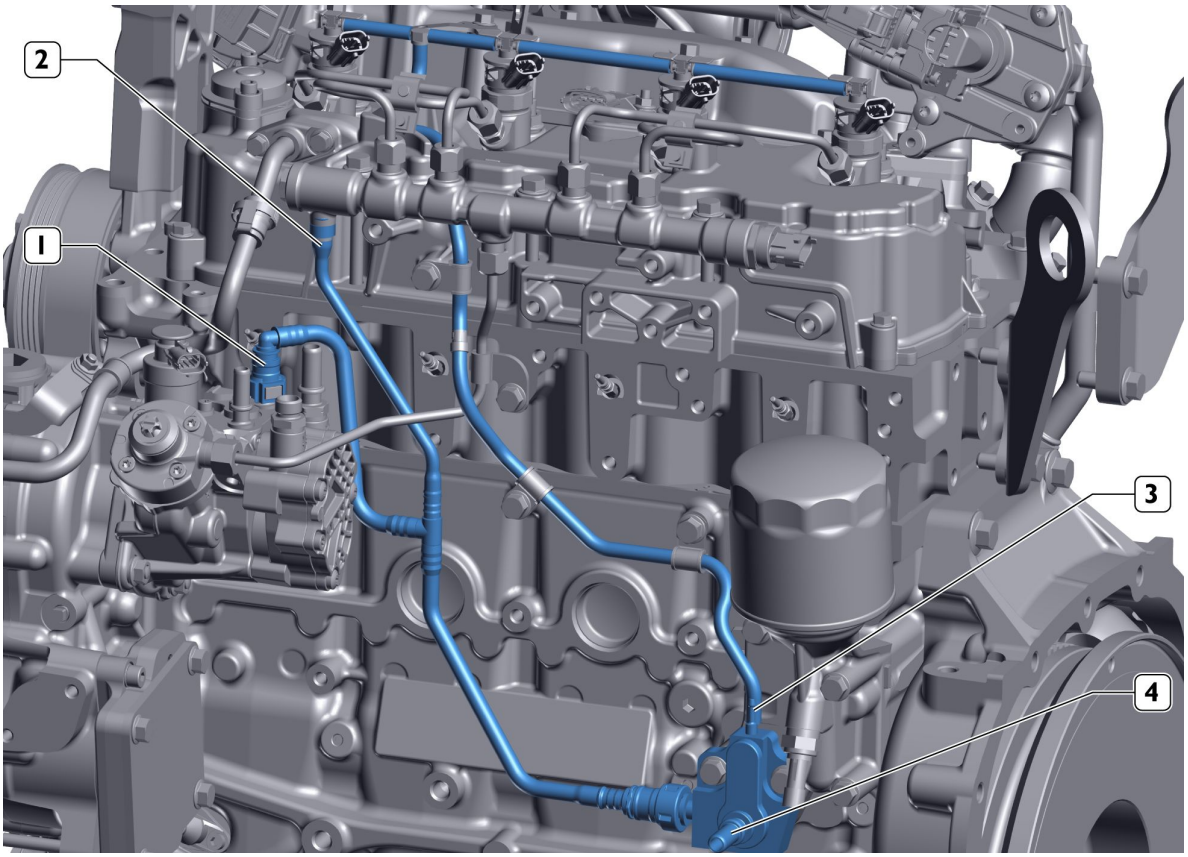



275054 1

**Location of the main components of the fuel pump**

| Ref. | Description |
|---|---|
| **(1)** | High-pressure pump |
| **(2)** | Pressure regulator valve (fuel metering unit) |
| **(3)** | High pressure pump from main filter |
| **(4)** | Return to reservoir |
| **(5)** | Low pressure pump intake from pre-filter |

| Ref. | Description |
|---|---|
| **(6)** | Gear low pressure pump |
| **(7)** | Delivery from low pressure pump to main filter |




276360 2

**Location of the backflow line**

| Ref. | Description |
|---|---|
| **(1)** | Backflow fitting to tank from high pressure pump |
| **(2)** | Pressure limiting valve backflow fitting |
| **(3)** | Injectors total backflow fitting |
| **(4)** | Total backflow to tank |

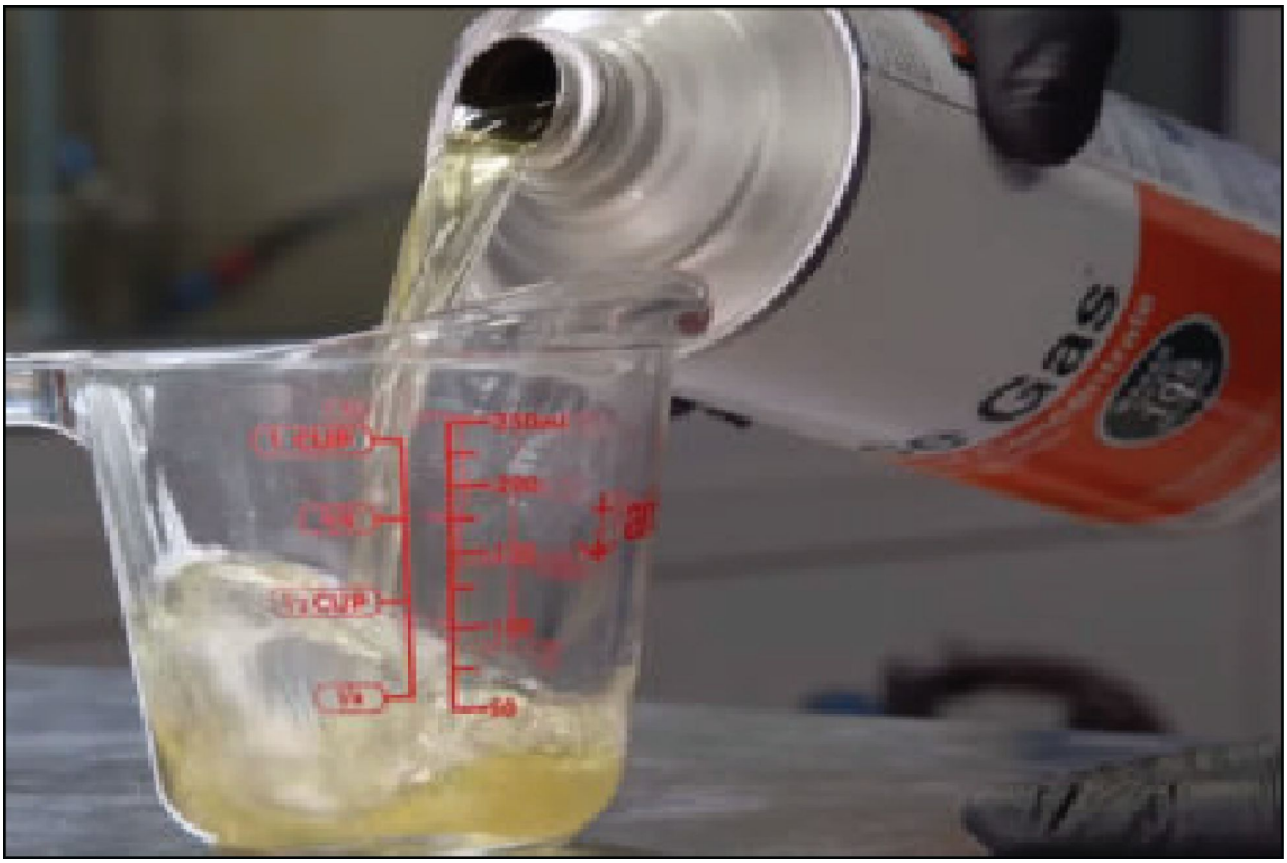
## Check

Offboard tools

- Flexible tube and adaptor to junction bolts
- Measuring cup (minimum **250 mL**)
- Stopwatch

Check high pressure system backflow rate.

- If possible run engine until coolant temperature of **65 °C** is reached
- Crank/start engine until diesel runs out the tube
- Use empty measuring cup
- Start engine and start the stop watch
- If case of non-starter: Crank engine multiple times (maximum **10 s** each) until specific time period is reached
- Start to fill the cup while the engine runs for specific time period.
- Note the total diesel volume of measuring cup
- See figure and table below for a list of expected results and go to **1**



271846 3

**Example of backflow fuel from container to measuring cup**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than* ***10 s ~ 12 s*** *each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Volume mL | Remark |
|---|---|---|
| Idle ( **60 s** ) | From **20,8 mL** to **31,2 mL** | At **850 RPM** (4-valve engine) |
| High idle ( **60 s** ) | From **44,0 mL** to **66,0 mL** | At **1500 RPM** (4-valve engine) |
| Idle ( **60 s** ) | From **70,4 mL** to **105,6 mL** | A **800 RPM** (2-valve engine) |
| High idle ( **60 s** ) | From **86,4 mL** to **129,6 mL** | At **1500 RPM** (2-valve engine) |

1. Check if the volumes measured are in the range explained in the table above.
   A. If the expected results are OK, go to **3**
   B. If the expected results are NOT OK, go to **2**
2. Possible root cause
   - Pressure limiting valve backflow leaky, check PLV backflow
   - Injector leaky, check backflow of each injector individually

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The high pressure system works properly.

# 771010 INJECTION PUMP ASSY - Pressure test Rail Pressure Adjustment check

## Preparation

General checks

- Battery voltage is sufficient.
- Vehicle fuses are OK.
- Connectors/plugs OK. No loose contact or corrosion.
- Offboard tool Diagnosis tester

## Rail Pressure Adjustment check

## Preparation

- Set the key to ON.
- Connect the diagnostic tester

## Check

- Modify the fuel pressure in the rail (pressure rail)
- The fuel pressure adjustment is possible in the range from **250 bar** to **1600 bar**.
- Go to **1**

1. Rail Pressure Adjustment check
   A. The fuel pressure in the rail is into specified pressure range
   B. If rail pressure adjustment is OK go to **3**.
   C. If rail pressure adjustment is not OK, go to **2** .
2. Possible root cause
   - Electrical defect of fuel system's components (e.g.: rail pressure sensor, fuel pump, fuel injector). Check wiring harness and component electrically.
   - Mechanical defect of fuel system's components (e.g.: faulty fuel pressure limiting valve).
   - Clogged fuel filters.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The injector works properly.

# 771010 INJECTION PUMP ASSY - Pressure test Check rail pressure during cranking

## Read parameters during cranking

Offboard tool

- Diagnosis tester.

## Preparation

- Set the key to ON.
- Connect the diagnostic tester
- Start active diagnosis: "Read Parameters"

## Check

- Crank the engine for **5 s**.
- Read out the rail pressure value.
- Go to **1**

1. Read parameters during cranking
   A. All values within specified range or similar to typical value!
   B. Rail pressure value larger **120 bar**.
   C. If parameters during cranking are OK go to **3**.
   D. If parameters during cranking are not OK, go to **2** .
2. Possible root cause
   - No sufficient low pressure fuel supply.
   - Fuel leakage at the high pressure system.

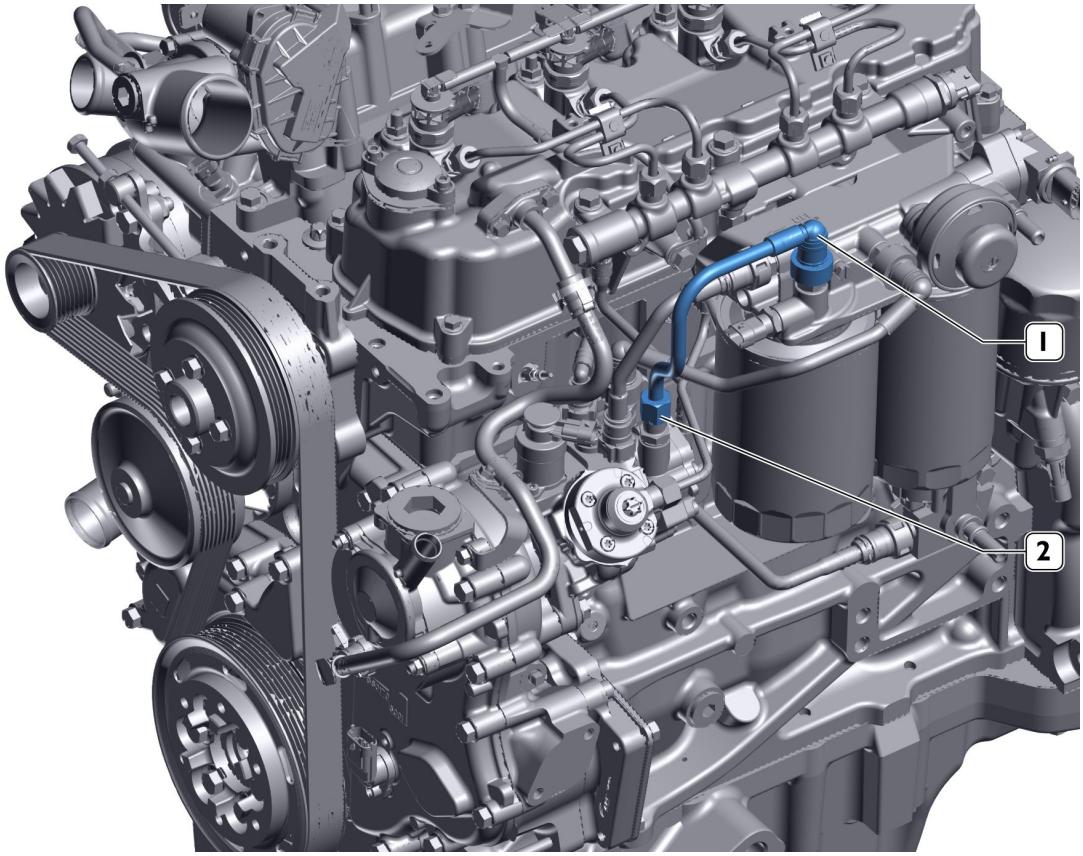
***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The injector works properly.

# 771013 CONTROL GEAR - Pressure test Check pressure between gear pump and main filter

## Preparation

- Visually check all related components for any signs of leakage
- Install the vacuum gauge between the gear pump and main filter

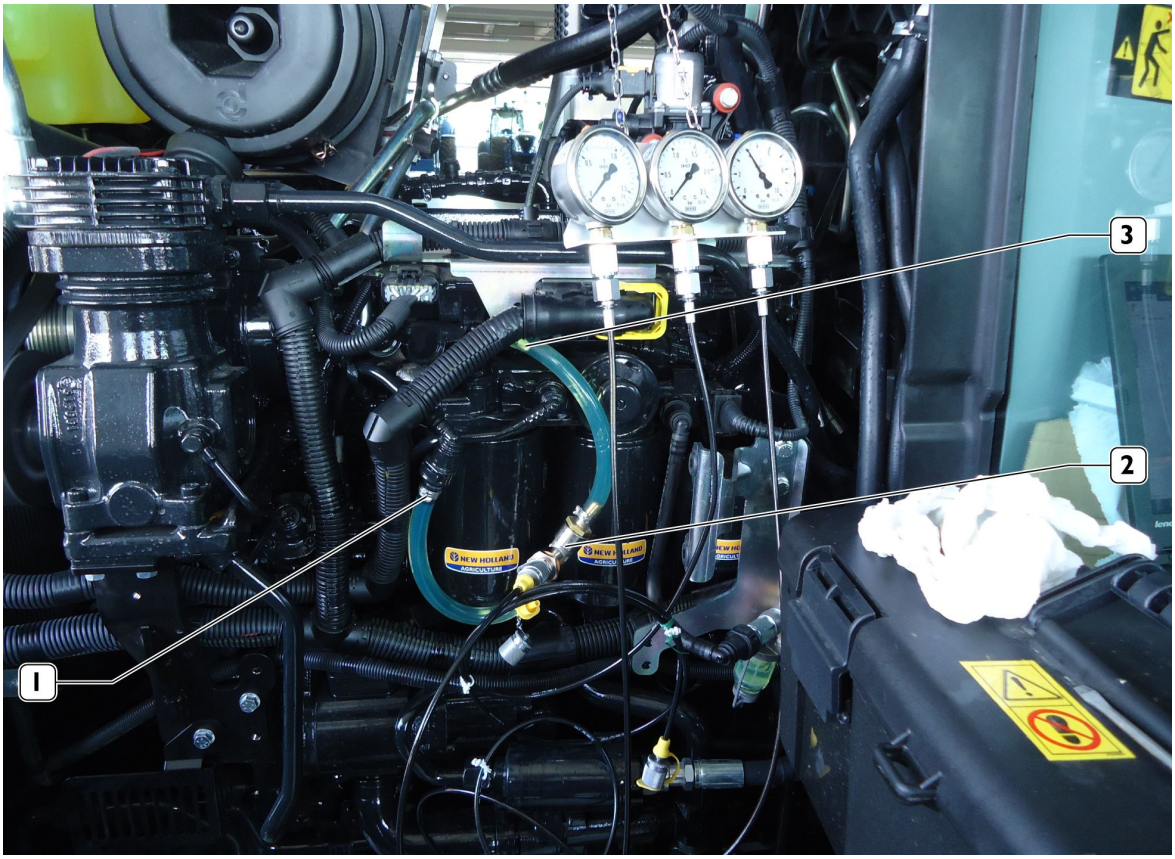



275044 1

**Location of pipe between gear pump and main filter**

| Ref. | Description |
|---|---|
| **(1)** | Main filter inlet |
| **(3)** | Gear pump outlet |

- Look figure below for preparation:




275045 2

**Gauge location (gear pump to main filter)**

| Ref. | Description |
|---|---|
| **(1)** | Gear pump outlet |
| **(2)** | T-connector gear pump outlet to main filter |
| **(3)** | Main filter inlet |

## Check pressure between gear pump and main filter

Offboard tools

- Low pressure vacuum gauge
- Adaptors
- Hose

Check pressure between gear pump and main filter

- Start or crank engine and let run for several minutes (please wait at least **30 s** while engine cranking sessions)
- Observe pressure built up in several engine conditions and note values
- See table below for a list of expected results and go to **1**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than* ***10 s ~ 12 s*** *each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Pressure value (rel.) bar | | Remark |
|---|---|---|---|
| | Minimum | Maximum | |
| Low idle speed | **3,0 bar** | **6,5 bar** | At **850 RPM** |
| High idle | **3,0 bar** | **6,5 bar** | At **1500 RPM** |

1. Check if the pressures measured are in the range explained in the table above
   A. If the expected results are OK, go to **4**
   B. If the expected results are NOT OK (Gear pump pressure too low, below minimum values), go to **2**
   C. If the expected results are NOT OK (Gear pump pressure too high, above maximum values), go to **3**
2. Possible root cause (Gear pump pressure too low, below minimum values)
   - Check tightness of tubes, connectors. Any small defect in tightness will lead to a reduced suction pressure. Air will be sucked into the system and the diesel flow will be reduced. (Check that there are no air bubbles in the backflow from the pump)
   - Tubes/connectors are damaged
   - Pre-filter blocked or damaged
   - Tank ventilation blocked/dirty (open tank cap, and listen to sucking sound)
   - Overflow-valve in high pressure pump sticking in open position (check the high pressure pump backflow rate)
   - Rare but possible: defective gear pump (exclude the possibility of other fuel delivery components before making this conclusion)
3. Possible root cause (Gear pump pressure too high, above maximum values)
   - Main filter blocked or damaged (check if the main filter blocked or damaged)
   - Tubes damaged/blocked (between gear pump to high pressure pump)
   - Inlet high pressure pump blocked (check the filter in the inlet bolt of the pump)
   - Backflow pipe blocked or damaged (check high pressure pump backflow pressure)
   - Overflow valve in high-pressure-pump blocked, dirty, sticking in closed position (check the high pressure pump backflow rate)

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The system works properly.

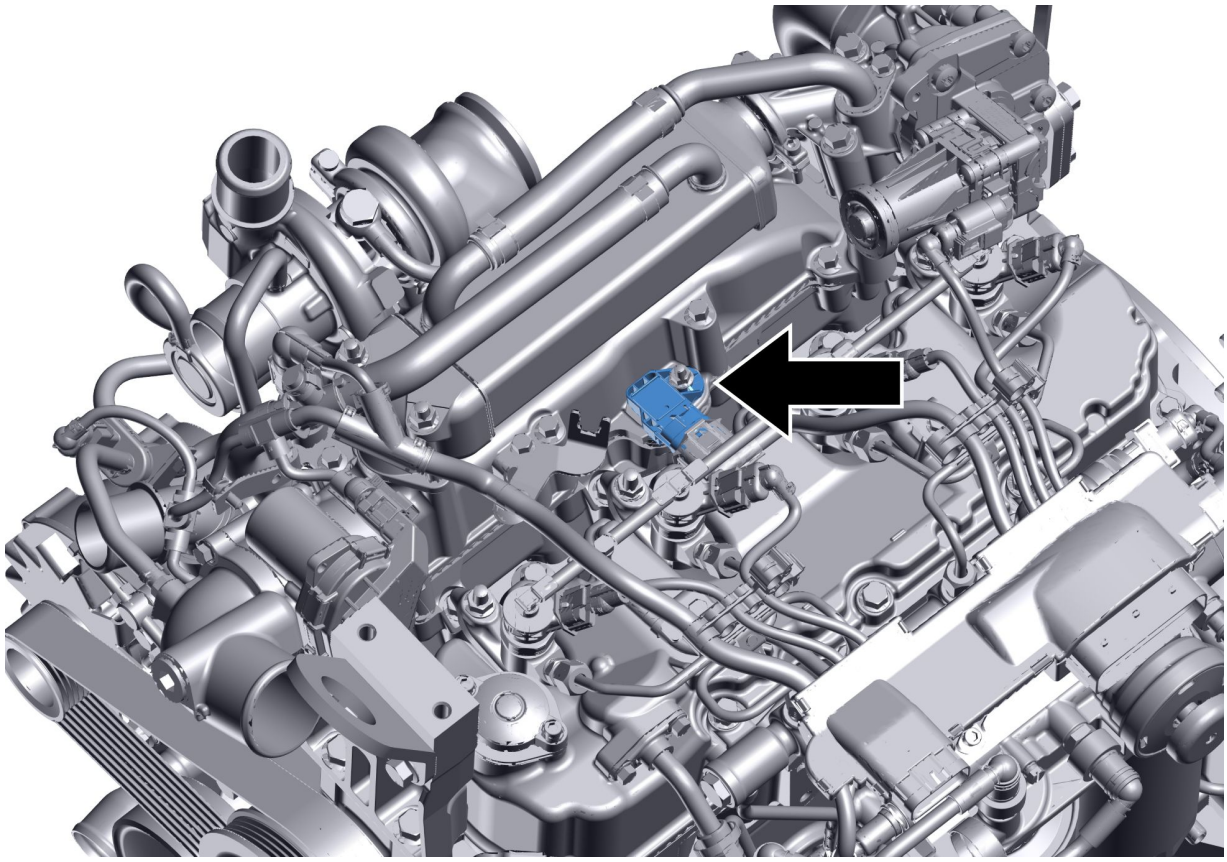
# 772647 AIR TEMPERATURE SENSOR - Test Check intake air pressure and temperature sensor

## Preparation

- Ignition switch set to OFF position.

## Visually check intake air pressure and temperature sensor

1. Visually check intake air pressure and temperature sensor
   - Visually check the connector of the sensor
   - Check if the sensor is installed correctly.
   - Check if the screw of the sensor is tight.
   - Check the sensor assembly to the intake air manifold.
   - See figure below for explanation and go to **2**



275032 1

**Location of intake air pressure and temperature sensor**

2. Check the intake manifold pressure and temperature sensor
   A. Connector of the sensor not damaged and not contaminated
   B. The sensor is mounted in the correct orientation
   C. The sensor is correctly fitted to the air intake manifold
   D. The screw is not loose
   E. If intake manifold pressure and temperature sensor is OK, go to **PreparationDiagnosis tester connected to vehicle.Ignition On.Engine Off.**
   F. If intake manifold pressure and temperature sensor is NOT OK, go to **3**
3. Possible root cause
   - Connector of the sensor damaged and/or contaminated
   - The sensor is not mounted in the correct orientation.
   - The sensor is loosely fitted to the air intake pipe.
   - Tighten the screw.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Read out intake air pressure sensor value

Preparation

- Diagnosis tester connected to vehicle.
- Ignition On.
- Engine Off.

## Read out intake air pressure sensor value

4. - Read out boost pressure value with diagnostic tester.
   - Go to **5**
5. Read out intake air pressure sensor value
   A. Boost pressure equal environment pressure (~ **1000 mbar**)
   B. If intake air pressure sensor valve is OK, go to **7**.
   C. If intake air pressure sensor valve is NOT OK, go to **6**.
6. Possible root cause
   - Offset error intake manifold pressure and temperature sensor

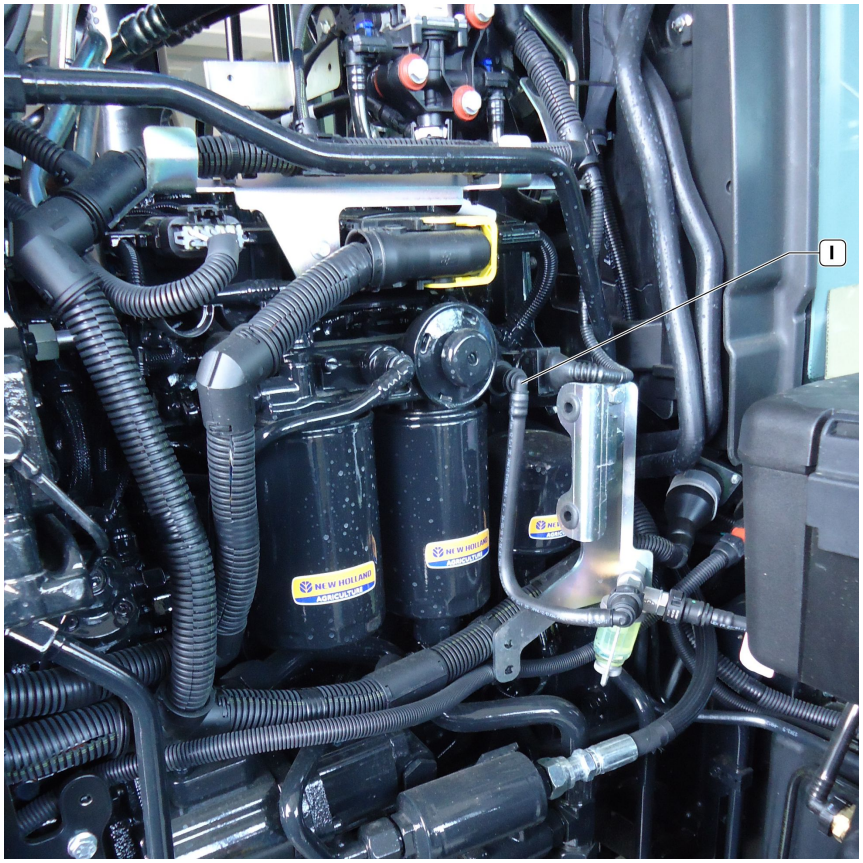
***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

7. The intake manifold pressure and temperature sensor works properly.

# 773110 FUEL PRE-FILTER - Pressure test Check suction pressure between tank and pre-filter

## Preparation

- Visually check all related components for any signs of leakage
- Disconnect the pre-filter supply
- Install the low pressure gauge between the fuel tank and pre-filter
- Tighten all connections to make sure that there is no possibility of leakage
- Look figure below for preparation:




275042 1

**Fuel Pre-filter**

| Ref. | Description |
|---|---|
| (1) | Pre-filter inlet |

## Check suction pressure between tank to pre-filter

Offboard tools

- Low pressure vacuum gauge
- Adaptors
- Hose

Check suction pressure between tank to pre-filter

- Start the engine (can be delayed) and let run for several minutes
- Observe suction pressure in several engine conditions. Check for leaks
- See table below for a list of expected results and go to **1**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than 10~12 seconds each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Pressure value (rel.) bar | Remark |
|---|---|---|
| Low idle speed | **-0,5 – 0,0 bar** | At **900 RPM** |
| High idle | **-0,5 – 0,0 bar** | At **1500 RPM** |

1. Check if the pressures measured are in the range explained in the table above
   A. If the expected results are OK, go to **4**
   B. If the expected results are NOT OK (Suction pressure too low, above maximum values), go to **2**
   C. If the expected results are NOT OK (Suction pressure too high, below minimum values), go to **3**
2. Possible root cause (Suction pressure too low, above maximum values):
   - Insufficient fuel
   - Check tightness of tubes, connectors. Any small defect in tightness will lead to a reduced suction pressure. Air will be sucked into the system and the diesel flow will be reduced (check that there are no air bubbles in the backflow from the pump)
   - Blocked or contaminated filters can reduce the suction pressure, check the pre-filter for blockage or damage and the main-filter blockage or damage
   - Rare but possible: defective gear pump (exclude the possibility of other fuel delivery component problems before making this conclusion)
3. Possible root cause (Suction pressure too high, below minimum values):
   - Blocked or damaged tube, dirt in tank/tube
   - Wrong diameter of the inlet pipe from tank to pre-filter
   - Tank ventilation blocked/dirty (open tank cap, and listen to sucking sound)

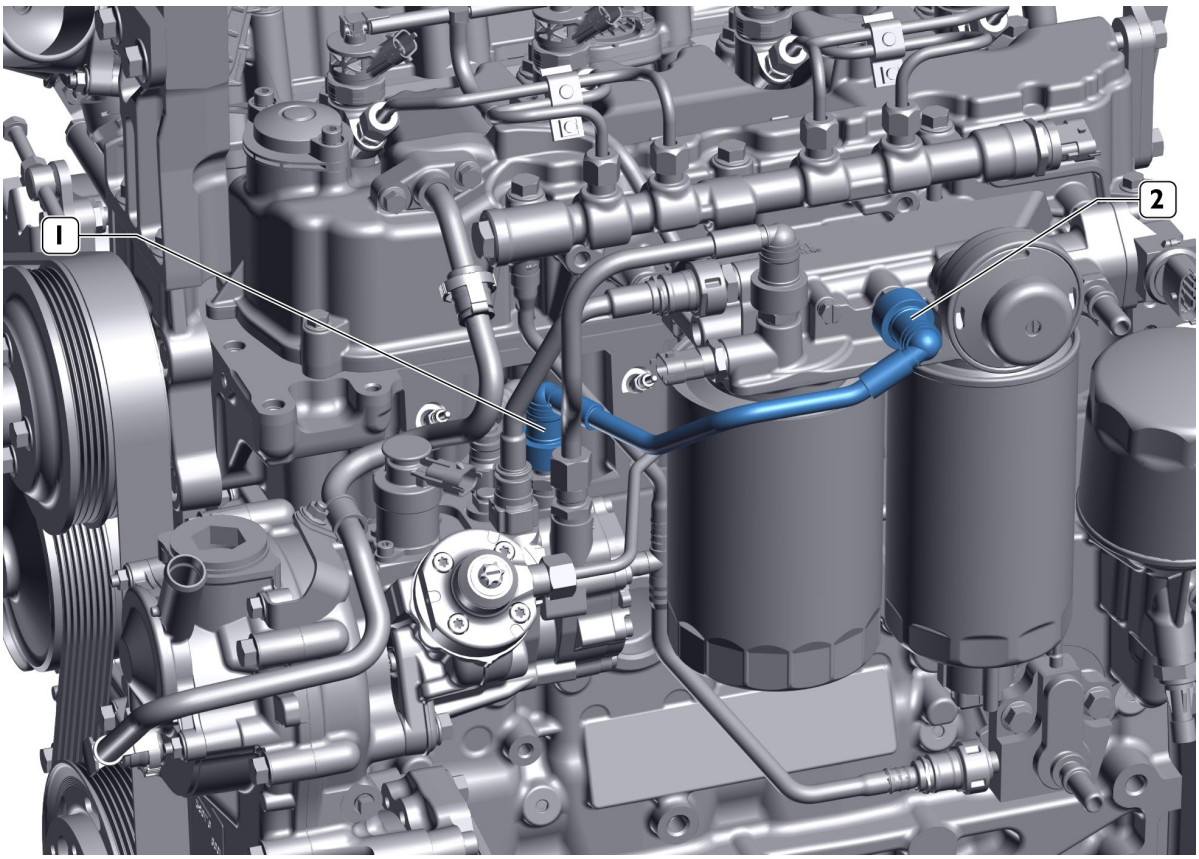
***NOTE:*** *After having eliminated the cause of the error, delete the fault memory and repeat the reading.*

4. The system works properly.

# 773110 FUEL PRE-FILTER - Pressure test Check suction pressure after pre-filter

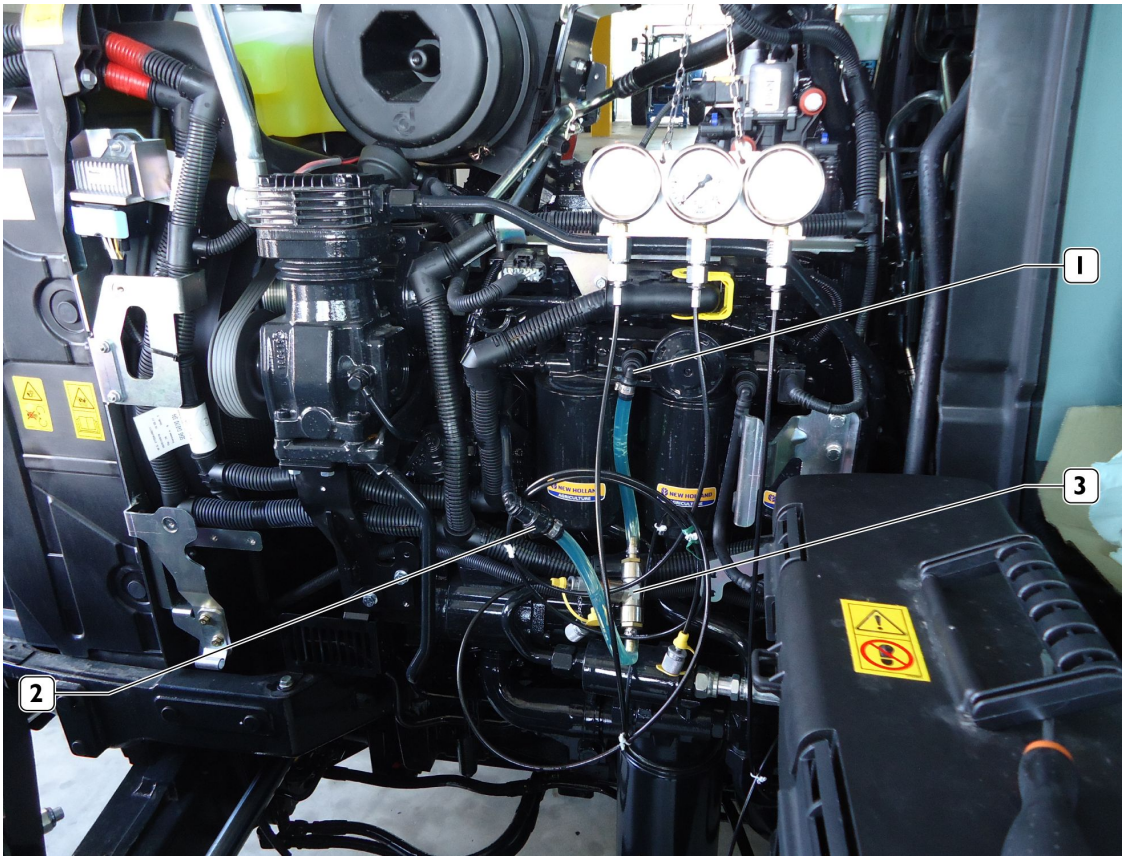
## Preparation

- Visually check all related components for any signs of leakage
- Install the low pressure gauge at the pre-filter outlet
- Look figure below for preparation:




276266 1

| Ref. | Description |
|---|---|
| (1) | Inlet fitting (low pressure pump) |
| (2) | Pre-filter outlet fitting |




275043 2

| Ref. | Description |
|---|---|
| **(1)** | Pre-filter outlet |
| **(2)** | Connecting hose to low pressure pump inlet |
| **(3)** | T-connector to manometer |

## Check suction pressure at pre-filter outlet

Offboard tools

- Low pressure vacuum gauge
- Adaptors
- Hose

Check suction pressure at pre-filter outlet

- Start the engine (can be delayed) and let run for several minutes
- Observe suction pressure in several engine conditions. Check for leaks
- See table below for a list of expected results and go to **1**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than* ***10 s - 12 s*** *each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Pressure value (rel.) bar | Remark |
|---|---|---|
| Low idle speed | **<0.0 bar** | At **900 RPM** |
| High idle | **<0.0 bar** | At **1500 RPM** |

1. Check if the pressures measured are in the range explained in the table above.
   A. If the expected results are OK, go to **4**
   B. If the expected results are NOT OK (Suction pressure too low, above maximum values), go to **2**
   C. If the expected results are NOT OK (Suction pressure too high, below minimum values), go to **3**
2. Possible root cause (Suction pressure too low, above maximum values):
   - Check tightness of tubes, connectors. Any small defect in tightness will lead to a reduced suction pressure. Air will be sucked into the system and the diesel flow will be reduced. (Check that there are no air bubbles in the backflow from the pump)
   - Less diesel in tank
   - Pre-filter blocked or damaged
   - Rare but possible: defective gear pump (exclude the possibility of other hydraulic component before making this conclusion)
   - If present: electrical lift pump defect
3. Possible root cause (Suction pressure too high, below minimum values):
   - Pre-filter blocked or damaged
   - Tubes, connectors squeezed/damaged/wrong diameter
   - Tank system dirty
   - Tank ventilation blocked/dirty (open tank cap, and listen to sucking sound)

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The system works properly.

# 773115 WATER SIGNALLING SENSOR - Test Check water in fuel sensor plausibility

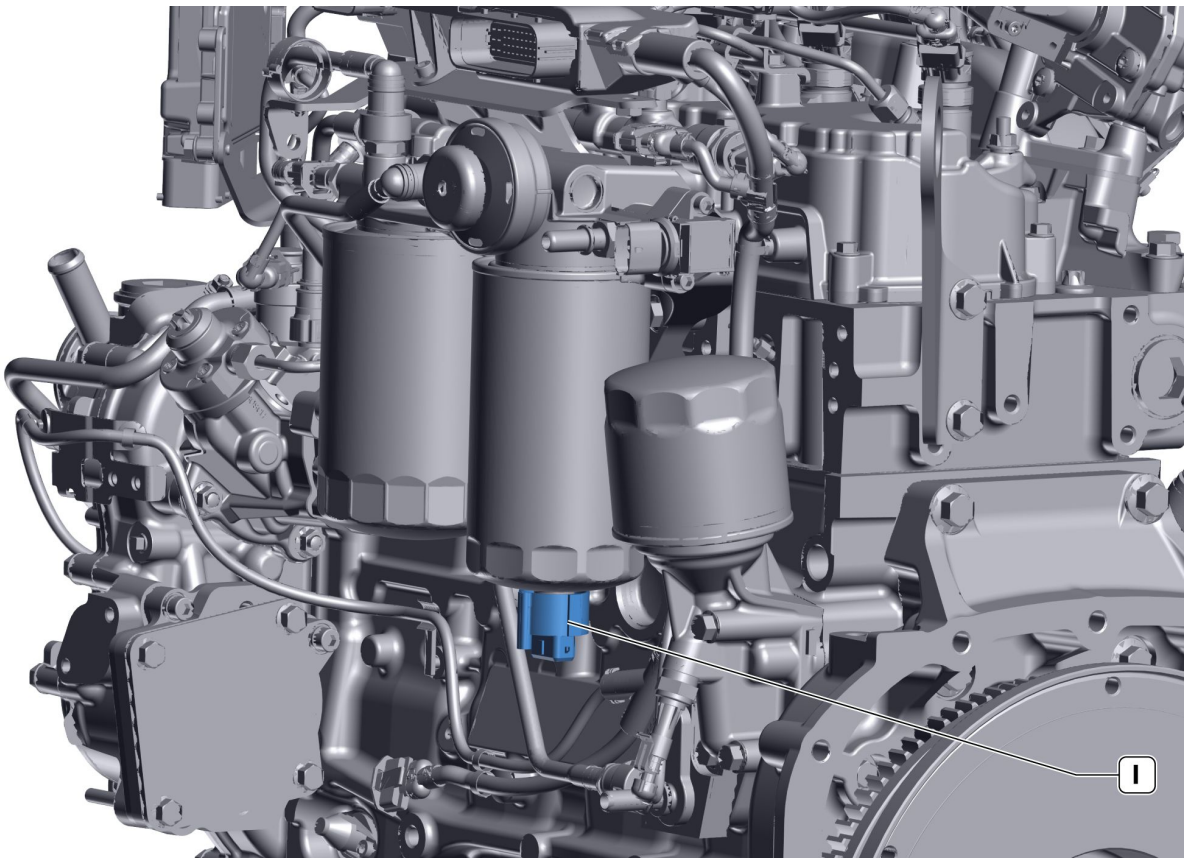
## Preparation

- No visible damage of fuel pre-filter

## Check

Check water in fuel sensor plausibility

- Read fault code memory from ECU
- Check amount of water at fuel pre-filter water in fuel sensor
- See figure and table below for explanation and go to **1**




275056 1

**Water in fuel sensor location at fuel pre-filter**

| Ref. | Description |
|---|---|
| (1) | Water in fuel sensor |

| Status ( ECM SYSTEM DIAGNOSTICS - Self-engage (29.54) ) | Water visible |
|---|---|
| Active | the |
| Not Active | no |

1. Check water in fuel sensor plausibility.
   A. If no water in fuel sensor, go to **3**.
   B. If there is water in the fuel sensor, go to **2**.

2. Possible root cause
   - Electrical defect of the water in fuel sensor.
   - Sensor defect, replace component.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The sensor works properly.

# 774510 HIGH PRESSURE ACCUMULATOR - Test Check external fuel leakage high pressure system

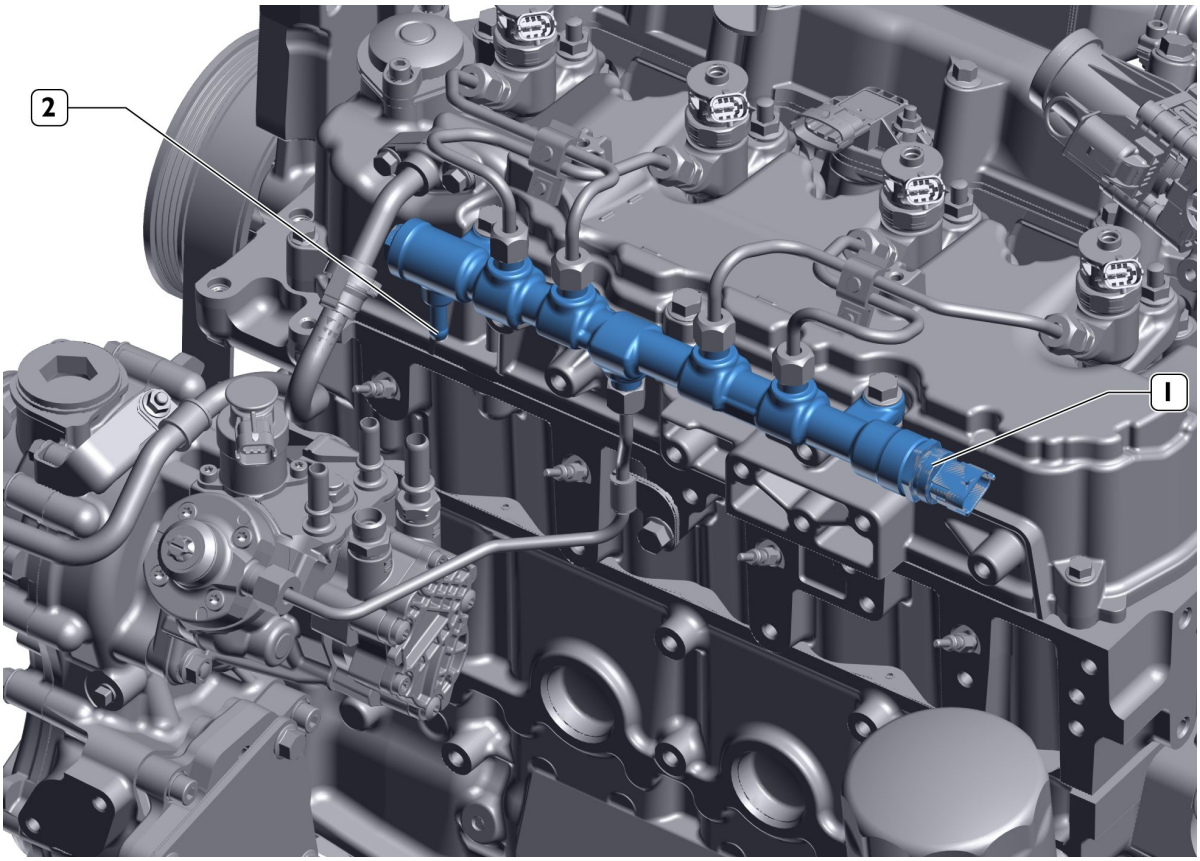
## Preparation

- Access the top part of the engine.

## Check

Check fuel leakage at rail and injectors

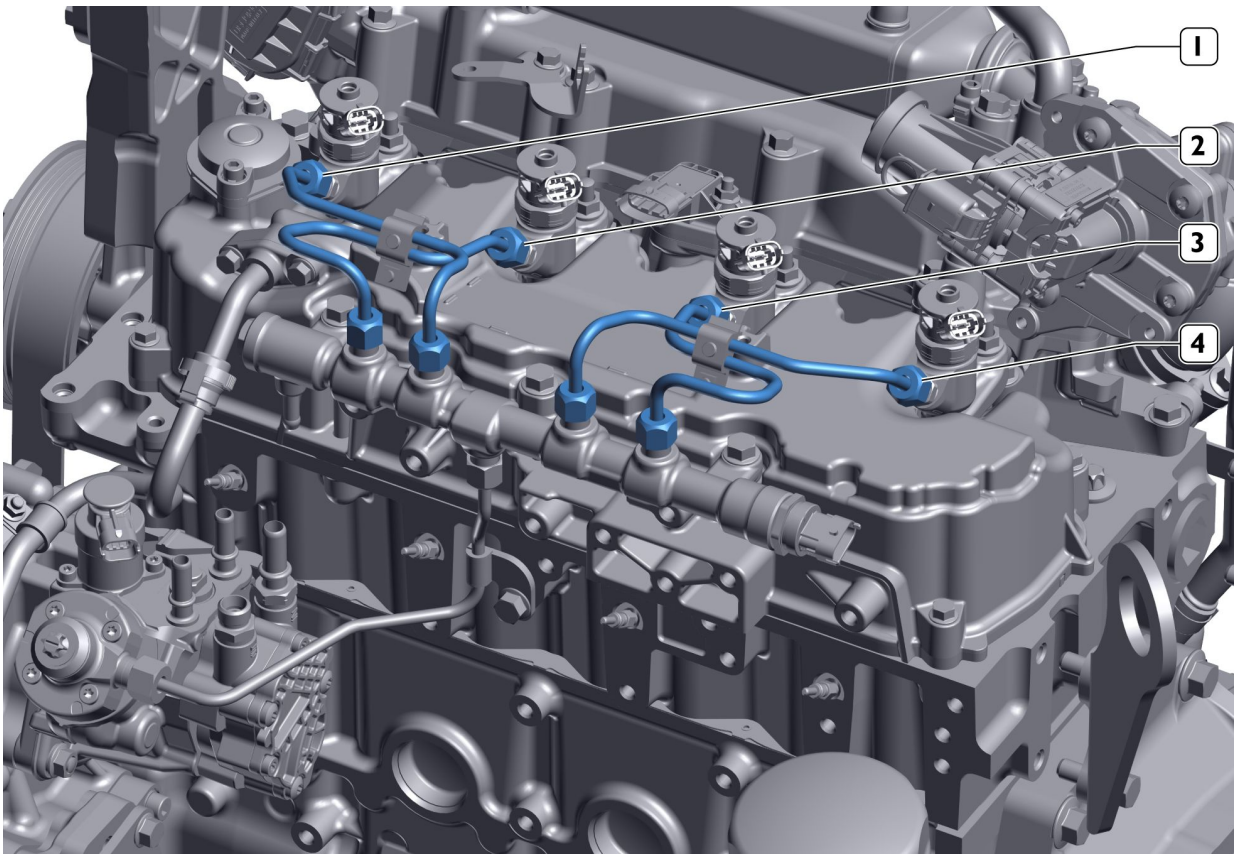
- Check the odours to identify any fuel contamination
- Visually check for any fuel contamination
- See the figures below, then go to **1**




275052 1

**Location of pressure sensor and limiting valve on the rail**

| Ref. | Description |
|---|---|
| (1) | Pressure sensor |
| (2) | Pressure limiting valve |




275051 2

**Location of the fuel rail and injectors**

| Ref. | Description |
|---|---|
| **(1–4)** | Injector high pressure inlets |

1. Check fuel leakage at rail and injectors
   A. No fuel odours are identified
   B. No visible fuel in the high-pressure connectors
   C. If there is no odour of fuel and no sign of any fuel at the connectors, go to **3**.
   D. If there is an odour of diesel and or signs of fuel at the high-pressure connectors, go to **2**.
2. Possible root cause
   - Damaged or leaking rail connectors.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

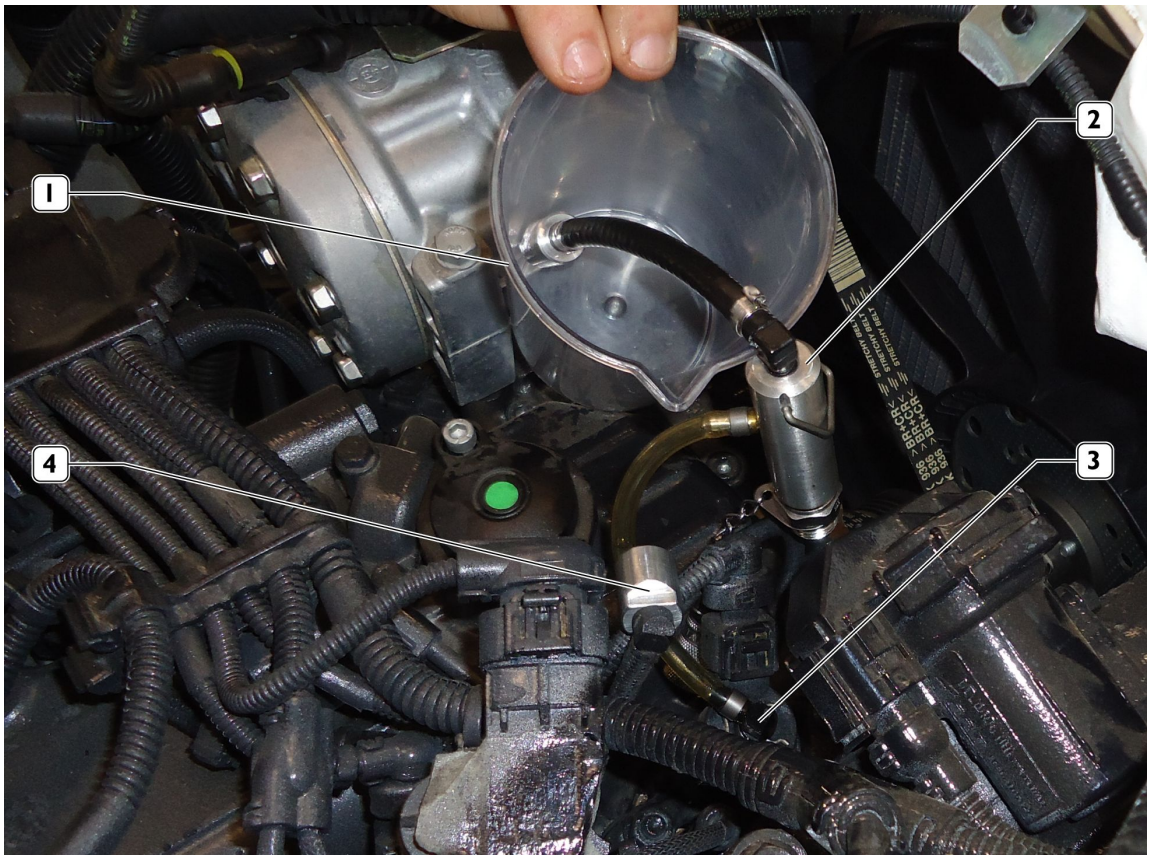
3. The fuel high pressure system works properly.

# 775010 INJECTOR - Test Check single injector backflow rate

## Preparation

If there is a strong suspicion for a too high injector backflow it is recommend to check all injectors individually.

- Visually check the components to ensure there are no external fuel leaks
- Disconnect the backflow hose on injector 1
- Plug the injectors backflow pipe
- Connect the pipe of the tool for measuring the injectors backflow pressure and flow rate on injector 1
- Prepare the stopwatch and measuring cup (min. **250 mL**)
- Insert the pipe from the tool for measuring the injectors flow rate and backflow pressure into the measuring cup
- Look the figures below for preparation:




276356 1

| Ref. | Description |
|---|---|
| (1) | Measuring cup |
| (2) | Equipment for measuring flow rate and injector backflow pressure |
| (3) | Injector backflow fitting |
| (4) | Plug |

## Check

Offboard tools

- Equipment for measuring flow rate and injector backflow pressure
- Measuring cup (min. **250 mL**)
- Stopwatch

Check single injector backflow rate

- If possible run engine until coolant temperature of **75 – 90 °C** is reached
- Crank/start engine until diesel runs out the tube
- Use empty measuring cup
- Leave the engine running, insert the pipe in the measuring device and start the stop watch
- Observe the diesel volume that runs into the measuring device. Use the same time period as in previous check of the high-pressure system backflow rate ( **60 s**)
- Note the injector individual diesel volume
- Repeat previous steps for every injector
- See figure and table below for a list of expected results and go to **1**

***NOTE:*** *Wait for approx.* ***1–2 min*** *between the measurement carried out on one injector and the next to allow the fuel flow to stabilise in the hose.*

| Engine condition | Volume mL / 60 s | | Remark |
|---|---|---|---|
| | Minimum | Maximum | |
| Idle | **4,0 mL** | **6,0 mL** | A **800 RPM** (4-valve engine) |
| High idle | **9,6 mL** | **14,4 mL** | At **1500 RPM** (4-valve engine) |
| Idle | **18,0 mL** | **24,0 mL** | At **850 RPM** (2-valve engine) |
| High idle | **20,0 mL** | **30,0 mL** | At **1500 RPM** (2-valve engine) |

1. Check if the volumes measured are in the range explained in the table above.
   A. If no large deviation of the single injector backflow rates between the single injectors, go to **3**
   B. If no individual injector backflow rate larger than three times the backflow rates of the injector with the smallest amount of backflow rate, go to **3**
   C. If the injectors backflow rate are NOT OK, go to **2**
2. Possible root cause (backflow rate too high)
   - If there are one/some injectors that shows a volume-rate above more than 3-times compared to the injector with the lowest rate, replace the injectors with this high volume rates

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The injector works properly.

# 775010 INJECTOR - Test Injector cut out activation check

## Preparation

General checks

- Battery voltage is sufficient.
- Vehicle fuses are OK.
- Connectors/plugs OK. No loose contact or corrosion.
- Offboard tool Diagnosis tester

## Injector cut out activation check

## Preparation

- Turn the ignition key to ON.
- Start the engine and set its required rpm.
- Connect the diagnostic tester.

## Check

- Deactivate a single injector, so the injector do no longer deliver fuel to the cylinder.




274377 1

- Observe change in system behaviour, such as changed of sound or increasing vibration.
- Repeat previous check with each cylinder.
- Go to **1**

1. Injector cut out activation check
   A. If an injector, which is not delivering sufficient quantity, is deactivated, the system behaviour should not change greatly.
   B. If a working injector is deactivated, the sound will change and the engine will shake noticeably.
   C. If Injector cut out activation is OK go to **3**.
   D. If Injector cut out activation is not OK, go to **2**.
2. Possible root cause
   - Electrical defect of the injector, check wiring harness and component electrically.
   - Mechanical defect of the injector, e.g. seized fuel injector.
   - Engine mechanical defect - Cylinder head gasket damaged - Valve control damaged.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The injector works properly.

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# 507133 TEMPERATURE SENSOR - Test - Particulate matter catalyst exhaust gas temperature sensor

## Description

The Particulate matter catalyst exhaust gas temperature sensor **B-F33** is present in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the temperature upstream of the particulate catalyst.

To refer to the technical data relating to the particulate matter catalyst exhaust gas temperature sensor **B-F33** see **TEMPERATURE SENSOR - Technical Data (50.71)** .

## Troubleshooting

1. Check that the temperature sensors on the exhaust gas treatment system (ATS) are installed correctly and in the specified positions.
2. Use the diagnostic instrument to check that when the engine is cold (< **50 °C**), the values of the temperature sensors on the exhaust gas after-treatment system (ATS) are all aligned and coincide with the ambient temperature.

   The sensors to be checked are the following:

   - Diesel Oxidation Catalyst (DOC) module temperature sensor **B-F32**
   - Particulate matter catalyst temperature sensor of the exhaust gas **B-F33**

   The test should last approx. **60 s** with a sampling frequency of **100 ms**.
   Any misalignment of the temperature value can indicate a fault in a sensor or in the relative electrical circuit.

   A. If the temperature values relating to the sensors in question are aligned, go to step **3**.

   B. If the temperature values relating to the sensors in question are not aligned, identify the sensor with the fault and go to step **4**.
3. Start the engine and bring it to stabilised thermal conditions. Proceed as follow:
   Reduce engine speed to idle for approximately **30 s**.
   Accelerate and keep full throttle ( **100%**) for approx **30 s**.

***NOTE:*** *When using the diagnostic instrument to detect the parameters, make sure that the vehicle is not in a start-up condition.*

Use the diagnostic instrument to check that the temperature sensors on the exhaust gas after-treatment system (ATS) show a decreasing temperature, starting from the sensor closest to the engine and moving towards the one furthest away.

The sensors to be checked, starting from the one closest to the engine are as follows:

- Diesel Oxidation Catalyst (DOC) module temperature sensor **B-F32**
- Particulate matter catalyst temperature sensor of the exhaust gas **B-F33**

Any misalignment of the temperature value can indicate a fault in a sensor or in the relative electrical circuit.

A. If the temperature trend relating to the sensors in question is plausible, go back to the fault identification stage.

B. If the temperature trend relating to the sensors in question are not plausible, identify the sensor with the fault and go to step **4**.

4. Check that the sensor in question returns resistance values which are compatible with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.71)**.

   Proceed as follow:

   - Disconnect sensor from wiring harness.
   - Remove the sensor from the after-treatment system
   - Place the sensor in a pipe which is of the same diameter and material as the one on the vehicle.
   - Heat the sensor using a digital hot air blower.



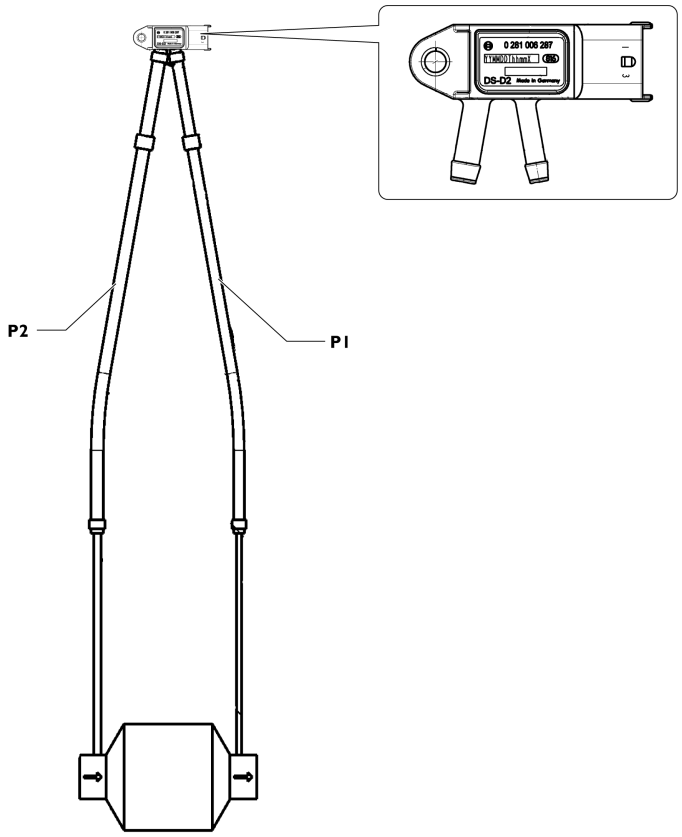
Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury

   - Use a thermal probe to check the temperature.
   - Use a precision multimeter to read the resistance values between the grey cable (signal) and the white cable (ground) and compare them with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.71)**.
   - With temperatures close to those indicated in the table, compatible resistance values should be identified. The linear ratio must be maintained as the temperature changes.

   A. If the resistance values are correct, the sensor is working correctly. Carry out the fault identification procedure.

   B. If the resistance values are incorrect, check the efficiency of the electrical wiring and carry out the fault identification procedure.

# 507134 PRESSURE SENSOR - Test - Particulate matter catalyst differential pressure sensor




**(P1) Pressure downstream of particulate catalyst- (P2) Pressure upstream of particulate catalyst**

## Description

The differential pressure sensor **B-F34** is present in the exhaust gas post-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the difference in pressure between the particulate catalyst inlet and outlet. The differential pressure sensor consists of a piezo-resistive pressure sensor connected to a signal amplification circuit with integrated temperature compensation on a silicon chip. Pressure (P1) acts on the underside of the silicon diaphragm which is resistant to corrosion. The diaphragm is protected by a gel film which prevents any damage due to ice as well as possible signal errors due to accumulation of impurities. Pressure (P2) acts on the upper side of the silicon diaphragm. The top surface of the chip and the connection of the wire to the ceramic substrate are protected against corrosion by the anti-corrosive gel.

To refer to the technical data relating to the differential pressure sensor **B-F34**, see **PRESSURE SENSOR - Technical Data (50.71)**.

## Diagnostics procedure

1. Visually check that the pipes connected to the differential pressure sensor **B-F34** show no sign of restrictions and are not damaged.

A. If the pipes are restricted and/or damaged, replace them and continue with step **4**.

B. If the pipes are not restricted and/or damaged, continue with step **2**.

2. Visually check that the pipes connected to the differential pressure sensor **B-F34** show no sign of obstructions due to dust or other impurities.

   A. If the pipes are obstructed, clean them and continue with step **3**.

   B. If the pipes are not obstructed, continue with step **3**.

3. Visually check that the wiring harness is intact and that the connector of the differential pressure sensor **B-F34** shows no sign of oxidation.

   A. If any damage to the wiring harness or oxidation on the contacts of the connector is detected, replace the wiring harness and continue with step **4**.

   B. If you find no damage to the wiring harness or oxidation on the contacts of the connector, continue with step **4**.

4. Use a diagnostics instrument to check the parameters relating to the differential pressure sensor **B-F34** in the following conditions:

   - Start the engine and maintain idle speed for **15 s**
   - Accelerate to maximum speed for **15 s**
   - Go back to idle speed from **15 s**

   Analyse the graph relating to the pressure differential.

   A. If the pressure differential is positive, this indicates that the sensor is working correctly.Go to step **5**.

   B. If the pressure differential is negative, this indicates that the pipes are not connected correctly. Check the connection layout and repeat the test.

   C. If the pressure differential remains unchanged, it is possible that the component is not working correctly. Return to the fault identification procedure and then go to step **5**.

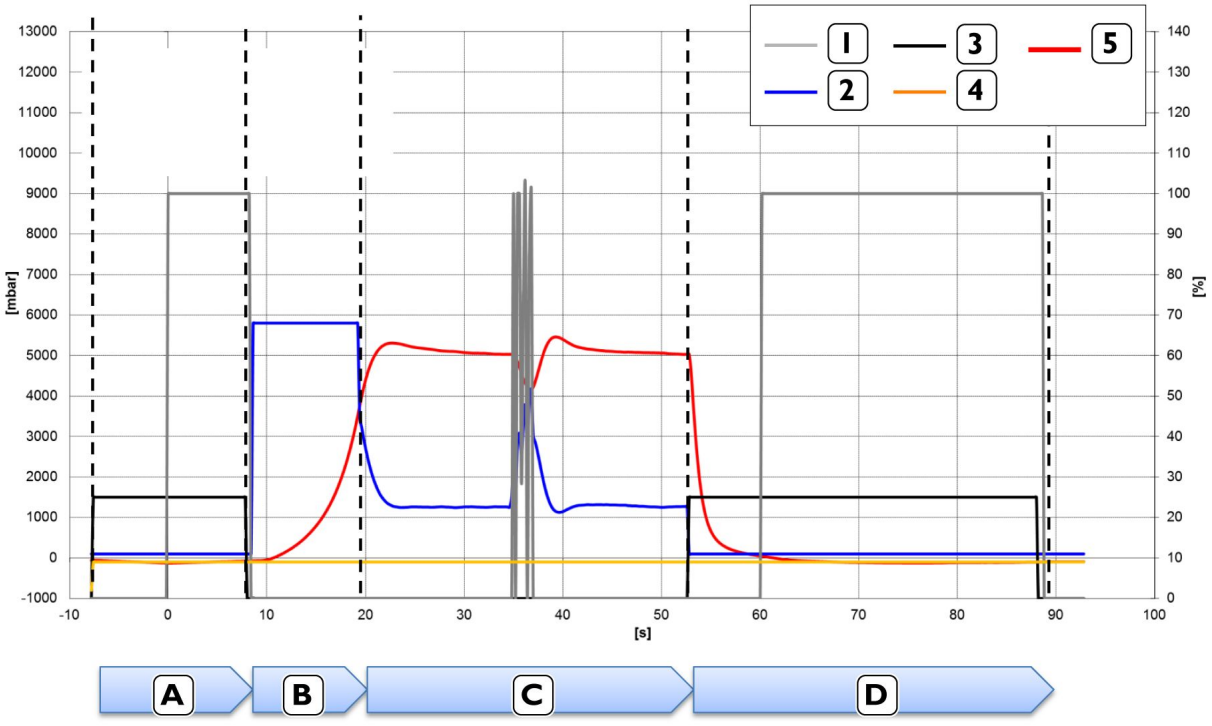
5. Use the diagnostic instrument to carry out a regeneration cycle of the particulate catalyst, disable and clear the fault codes, and check whether the error returns.

   A. If the fault code relating to the differential pressure sensor is not active, carry out a functional test to check correct vehicle operation. Diagnostics can be considered terminated if there are no faults relating to the differential pressure sensor.

   B. If the fault code relating to the differential pressure sensor is active, go back to the fault identification procedure.

# 5074 AD-BLUE SYSTEM - Test - Urea Dosing System Check (UDST) Bosch 6.5 and Bosch 3.3

The Urea-Dosing-System-Test (UDST) is a test procedure carried out by the diagnostic instrument, and which allows the correct installation and operation of the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** dosing components to be checked.



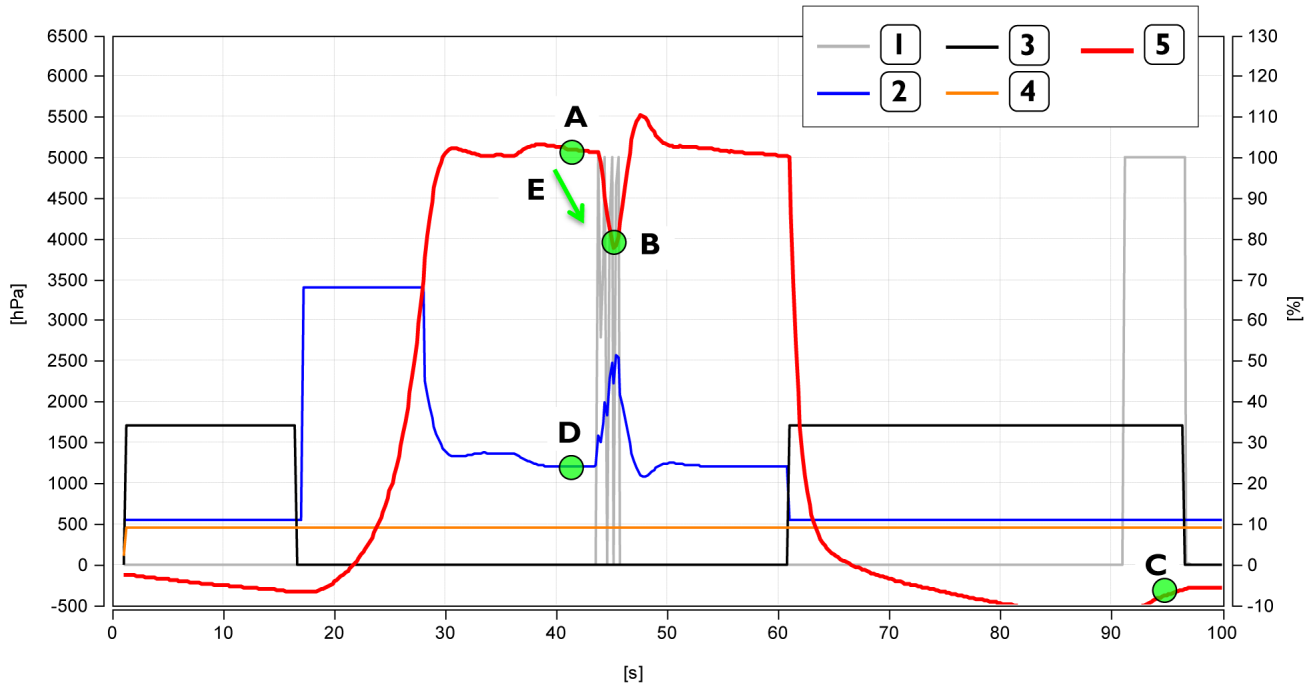

268102 1

**(1) DC dosing module — (2) DC pump — (3) DC return pump — (4) SCR status — (5) Pressure ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**

## Main sections of the UDST test procedure

| | Section | Description |
|---|---|---|
| A | Pressure reduction | Brief emptying stage to bring the system to a specific start phase of the procedure |
| B | Pressure filling and increase | Filling the system following an increase in pressure until the nominal threshold **5 bar** is reached |
| C | Stabilising pressure and injection | Stabilising phase of the pressure following a short injection |
| D | Evacuation | Emptying phase of the lines, the dosing module and the supply module |

## Assessment of the UDST test procedure




268103-01 2

**(1) DC dosing module — (2) DC pump — (3)DC return pump — (4) SCR status — (5) Pressure AdBlue fluid level. Meets the requirements of ISO 22241. Qualification IVECO Standard 18-1852**

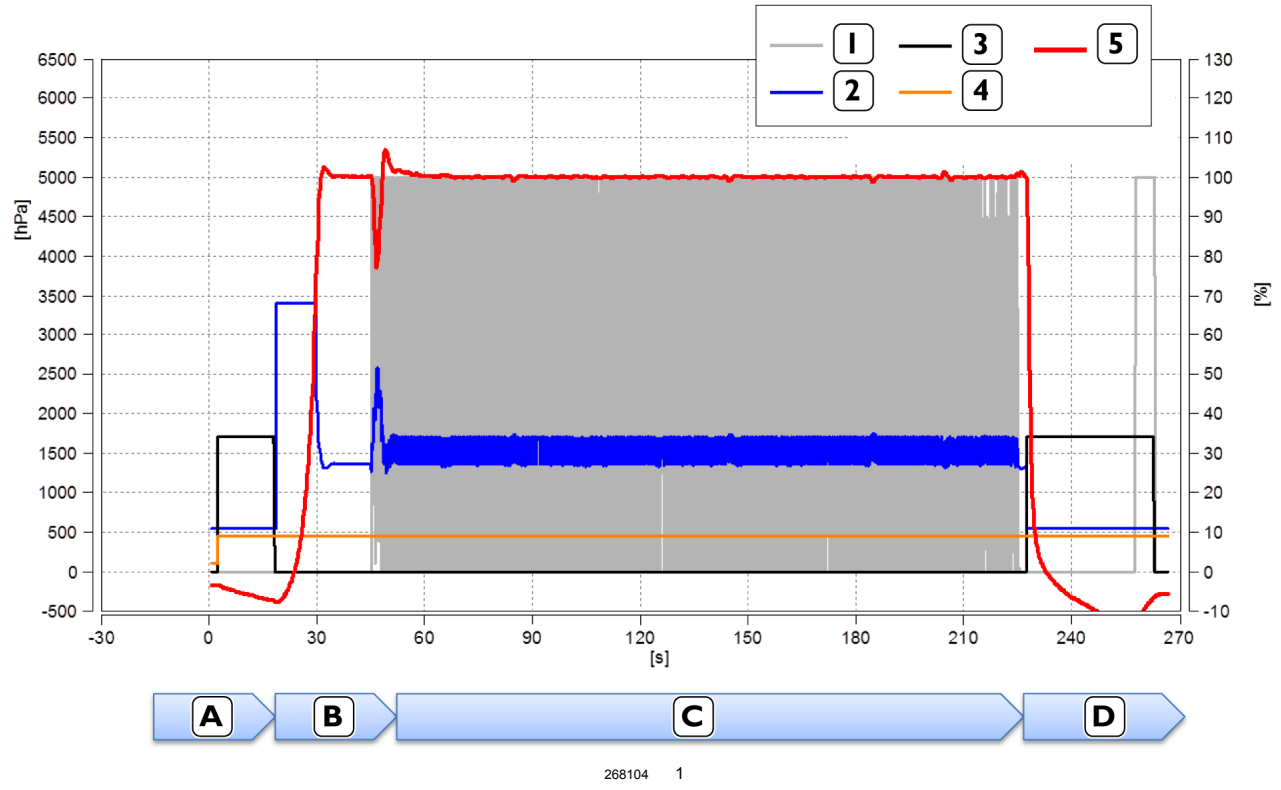
| Assessment point | Type | Upper limit | Lower limit |
|---|---|---|---|
| A | Operating pressure | **5300 mbar** | **4700 mbar** |
| B | Pressure on injection | No limit applied, data used to calculate the drop in pressure during injection | |
| C | Pressure on emptying | **0 mbar** | **–1000 mbar** |
| D | Pump working cycle | **28%** | **18%** |
| E | Pressure drop during injection | **- mbar** | **250 mbar** |

# 5074 AD-BLUE SYSTEM - Test - Urea Dosing Valve Check (UDVC) Bosch 6.5 and Bosch 3.3

The Urea-Dosing-Valve-Check (UDVC) is a test procedure carried out by the diagnostic instrument, which allows the correct amount of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injected by the dosing module to be checked. The procedure involves removing the dosing module and checking the amount injected using a graded container.

During the procedure, a flow rate of **2000 g/h** and an injection amount of **100 g** is considered. The amount of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injected must be between **± 10%** of the nominal value.

| Test | Flow Rate | Amount injected | Test duration | Lower limit of injected amount | Upper limit of injected amount |
|---|---|---|---|---|---|
| UDVC | **2000 g/h** | **100 g** | **270 s** | **90 g** | **110 g** |




268104 1

**(1) DC dosing module — (2) DC pump — (3) DC return pump — (4) SCR status — (5) Pressure ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**

## Main sections of the UDVC test procedure

The UDVC procedure can be divided into 4 sequential sections:

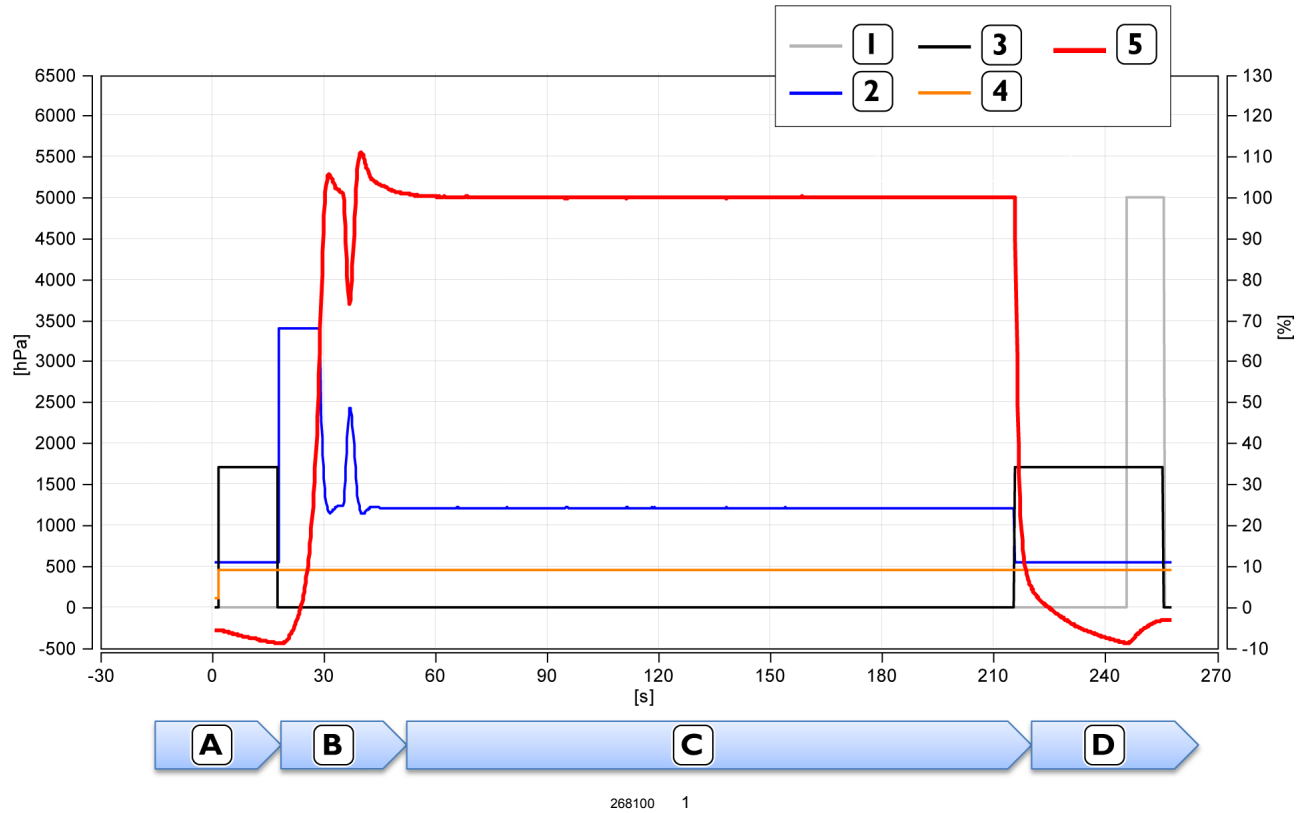
| | Section | Description |
|---|---|---|
| A | Pressure reduction | Brief emptying stage to bring the system to a specific start phase of the procedure |
| B | Pressure filling and increase | Refilling the system after an increase in pressure |
| C | Stabilising pressure and injection | Pressure stabilisation phase followed by injection |

| | | |
|---|---|---|
| D | Evacuation | Emptying phase of the lines, the dosing module and the supply module |

# 5074 AD-BLUE SYSTEM - Test - Urea Dosing Leakage Check (UDLC) Bosch 6.5 and Bosch 3.3

The Urea-Dosing-Leakage-Check (UDLC) is a test procedure carried out by the diagnostic instrument, which allows verification of an **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** leak by pressurising the system for a specific length of time. **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** is not injected during the test.

| Test | Flow Rate | Amount injected | Test duration | Criteria of acceptability |
|---|---|---|---|---|
| UDLC | **0 g/h** | **0 g** | **250 s** | No **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** leak |




**(1) DC dosing module — (2) DC pump — (3) DC return pump — (4) SCR status — (5) Pressure ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**

## Main sections of the UDLC test procedure

The UDLC procedure can be divided into 4 sequential sections:

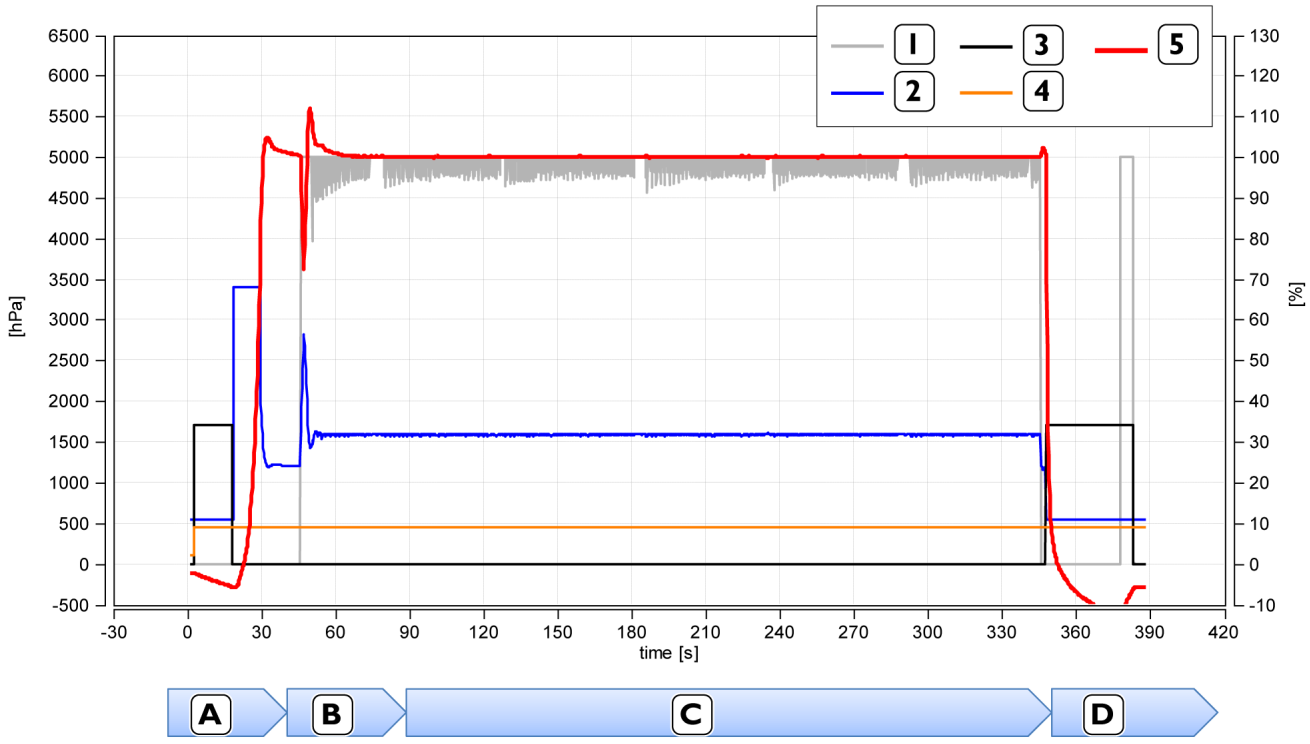
| | Section | Description |
|---|---|---|
| A | Pressure reduction | Brief emptying stage to bring the system to a specific start phase of the procedure |
| B | Pressure filling and increase | Refilling the system after an increase in pressure |
| C | Pressure stabilisation | Pressure stabilisation phase |
| D | Evacuation | Emptying phase of the lines, the dosing module and the supply module |

# 5074 AD-BLUE SYSTEM - Test - Urea Dosing Pump Check (UDPC) Bosch 6.5 and Bosch 3.3

The Urea-Dosing-Pump-Check (UDVC) is a test procedure carried out by the diagnostic instrument, which allows the correct amount of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injected by the dosing module to be checked. The procedure involves removing the dosing module and checking the amount injected using a graded container.

During the procedure, a flow rate of **3120 g/h** and an injection amount of **260 g** is considered for a period of **390 s**

| Test | Flow Rate | Amount injected | Test duration | Criteria of acceptability |
|---|---|---|---|---|
| UDPC | **3120 g/h** | **260 g** | **390 s** | Stable pressure during the entire test |




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**(1) DC dosing module — (2) DC pump — (3) DC return pump — (4) SCR status — (5) Pressure ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**

## Main sections of the UDPC test procedure

The UDPC procedure can be divided into 4 sequential sections:

| | Section | Description |
|---|---|---|
| A | Pressure reduction | Brief emptying stage to bring the system to a specific start phase of the procedure |
| B | Pressure filling and increase | Refilling the system after an increase in pressure |
| C | Stabilising pressure and injection | Stabilising phase of the pressure followed by an injection equal to the maximum flow rate deliverable |
| D | Evacuation | Emptying phase of the lines, the dosing module and the supply module |

# 5074 AD-BLUE SYSTEM - Test - Bosch 6.5 supply module and Bosch 3.3 dosing module

## Description

The **M-F42A** supply module in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** serves basically to take the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** from the tank and send it under pressure to the dosing module **Y-F44A**.

The supply module **M-F42A** consists basically of a diaphragm pump which takes the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** from the tank and sends it to the dosing module **Y-F44A**. It is equipped with a circuit connected to the engine cooling system which, in the case of low temperature, prevents the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** from freezing. The amount of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** sent to the dosing module **Y-F44A** and the injection pressure are both controlled by the engine control unit and are based on the engine operating conditions and the signals sent by the sensors. To prevent damage to the pump and the dosing module, the supply module has a filter inside which cleans the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** of any impurities.

To refer to the technical data relating to the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** supply module **M-F42A**, see **AD-BLUE UNIT PUMP MODULE - Technical Data (50.74)**.

To refer to the technical data relating to the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852 Y-F44A** dosing module, see **AD-BLUE METERING DEV MODU - Technical Data (50.74)**.

## Troubleshooting

1. Use the diagnostic instrument to carry out the Urea Dosing System Test (UDST) **AD-BLUE SYSTEM - Test (50.74)** .
2. On the basis of the system conditions, the test will return the following fault modes:

| Fault Mode | Description | connection |
|---|---|---|
| EM-0 | No fault and/or anomaly present. System responds correctly | - |
| EM-1 | Obstruction on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** return line | **ERROR MODE – 1** |
| EM-2 | **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** leak from the delivery line | **ERROR MODE – 2** |
| EM-3 | Operating pressure too low | **ERROR MODE – 3** |
| EM-4 | Pressurised line blocked | **ERROR MODE – 4** |

| | | |
|---|---|---|
| EM-5 | Fault relating to return valve | **ERROR MODE – 5** |
| EM-99 | Theoretical anomaly or fault, not foreseeable | **ERROR MODE – 99** |

ERROR MODE – 1

If the UDST tests returns EM-1 mode, proceed as follows:

A: Obstruction on the return line.

1. Visually check that there are no obstructions or crushed sections on the lines relating to the return line.
2. Clean or replace the damaged lines.
3. Repeat the UDST test and check that the fault has been resolved.

B: Valve clogged or non-return valve blocked (does not open).

1. Check that the **AdBlue fluid level. Meets the requirements of ISO 22241. Qualification IVECO Standard 18-1852** returns correctly.
2. Disconnect the return line connector from the supply module and start the UDST procedure. Visually check that there is a constant flow of **AdBlue fluid level. Meets the requirements of ISO 22241. Qualification IVECO Standard 18-1852**. If the flow is not constant, go back to the fault identification procedure.
3. Repeat the UDST test and check that the fault has been resolved.

C: Impurities in the return line filter.

1. Go back to the fault identification procedure.
2. Repeat the UDST test and check that the fault has been resolved.

D: Pump malfunction.

1. Go back to the fault identification procedure.

Repeat the UDST procedure and check that the fault has been resolved.

ERROR MODE – 2

If the UDST tests returns EM-2 mode, proceed as follows:

A: **AdBlue fluid level. Meets the requirements of ISO 22241. Qualification IVECO Standard 18-1852** leak from the delivery line.

1. Visually check that there are no leaks from the lines. Repair or replace the damaged line.
2. Visually check there are no leaks from the connections on the dosing module. Repair or replace the damaged component (if present).
3. Visually check there are no leaks from the connections on the supply module (delivery). Repair or replace the damaged component (if present).
4. Repeat the UDST test and check that the fault has been resolved.

B: Obstruction on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** suction line.

1. Visually check that there are no obstructions or crushed sections on the lines relating to the suction line. Repair or replace the damaged line.
2. Repeat the UDST test and check that the fault has been resolved.

C: Clogging of the supply module pre-filter.

1. Make sure that the supply module pre-filter is not clogged. Replace the supply module pre-filter if necessary.

Carry out the Urea Dosing Leakage Check (UDLC) procedure **AD-BLUE SYSTEM - Test (50.74)** .
During the UDLC test, the supply module brings the system up to pressure and keeps it pressurised for a given period of time. During the test, **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injection is not activated. This is useful for checking for the presence of leaks or gaps.
Repeat the UDST procedure and check that the fault has been resolved.

ERROR MODE – 3

If the UDST tests returns EM-3 mode, proceed as follows:

A: Operating pressure too low - **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank empty.

1. Check the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** level in the tank. Restore the correct level of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**.

B: Incorrect connection of the inlet and outlet lines on the supply module or on the tank.

1. Check that the inlet and outlet lines are both connected correctly. Pay careful attention to the indications on the supply module.

C: Serious **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** leak from the pressurised components.

1. Visually check that there are no leaks from the lines. Repair or replace the damaged line.
2. Repeat the UDST test and check that the fault has been resolved.

D: Obstruction in the aeration line of the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank.

1. Check that the aeration line of the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank is not obstructed by crystallised Urea or a restricted section. Clean / repair or replace the damaged line.

E: Obstruction on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** suction line.

1. Visually check that there are no obstructions or crushed sections on the lines relating to the suction line. Repair or replace the damaged line.

F: Clogging of the supply module pre-filter.

1. Make sure that the supply module pre-filter is not clogged. Replace the supply module pre-filter if necessary.

G: Leak on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** suction line.

1. Visually check that there are no leaks relating to the suction line. Repair or replace the damaged line.

***NOTE:*** *Leaks relating to the suction line are extremely difficult to detect. There are no clear leaks outwards but the air is being sucked in.*
*In you are in any doubt, carry out a test using a new suction line and supply the pump module from a separate tank filled with* ***ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852****.*

1. Visually check that the O-rings on the connections of the supply module and the tank are not damaged. Replace the damaged O-rings.
2. Check that the suction line from the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank is not damaged. If necessary, replace the suction line from the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank.

H: Supply module fault (faulty diaphragm pump, faulty return valve…).

1. Go back to the fault identification procedure.

I: Drift of values returned from the pressure sensor.

1. Go back to the fault identification procedure.

Carry out the Urea Dosing Valve Check (UDVC) procedure **AD-BLUE SYSTEM - Test (50.74)**. During the UDVC test, it is possible to evaluate the volume of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** supplied by the injector. The verification is possible by disassembling the injector and delivering into a graded container.

Carry out the Urea Dosing Pump Check (UDPC) procedure **AD-BLUE SYSTEM - Test (50.74)**. During the UDPC test it is possible to evaluate the maximum flow rate of the supply module pump. The verification is possible by disassembling the injector and delivering into a graded container.

The pressure must remain stable during the entire test.

Carry out the UDLC procedure **AD-BLUE SYSTEM - Test (50.74)**. During the UDLC test, the supply module brings the system up to pressure and keeps it pressurised for a given period of time. During the test, **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injection is not activated. This is useful for checking for the presence of leaks or gaps.

Repeat the UDST procedure and check that the fault has been resolved.

ERROR MODE – 4

If the UDST tests returns EM-4 mode, proceed as follows:

A: Dosing valve blocked (in both the open and the closed position).

- Repeat the UDST test twice. The first time to release the system and the second time to verify the presence of operating conditions.

***NOTE:*** *The **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injector may block due to deposits of crystallised Urea. The condition can often be resolved by repeating the test or dissolving the deposits with **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**.*

- If the second test also gives a negative result, go back to the fault identification procedure.

***NOTE:*** *The dosing module must be replaced if it has been subjected to thermal damage resulting from exposure to excessively high temperatures. The **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injector may block due to deposits of crystallised Urea. The condition can often be resolved by repeating the test or dissolving the deposits with **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**.*

B: Serious obstruction on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** delivery line.

1. Visually check that there are no obstructions or crushed sections on the lines relating to the delivery line. Repair or replace the damaged line.
2. Check that the delivery line is not clogged with solid particles. Clean or replace the line as necessary.

Carry out the UDVC procedure **AD-BLUE SYSTEM - Test (50.74)** . During the UDVC test, it is possible to evaluate the volume of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** supplied by the injector. The verification is possible by disassembling the injector and delivering into a graded container.

Carry out the UDPC procedure **AD-BLUE SYSTEM - Test (50.74)** . During the UDPC test it is possible to evaluate the maximum flow rate of the supply module pump. The verification is possible by disassembling the injector and delivering into a graded container.

The pressure must remain stable during the entire test.

Repeat the UDST procedure and check that the fault has been resolved.

ERROR MODE – 5

If the UDST tests returns EM-5 mode, proceed as follows:

A: Fault relating to the purging pump

1. Check operation of the purging pump and, if it is not working correctly, go back to the fault identification procedure.

Carry out the UDPC procedure **AD-BLUE SYSTEM - Test (50.74)**. During the UDPC test it is possible to evaluate the maximum flow rate of the supply module pump. The verification is possible by disassembling the injector and delivering into a graded container.

The pressure must remain stable during the entire test.

Repeat the UDST procedure and check that the fault has been resolved.

ERROR MODE – 99

If the UDST tests returns EM-99 mode, proceed as follows:

A: Theoretical anomaly or fault, not foreseeable.

1. Fault which has not occurred before. Repeat the UDST test
2. If the UDST test confirms error EM-99, contact the Technical Help Desk.

# 507424 AD-BLUE INDICATOR - Test - AdBlue level and temperature sensor

The DEF/AdBlue® quality, level and temperature sensor **B-F43-46**is present in the exhaust gas after treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** temperature, level and quality inside the tank.

To refer to the technical data relating to the DEF/AdBlue® temperature and level sensor **B-F43-46**, see **AD-BLUE INDICATOR - Technical Data (50.74)**.

## Diagnostics procedure

1. Use the diagnostic instrument to acquire the data relating to the temperature of the fluid in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank. Use a digital thermometer with a probe to acquire the temperature data relating to the fluid in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank. Compare the data provided by the diagnostic instrument with the data acquired directly using the digital thermometer.
   A. If the temperature values match, this indicates that the temperature read by the sensor is correct. Go to step **2**.
   B. If the temperature values do not coincide, this indicates that the sensor might not be working correctly. Go back to the fault identification procedure.

2. Use the diagnostic instrument to acquire the data relating to the level of liquid present in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank in the following conditions:
   - **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank completely empty ( **0%**).
   - **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank full to **50%**, use the capacity data to determine the exact amount of liquid to be introduced.
   - **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank completely empty ( **100%**)

   Analyse the three sets of data provided by the diagnostic instrument, checking that they are consistent with the three different test conditions.

   A. If the values related to the level sensor are consistent, this indicates that the sensor is working correctly. Continue with the troubleshooting procedure.

   B. If the values relating to the level sensor are not consistent, check the efficiency of the electrical wiring and carry out the fault identification procedure.

# 507433 CROSSOVER VALVE - Test - DEF/AdBlue® tank heating valve

## Description:

The heating valve of the DEF/AdBlue® tank **Y-F60** is present in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and has the dual purpose of preventing the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** from freezing and also preventing the dosing module from overheating. The switching valve is a 2 position/3-way solenoid valve. Depending on the temperatures detected by the NTC sensor, the switching valve will close or open the passage of the engine coolant in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank heating coil. The cooling circuit of the dosing module will always remain open. The first position allows cooling of the dosing module, the second position allows heating of the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank and relative pipes.

To refer to the technical data relating to the DEF/AdBlue® **Y-F60** heating valve, see **CROSSOVER VALVE - Technical Data (50.74)** .

## Diagnostics procedure

1. Check the internal resistor of the DEF/Ad-blue® tank heating valve **Y-F60**. Proceed as follows:
   - Use a multimeter to check that the resistance recorded between the two pins of the connector of the valve **Y-F60** is between **30 – 34 Ω** and **25 °C** for version **24 V** and **20 – 24 Ω** and **25 °C** for version **12 V**.
     A. If the resistance measured is between **30 – 34 Ω** and **25 °C** for the **24 V** version and **20 – 24 Ω** and **25 °C** for the **12 V** version, go to step **2**.
     B. If the measured resistance is not between **30 – 34 Ω** at **25 °C** for the version **24 V**and **20 – 24 Ω** at **25 °C** for the version **12 V**, the component may not work correctly. Return to the troubleshooting procedure.

2. Start the engine and bring it to a stabilised operating temperature. Power the valve **Y-F60** and use a designated digital thermometer with a probe to check that the temperature of the liquid in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank rises.
   A. If there is an increase in the temperature of the liquid in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank, go to step **3**.
   B. If there is no increase in the temperature of the liquid in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank, this indicates that the component might not be working correctly. Go back to the fault identification procedure.
3. Use a diagnostics tool to disable and clear the fault code. Restore the operating conditions of the vehicle and check that the fault code relating to the DEF/AdBlue® **Y-F60** tank heating valve does not activate.
   A. If the fault code relating to the DEF/AdBlue® tank heating valve is not active, this indicates that the sensor is operating correctly. Continue with the fault identification procedure.
   B. If the fault code relating to the DEF/AdBlue® tank heating valve is active, check the efficiency of the wiring and continue with the fault identification procedure.

# 507434 TEMPERATURE SENSOR - Test - Exhaust gas temperature sensor upstream of the DOC

## Description

The Diesel Oxidation Catalyst (DOC) module temperature sensor **B-F32** is included in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the temperature at the inlet of the catalyst. The sensor consists of an internal platinum resistor crossed by a voltage of **5 V** which allows indirect measurement of the resistance as the temperature varies. The sensor allows the engine electronic control unit (ECU) **A-F02** to constantly adapt the supply of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** to the engine load conditions.

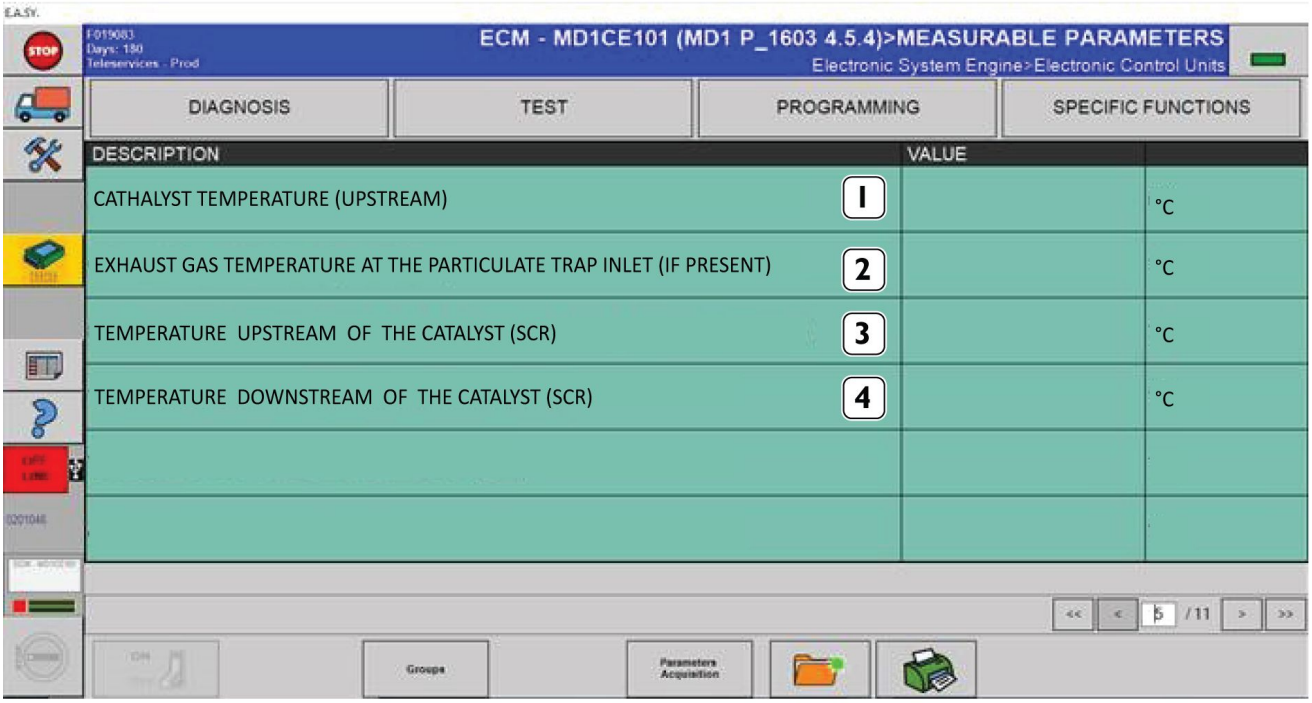
To consult the technical data regarding the Diesel Oxidation Catalyst (DOC) module temperature sensor **B-F32** see **TEMPERATURE SENSOR - Technical Data (50.74)** .

## Diagnostics procedure

1. Check that the temperature sensors on the exhaust gas treatment system (ATS) are installed correctly and in the specified positions.
2. Use the diagnostic instrument to check that when the engine is cold, the values of the temperature sensors on the exhaust gas after-treatment system (ATS) are all aligned and coincide with the ambient temperature.

   The sensors to be checked are the following:

   1. Exhaust gas temperature sensor upstream of DOC **B-F32**
   2. Exhaust gas temperature sensor downstream of DOC **B-F113**
   3. Exhaust gas temperature sensor upstream of SCR **B-F38**
   4. Exhaust gas temperature sensor downstream of SCR **B-F39**




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Any misalignment of the temperature value can indicate a fault in a sensor or in the relative electrical circuit.

A. If the temperature values corresponding to the sensors detected are in-line, adjust the temperature of the engine by following the instructions in step **3** and then go to step **4**.

B. If the temperature values relating to the sensors in question are not aligned, identify the sensor with the fault and continue with step **8**.

3. Adjust the temperature of the engine as follows:
   1. Keep the ignition switch in the “ON” position for **15 s**.
   2. Start the engine and maintain idle speed for **15 s**
   3. Keep the engine at **2000 RPM** for **30 s**
   4. Keep the engine at **1600 RPM** for **30 s** with the exhaust choking valve closed at **90%**
   5. Keep the engine at idle speed for **15 s**
4. Use the diagnostic instrument to check that the temperature sensors on the exhaust gas after-treatment system (ATS) show a decreasing temperature, starting from the sensor closest to the engine and moving towards the one furthest away in the exhaust.

   The test should last approx. **300 s** with a sampling frequency of **200 ms**.

***NOTE:*** *When using the diagnostic instrument to detect the parameters, make sure that the vehicle is not in a start-up condition.*

The sensors to be checked with a decreasing temperature sequence are:

1. Exhaust gas temperature sensor upstream of DOC **B-F32**
2. Exhaust gas temperature sensor downstream of DOC **B-F113**
3. Exhaust gas temperature sensor upstream of SCR **B-F38**
4. Exhaust gas temperature sensor downstream of SCR **B-F39**

5. If the decreasing temperature trend is not observed, this indicates a malfunction of a sensor or the relative electric circuit.

   A. If the temperature values relating to the sensors in question do observe the decreasing temperature trend, continue with step **6**.

   B. If the temperature values relating to the sensors in question do not observe the decreasing temperature trend, this indicates a malfunction in a sensor or the relative electrical circuit. Go to step **8**.

6. Check that the sensors in question return resistance values which are compatible with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

7. Proceed as follow:

   1. Disconnect sensor from wiring harness.
   2. Remove the sensor from the after-treatment system.
   3. Place the sensor in a pipe which is of the same diameter and material as the one on the vehicle.
   4. Heat the sensor using a digital hot air blower.



Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury

- Use a thermal probe to check the temperature.
- Use a precision multimeter to read the resistance values between pin 1 and pin 2 of the temperature sensor in question and compare them with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

A. If the resistance values are correct, the sensor is working correctly. Continue with the fault identification procedure.

B. If the resistance values are incorrect, continue with step. **8**.

8. Check the efficiency of the electrical wiring and carry out the fault identification procedure.

# 507434 TEMPERATURE SENSOR - Test - Exhaust gas temperature sensor upstream of the SCR

## Description

The exhaust gas temperature sensor upstream of SCR **B-F38** is included in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the temperature at the catalyst inlet. The exhaust gas temperature sensor upstream of SCR **B-F38** is located in the after-treatment system, between the DOC module and the SCR catalyst. It consists of an internal platinum resistor crossed by a voltage of **5 V** which allows indirect measurement of the resistance as the temperature varies. The sensor allows the engine electronic control unit (ECU) **A-F02** to constantly adjust the supply of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** according to the emissions.

To consult the technical data regarding the exhaust gas temperature sensor upstream of SCR **B-F38** see **TEMPERATURE SENSOR - Technical Data (50.74)** .

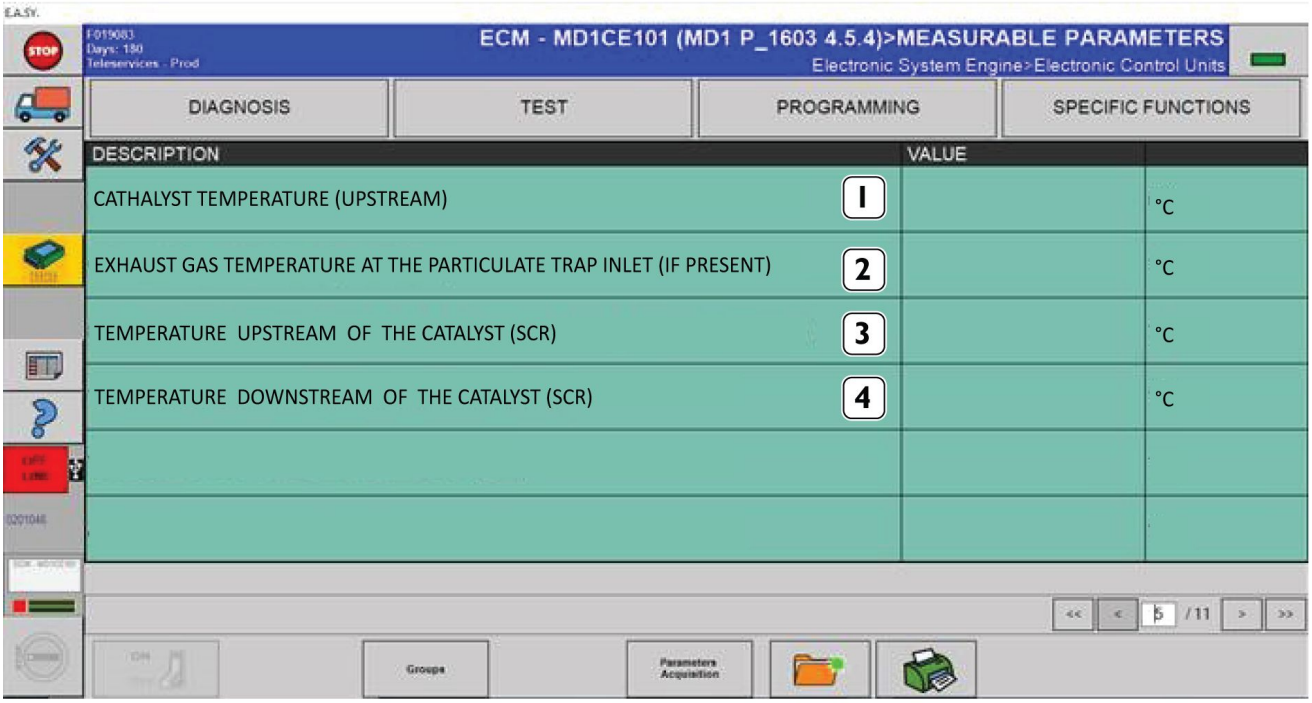
***NOTE:*** *The error codes regarding the exhaust gas temperature sensor upstream of SCR **B-F38** become immediately non-active when the temperature at the SCR input drops below the threshold value. When the vehicle s in the workshop it is probable that the error code is non-active.*

## Diagnostics procedure

1. Check that the temperature sensors on the exhaust gas treatment system (ATS) are installed correctly and in the specified positions.
2. Use the diagnostic instrument to check that when the engine is cold, the values of the temperature sensors on the ATS system are all aligned and coincide with the ambient temperature.

   The sensors to be checked are the following:

   1. Exhaust gas temperature sensor upstream of DOC **B-F32**
   2. Exhaust gas temperature sensor downstream of DOC **B-F113**
   3. Exhaust gas temperature sensor upstream of SCR **B-F38**
   4. Exhaust gas temperature sensor downstream of SCR **B-F39**




289656-01 1

Any misalignment of the temperature value can indicate a fault in a sensor or in the relative electrical circuit.

A. If the temperature values corresponding to the sensors detected are in-line, adjust the temperature of the engine by following the instructions in step **3** and then go to step **4**.

B. If the temperature values relating to the sensors in question are not aligned, identify the sensor with the fault and continue with step **8**.

3. Adjust the temperature of the engine as follows:
   1. Keep the ignition switch in the “ON” position for **15 s**.
   2. Start the engine and maintain idle speed for **15 s**
   3. Keep the engine at **2000 RPM** for **30 s**
   4. Keep the engine at **1600 RPM** for **30 s** with the exhaust choking valve closed at **90%**
   5. Keep the engine at idle speed for **15 s**
4. Use the diagnostic instrument to check that the temperature sensors on the exhaust gas after-treatment system (ATS) show a decreasing temperature, starting from the sensor closest to the engine and moving towards the one furthest away in the exhaust.

   The test should last approx. **300 s** with a sampling frequency of **200 ms**.

***NOTE:*** *When using the diagnostic instrument to detect the parameters, make sure that the vehicle is not in a start-up condition.*

The sensors to be checked with a decreasing temperature sequence are:

1. Exhaust gas temperature sensor upstream of DOC **B-F32**
2. Exhaust gas temperature sensor downstream of DOC **B-F113**
3. Exhaust gas temperature sensor upstream of SCR **B-F38**
4. Exhaust gas temperature sensor downstream of SCR **B-F39**

5. If the decreasing temperature trend is not observed, this indicates a malfunction of a sensor or the relative electric circuit.

   A. If the temperature values relating to the sensors in question do observe the decreasing temperature trend, continue with step **6**.

   B. If the temperature values relating to the sensors in question do not observe the decreasing temperature trend, this indicates a malfunction in a sensor or the relative electrical circuit. Go to step **8**.

6. Check that the sensors in question return resistance values which are compatible with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

7. Proceed as follow:

   1. Disconnect sensor from wiring harness.
   2. Remove the sensor from the after-treatment system.
   3. Place the sensor in a pipe which is of the same diameter and material as the one on the vehicle.
   4. Heat the sensor using a digital hot air blower.



Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury

- Use a thermal probe to check the temperature.
- Use a precision multimeter to read the resistance values between pin 1 and pin 2 of the temperature sensor in question and compare them with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

A. If the resistance values are correct, the sensor is working correctly. Continue with the fault identification procedure.

B. If the resistance values are incorrect, continue with step. **8**.

8. Check the efficiency of the electrical wiring and carry out the fault identification procedure.

# 507434 TEMPERATURE SENSOR - Test - Exhaust gas temperature sensor downstream of the SCR

## Description

The exhaust gas temperature sensor downstream of SCR **B-F39** is included in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the temperature at the catalyst outlet. The exhaust gas temperature sensor downstream of SCR **B-F39** is located in the after-treatment system downstream of the SCR catalyst. It consists of an internal platinum resistor crossed by a voltage of **5 V** which allows indirect measurement of the resistance as the temperature varies. The sensor allows the engine electronic control unit (ECU) **A-F02** to constantly adjust the supply of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** according to the emissions.

To consult the technical data regarding the exhaust gas temperature sensor downstream of SCR **B-F39** see **TEMPERATURE SENSOR - Technical Data (50.74)** .

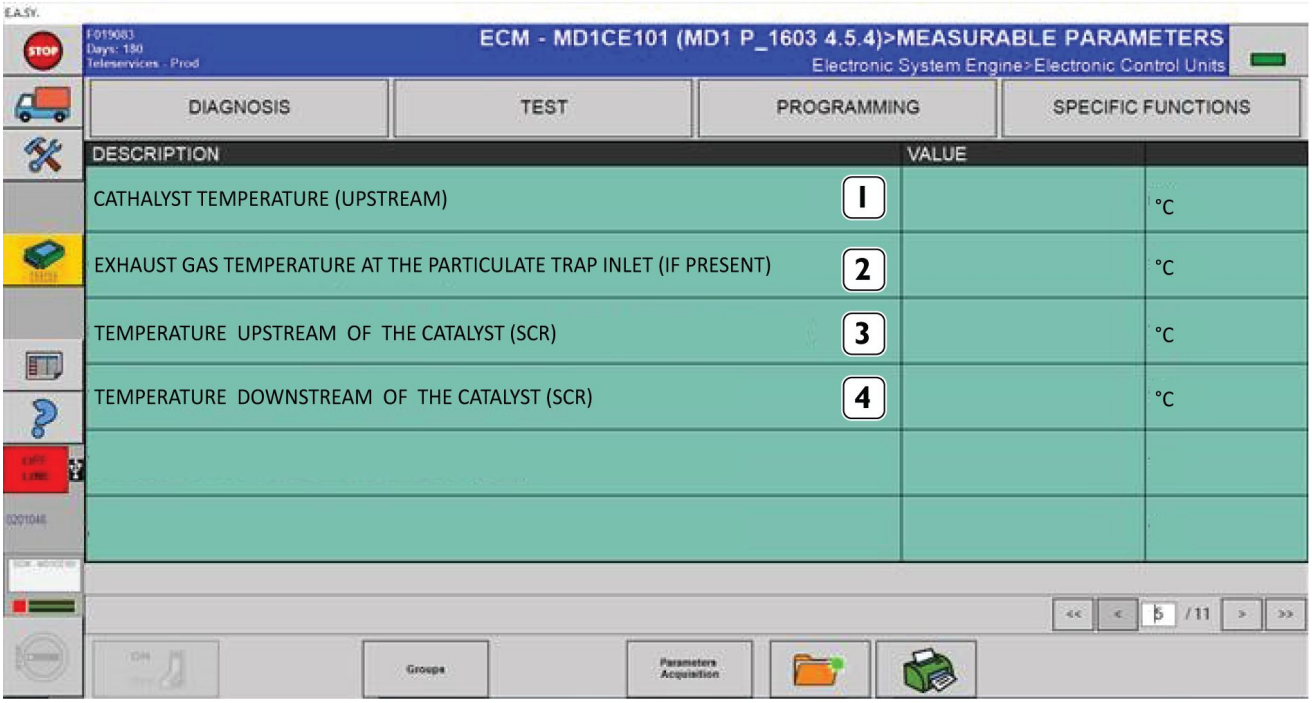
***NOTE:*** *The error codes regarding the exhaust gas temperature sensor downstream of SCR **B-F39** become immediately non-active when the temperature at the SCR output drops below the threshold value. When the vehicle s in the workshop it is probable that the error code is non-active.*

## Diagnostics procedure

1. Check that the temperature sensors on the exhaust gas treatment system (ATS) are installed correctly and in the specified positions.
2. Use the diagnostic instrument to check that when the engine is cold, the values of the temperature sensors on the ATS system are all aligned and coincide with the ambient temperature.

   The sensors to be checked are the following:

   1. Exhaust gas temperature sensor upstream of DOC **B-F32**
   2. Exhaust gas temperature sensor downstream of DOC **B-F113**
   3. Exhaust gas temperature sensor upstream of SCR **B-F38**
   4. Exhaust gas temperature sensor downstream of SCR **B-F39**




289656-01 1

Any misalignment of the temperature value can indicate a fault in a sensor or in the relative electrical circuit.

A. If the temperature values corresponding to the sensors detected are in-line, adjust the temperature of the engine by following the instructions in step **3** and then go to step **4**.

B. If the temperature values relating to the sensors in question are not aligned, identify the sensor with the fault and continue with step **8**.

3. Adjust the temperature of the engine as follows:
   1. Keep the ignition switch in the “ON” position for **15 s**.
   2. Start the engine and maintain idle speed for **15 s**
   3. Keep the engine at **2000 RPM** for **30 s**
   4. Keep the engine at **1600 RPM** for **30 s** with the exhaust choking valve closed at **90%**
   5. Keep the engine at idle speed for **15 s**
4. Use the diagnostic instrument to check that the temperature sensors on the exhaust gas after-treatment system (ATS) show a decreasing temperature, starting from the sensor closest to the engine and moving towards the one furthest away in the exhaust.

   The test should last approx. **300 s** with a sampling frequency of **200 ms**.

***NOTE:*** *When using the diagnostic instrument to detect the parameters, make sure that the vehicle is not in a start-up condition.*

The sensors to be checked with a decreasing temperature sequence are:

1. Exhaust gas temperature sensor upstream of DOC **B-F32**
2. Exhaust gas temperature sensor downstream of DOC **B-F113**
3. Exhaust gas temperature sensor upstream of SCR **B-F38**
4. Exhaust gas temperature sensor downstream of SCR **B-F39**

5. If the decreasing temperature trend is not observed, this indicates a malfunction of a sensor or the relative electric circuit.

   A. If the temperature values relating to the sensors in question do observe the decreasing temperature trend, continue with step **6**.

   B. If the temperature values relating to the sensors in question do not observe the decreasing temperature trend, this indicates a malfunction in a sensor or the relative electrical circuit. Go to step **8**.

6. Check that the sensors in question return resistance values which are compatible with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

7. Proceed as follow:

   1. Disconnect sensor from wiring harness.
   2. Remove the sensor from the after-treatment system.
   3. Place the sensor in a pipe which is of the same diameter and material as the one on the vehicle.
   4. Heat the sensor using a digital hot air blower.



Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury

- Use a thermal probe to check the temperature.
- Use a precision multimeter to read the resistance values between pin 1 and pin 2 of the temperature sensor in question and compare them with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

A. If the resistance values are correct, the sensor is working correctly. Continue with the fault identification procedure.

B. If the resistance values are incorrect, continue with step. **8**.

8. Check the efficiency of the electrical wiring and carry out the fault identification procedure.

# 507435 NOX DETECTION SENSOR - Test - NOx sensor downstream of the SCR

## Description

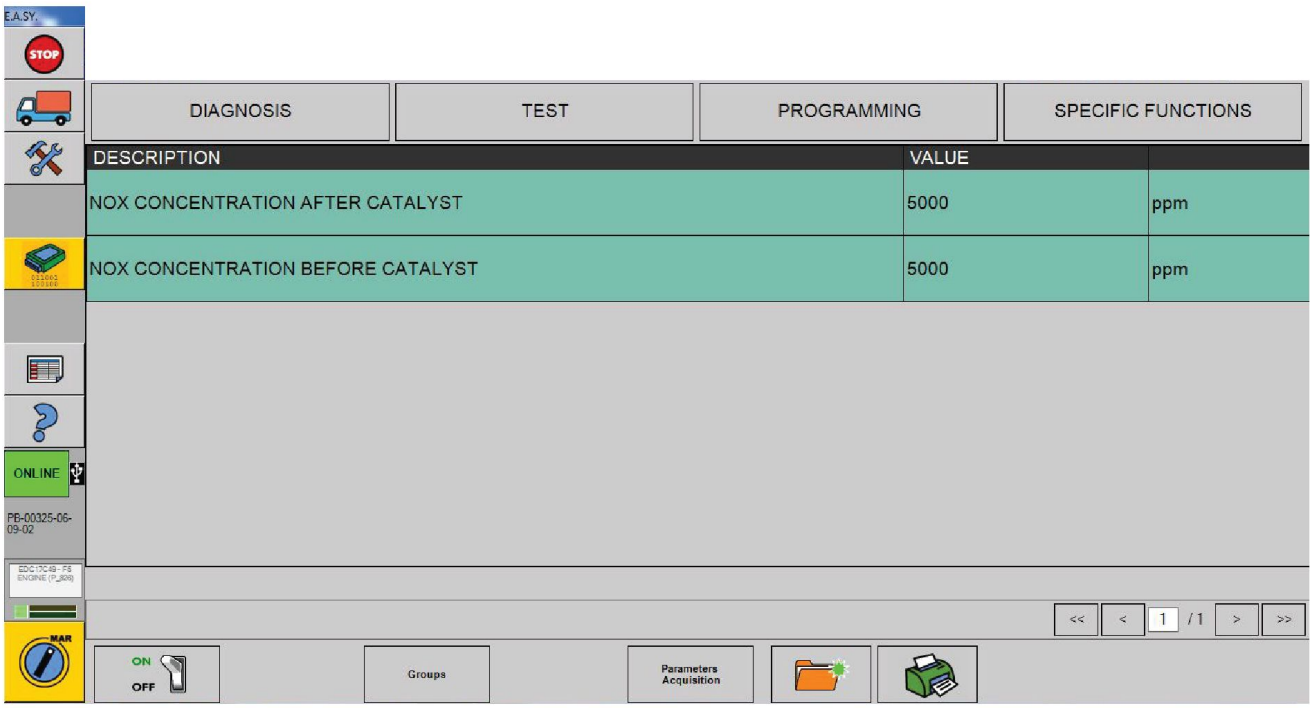
The NOx sensor **B-F49** is downstream of the Selective Catalytic Reduction (SCR) and is in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)**. The NOx sensor **B-F49** consists of two parts: an electronic module and the sensor body, connected by wiring. The two components are inseparable. The NOx **B-F49** outlet sensor detects the amount of nitrogen oxide leaving the SCR system and, via the CAN network, it allows the Engine Control Unit **A-F02** to constantly adjust the supply of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** according to the emissions.

To consult the technical data relating to the NOx sensor **B-F49** see **NOX DETECTION SENSOR - Technical Data (50.74)**.

***NOTE:*** *The electronic control unit activates the sensor only when the temperature inside the exhaust duct is sufficiently high to prevent the presence of condensate, otherwise the sensor could be damaged.*

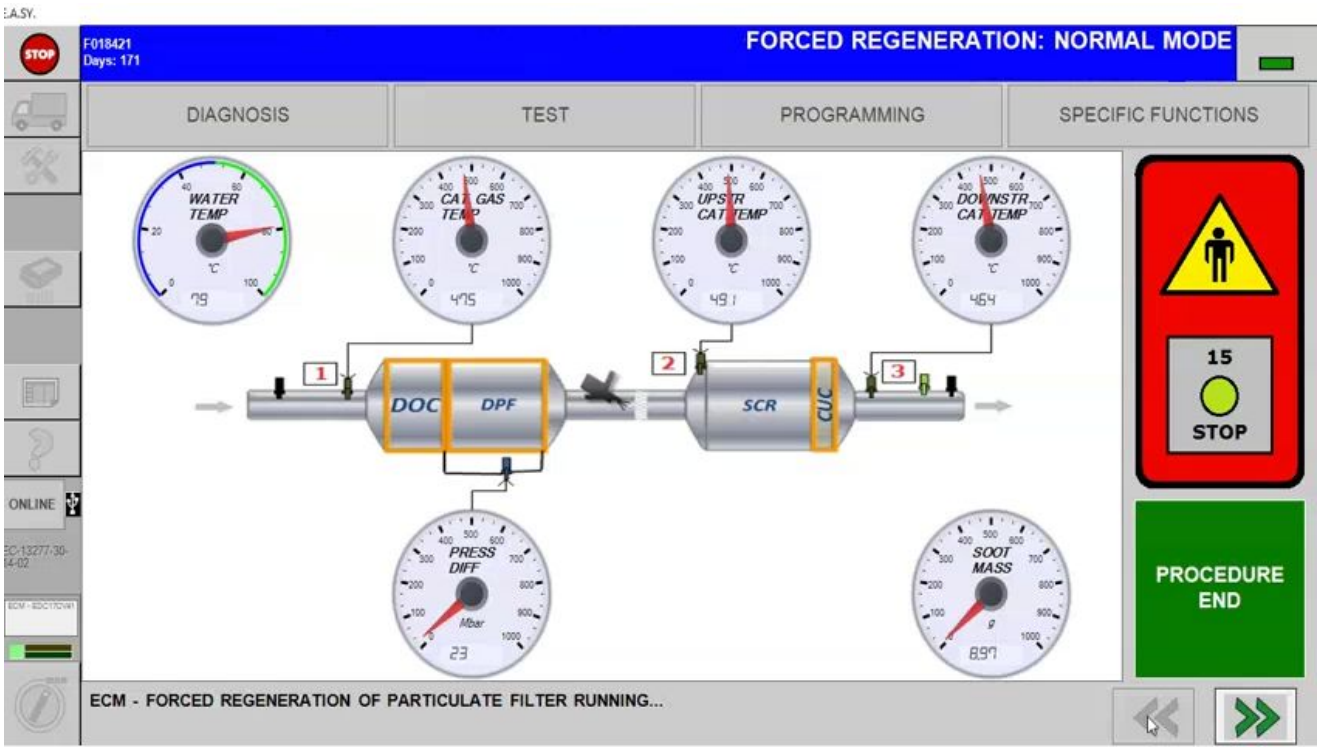
## Diagnostics procedure

1. Use the diagnostic instrument to monitor the values relating to the following sensors:
   - Upstream Nox sensor **B-F67** of the Selective Catalytic Reduction (SCR)
   - NOx sensor downstream **B-F49** of the Selective Catalytic Reduction (SCR)



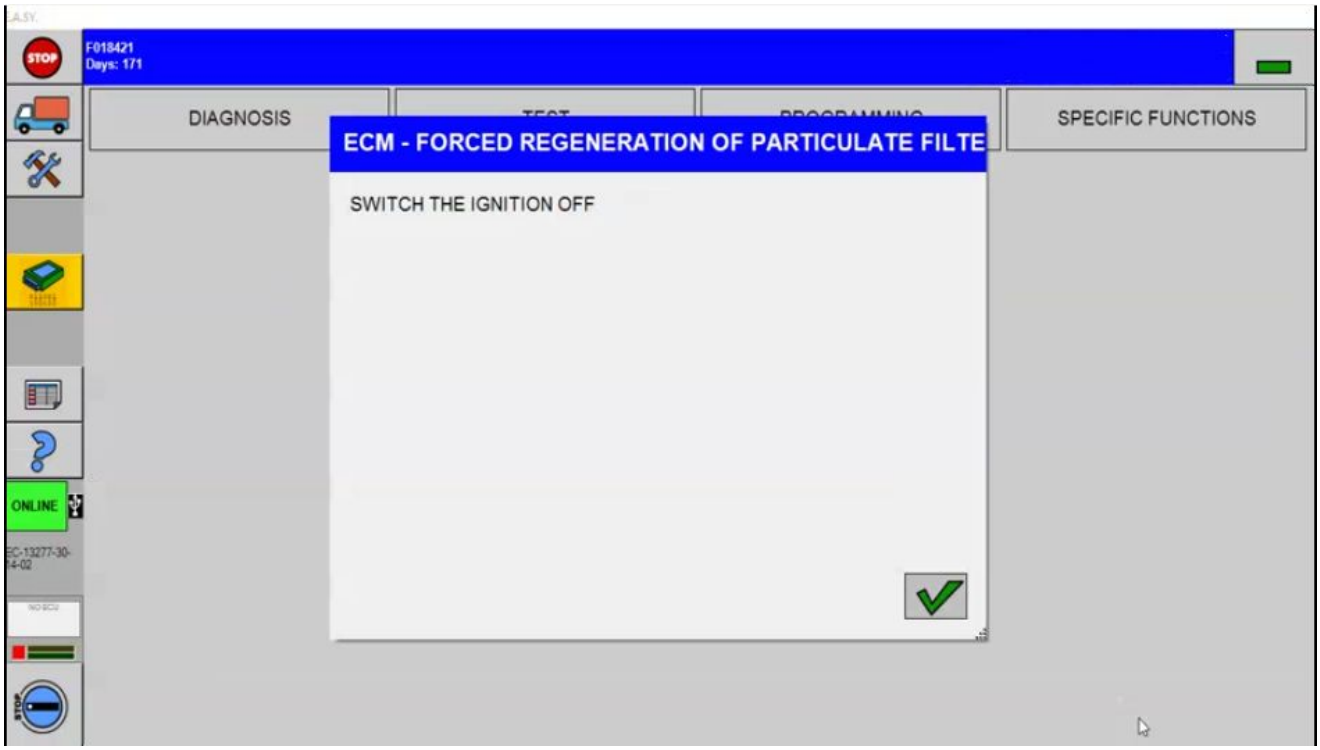

266051 1

2. Using the diagnostic tool, start the forced regeneration procedure of the DPF filter



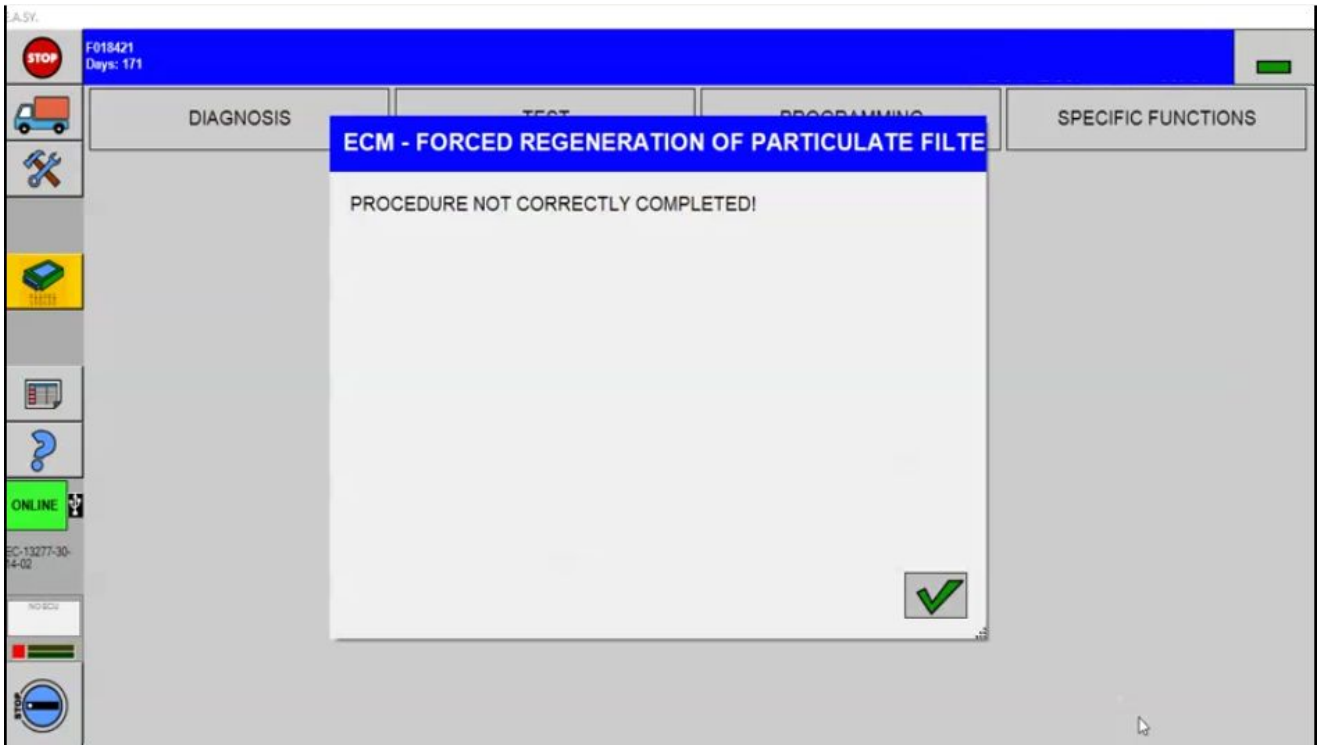

290081 2

3. Stop the forced regeneration procedure of the DPF filter before the cooling phase in order to obtain high temperatures in the exhaust gas after treatment system



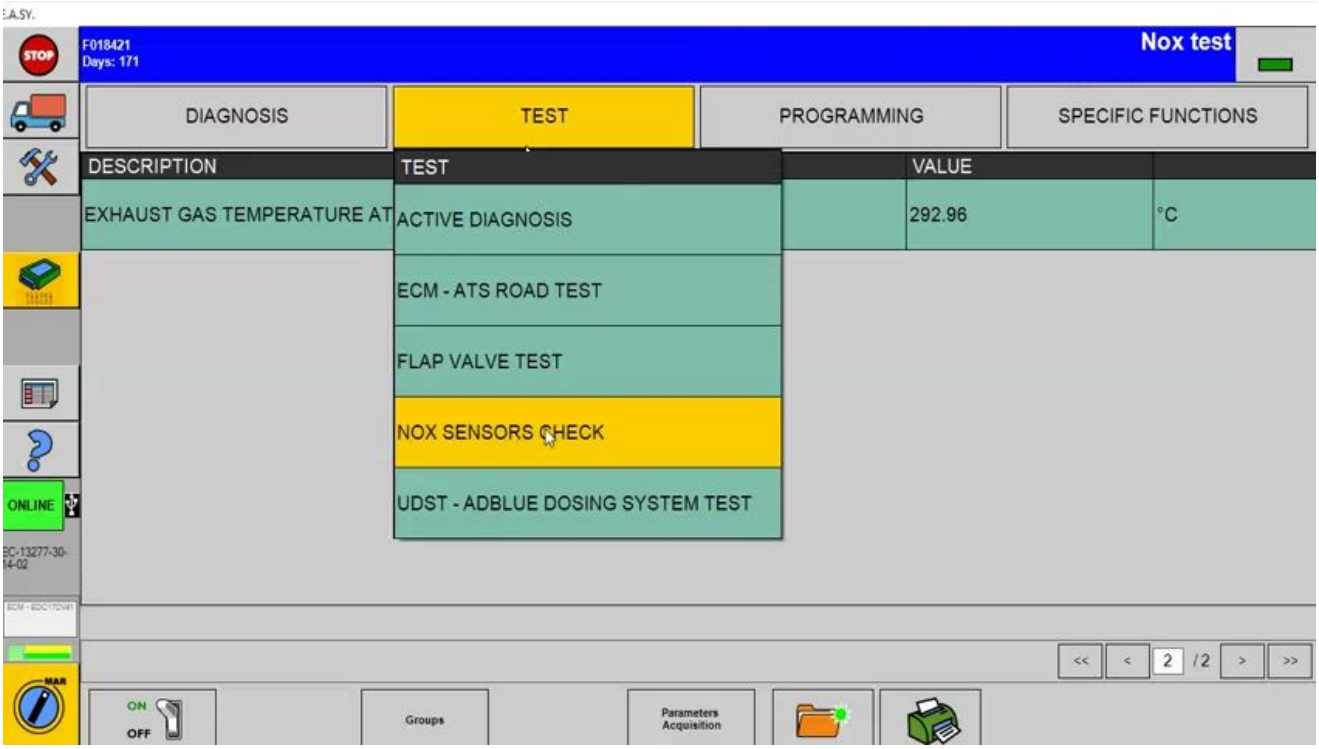

290085 3

4. The interruption of the forced regeneration procedure of the DPF filter will automatically stop the engine




290086 4

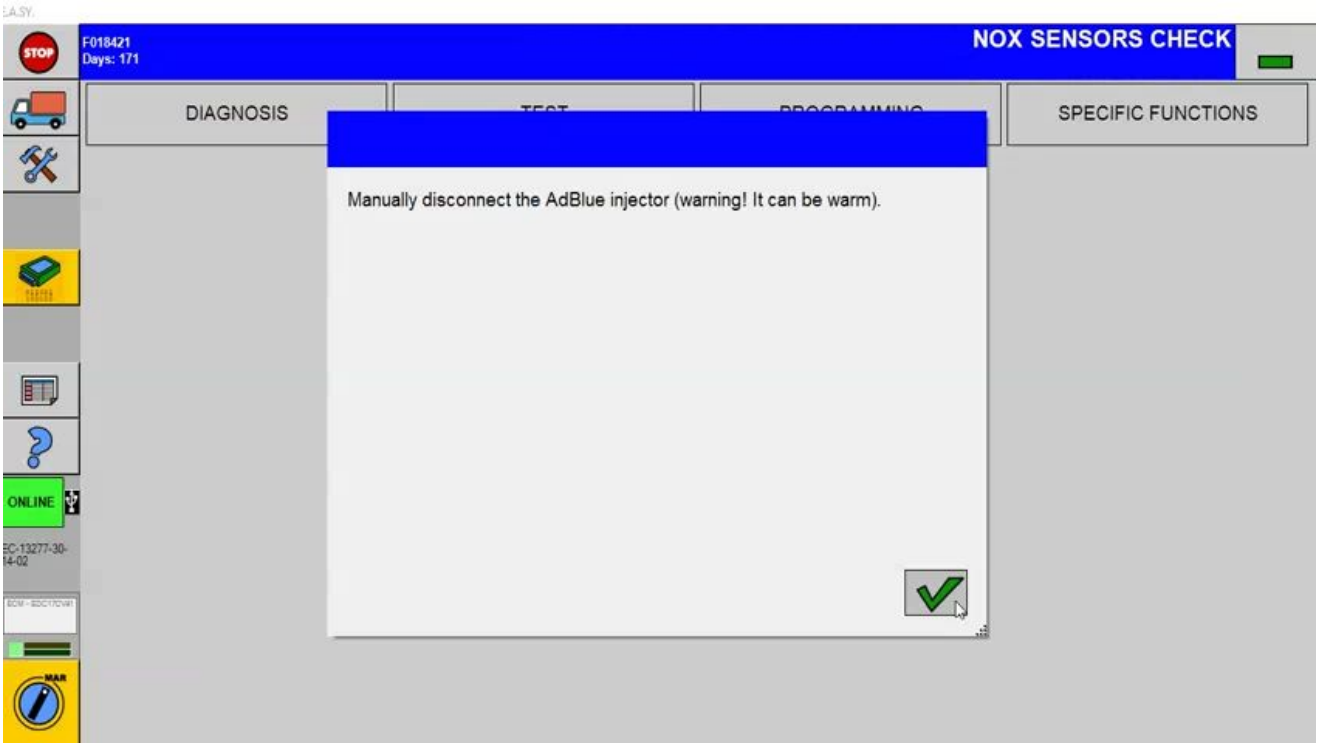
5. Using the diagnostic tool, start the active diagnosis of the NOx sensors




290087 5

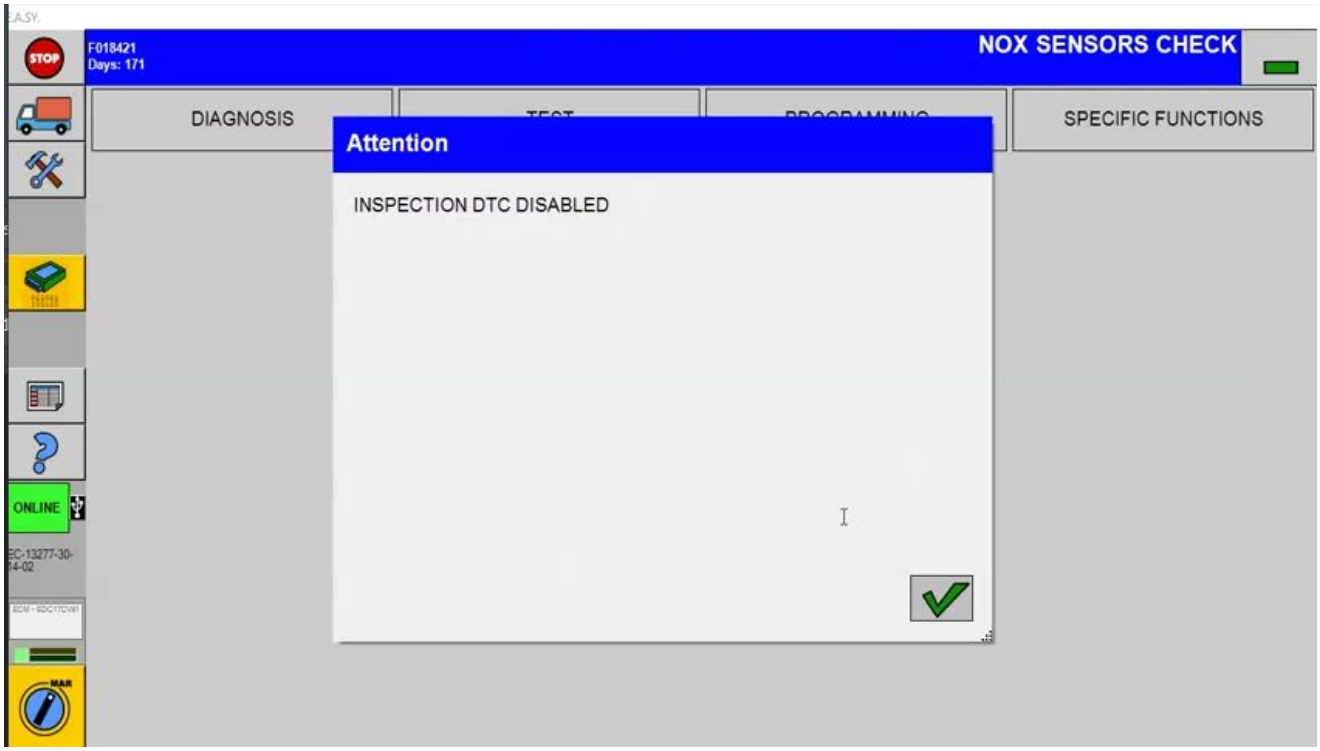
6. Manually disconnect the connector of the dosing module **X-F44** / **X-F44A**

Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury



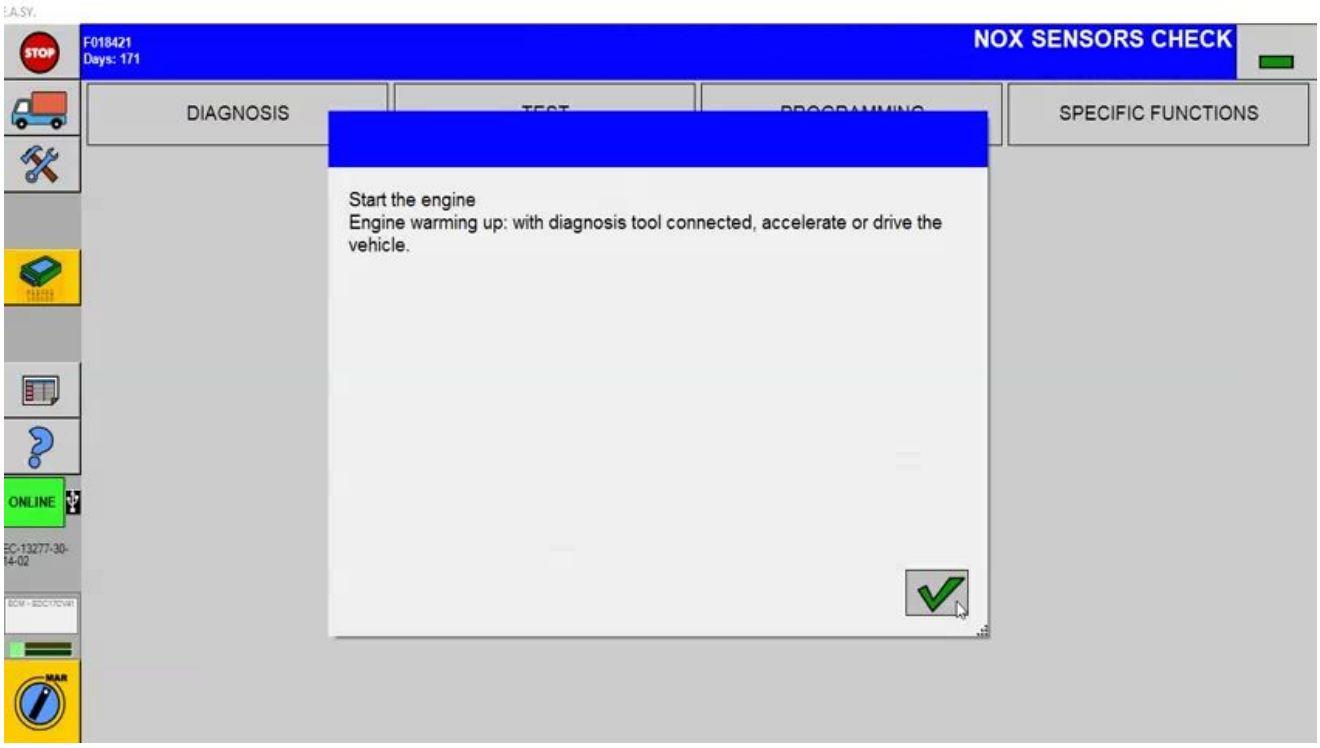

290089 6

7. Active diagnosis relating to NOx sensors will inhibit the errors setting



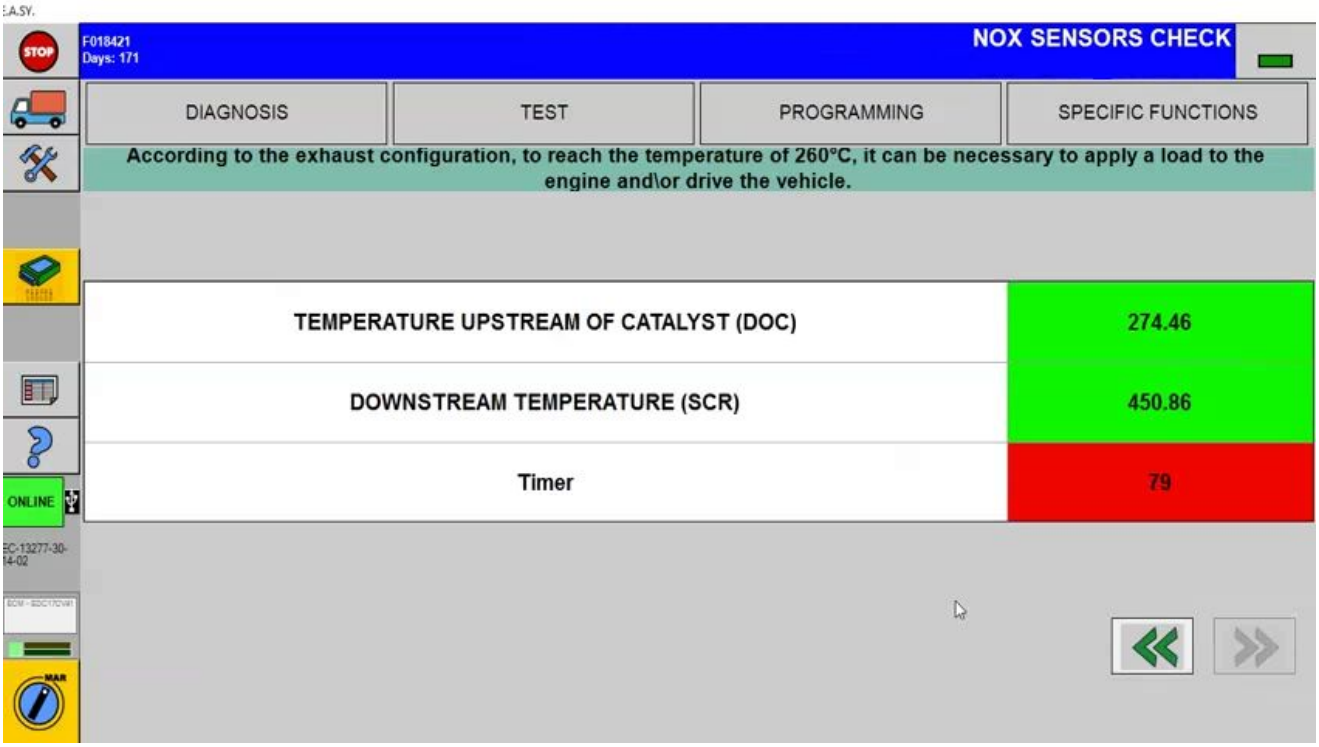

290088 7

8. Start the engine again and run it at a speed close to **1600 RPM** in order to maintain high temperatures in the exhaust gas after treatment system



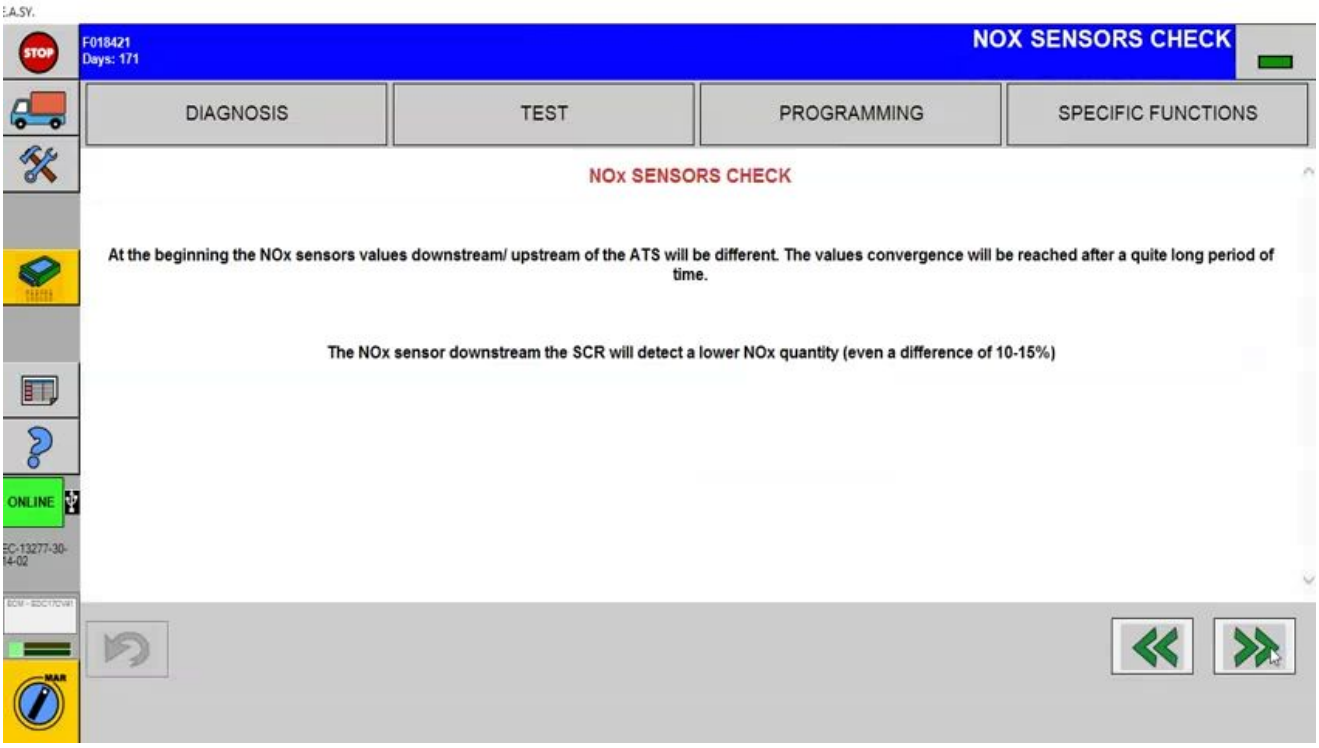

290090 8

9. Wait for the temperature to reach the indicated threshold and for the timer to finish the count.



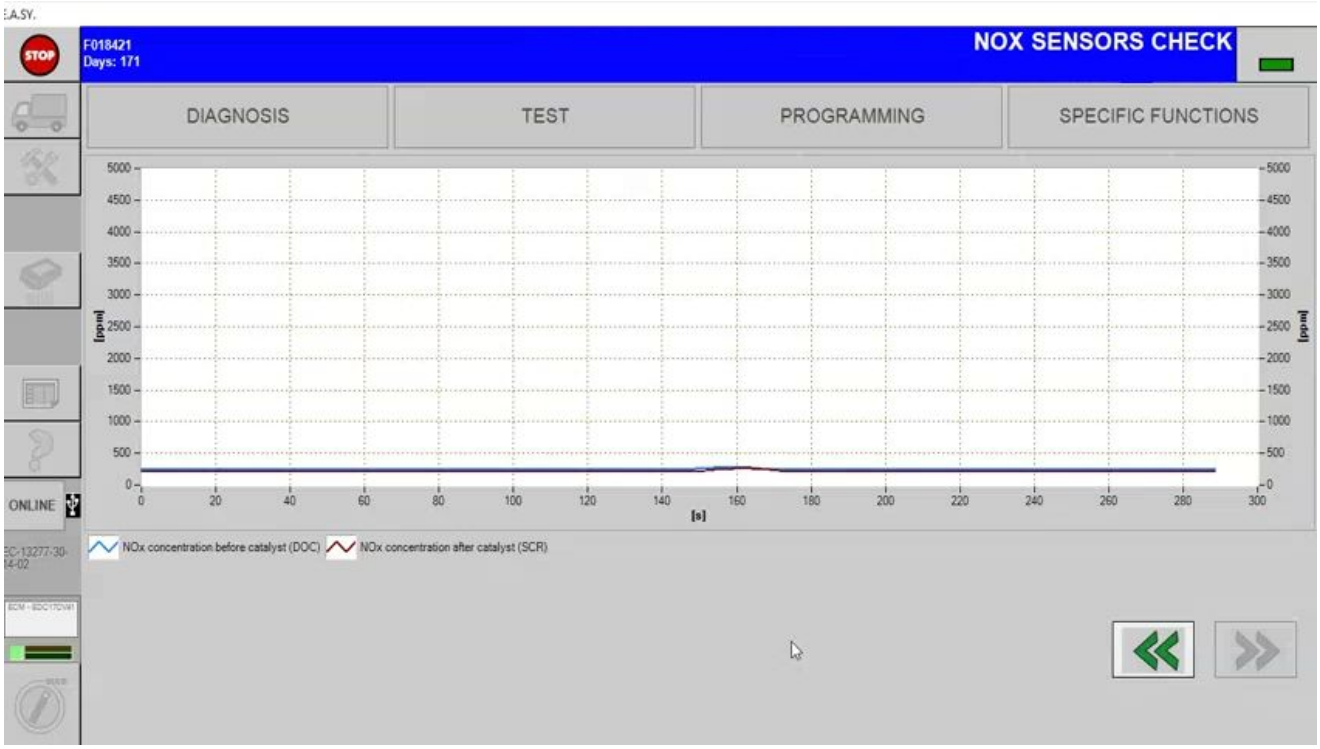

290091 9

10. Wait until the values regarding the sensors **B-F67** and **B-F49** converge. In this phase the residues of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** inside the exhaust system pipes are gradually drained.




290092 10

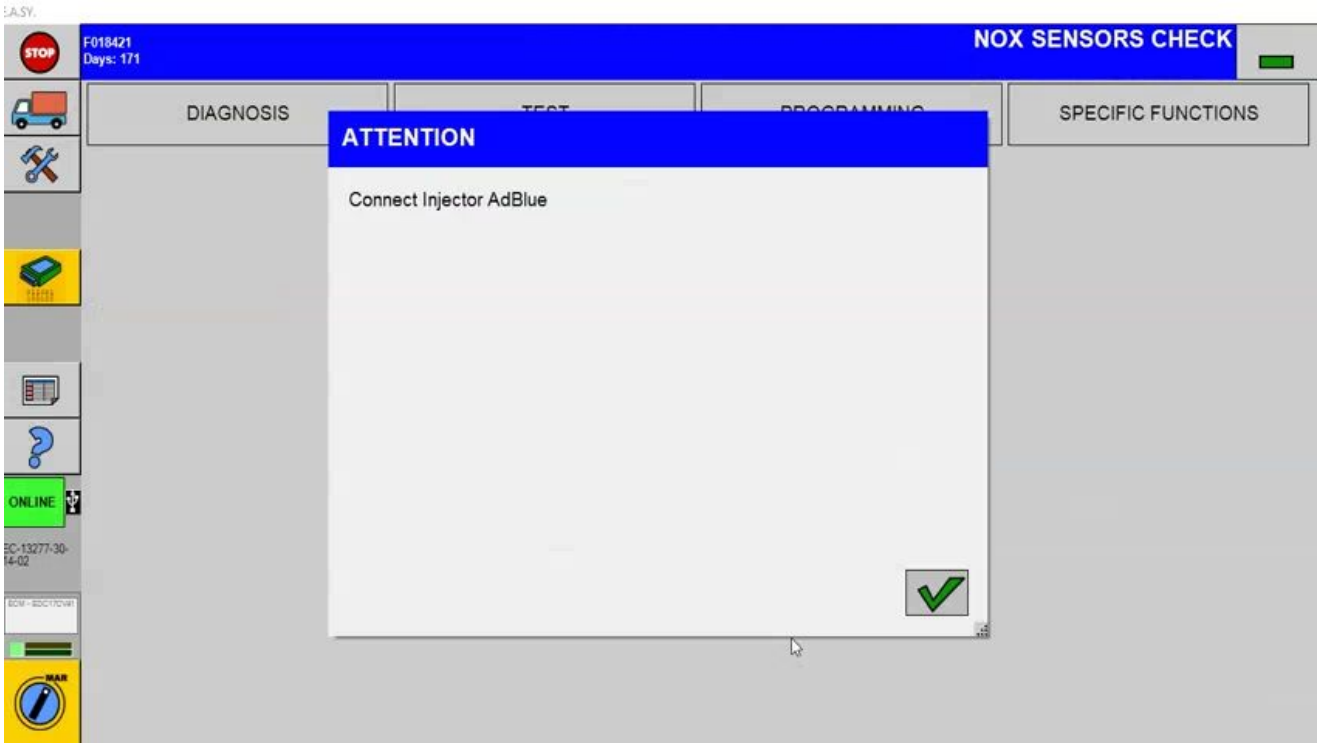
11. continue by selecting the “>>” key to wait for the graph to be completed




290093 11

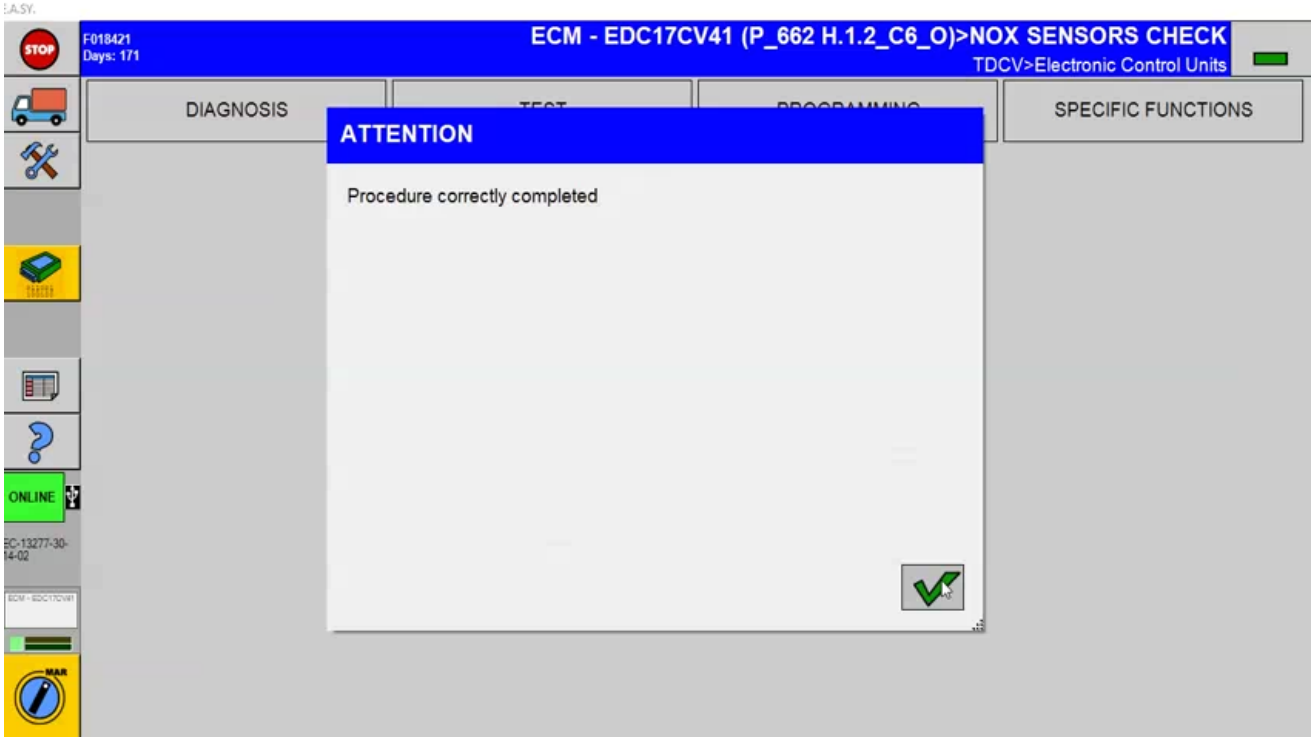
12. Reconnect the connector of the dosing module **X-F44** / **X-F44A**

Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury




290094 12

13. The procedure is complete, clear the fault memory and go to the step **14**




290095 13

14. The procedure allows correct operation and plausibility of the sensors to be checked upstream and downstream of the Selective Catalytic Reduction (SCR).

    A. If both sensors return a similar value to each other, then the procedure is verified. Return to the troubleshooting procedure.

    B. If the sensors do not return similar values, there could be a malfunction on one of the two components. Return to the fault identification procedure.

# 507435 NOX DETECTION SENSOR - Test - NOx sensor upstream of the SCR

## Description

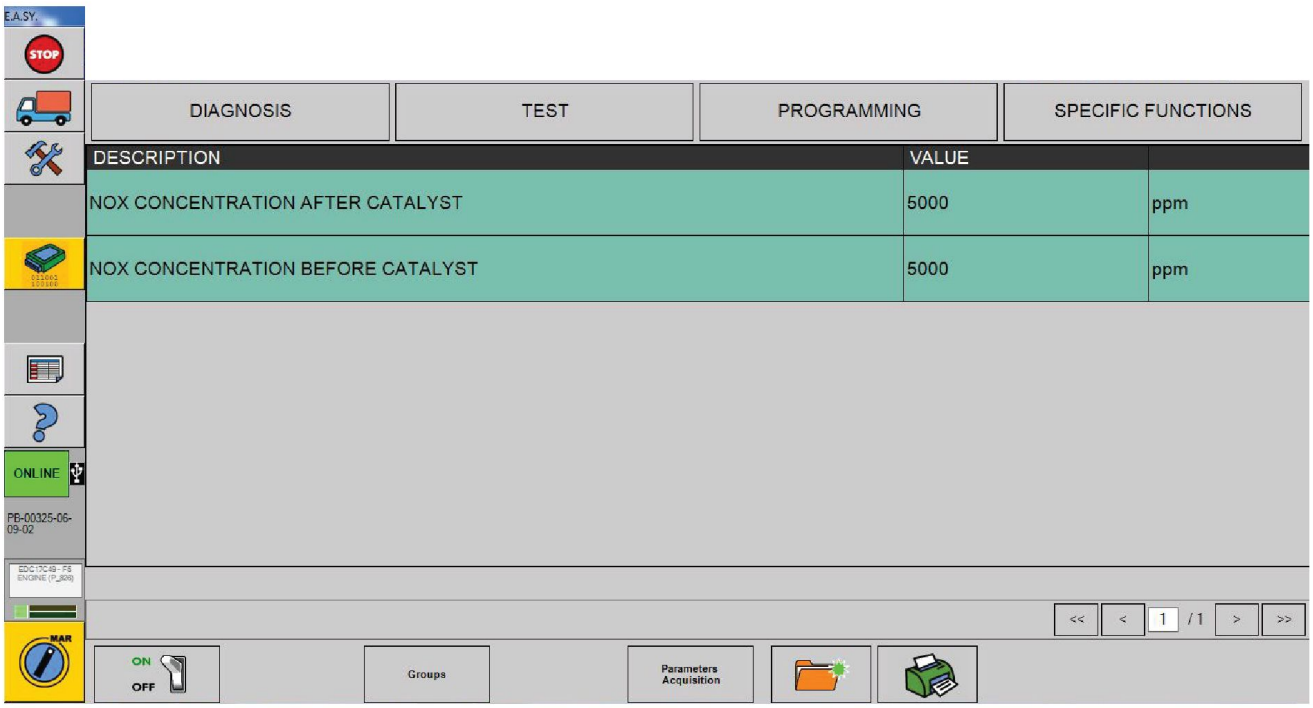
The NOx sensor **B-F67** is present in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and is located after the turbocharger at the inlet of the Diesel Oxidation Catalyst (DOC). The NOx sensor **B-F67** is made up of two parts: an electronic module connected via wiring to the sensor body. The two components cannot be separated. The NOx inlet sensor **B-F67** detects the amount of nitrogen oxide entering the DOC and, via the CAN network, it allows the Engine Control Unit **A-F02** to constantly adjust the introduction of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** on the basis of the emissions.

To refer to the technical data relating to the NOx sensor **B-F67**, see **NOX DETECTION SENSOR - Technical Data (50.74)**.

***NOTE:*** *The electronic control unit activates the sensor only when the temperature inside the exhaust duct is sufficiently high to prevent the presence of condensate, otherwise the sensor could be damaged.*

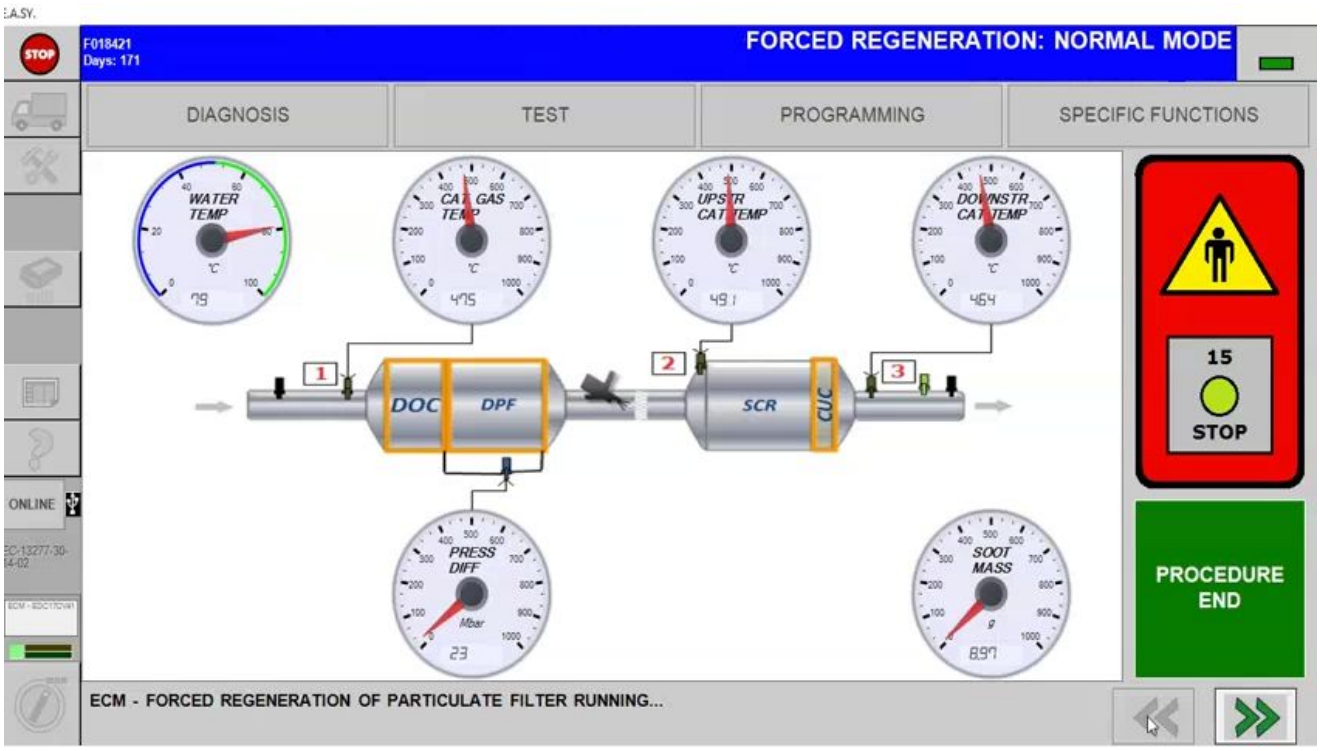
## Diagnostics procedure

1. Use the diagnostic instrument to monitor the values relating to the following sensors:
   - NOx sensor upstream **B-F67** of the Selective Catalytic Reduction catalyst (SCR)
   - NOx sensor downstream **B-F49** of the Selective Catalytic Reduction catalyst (SCR)



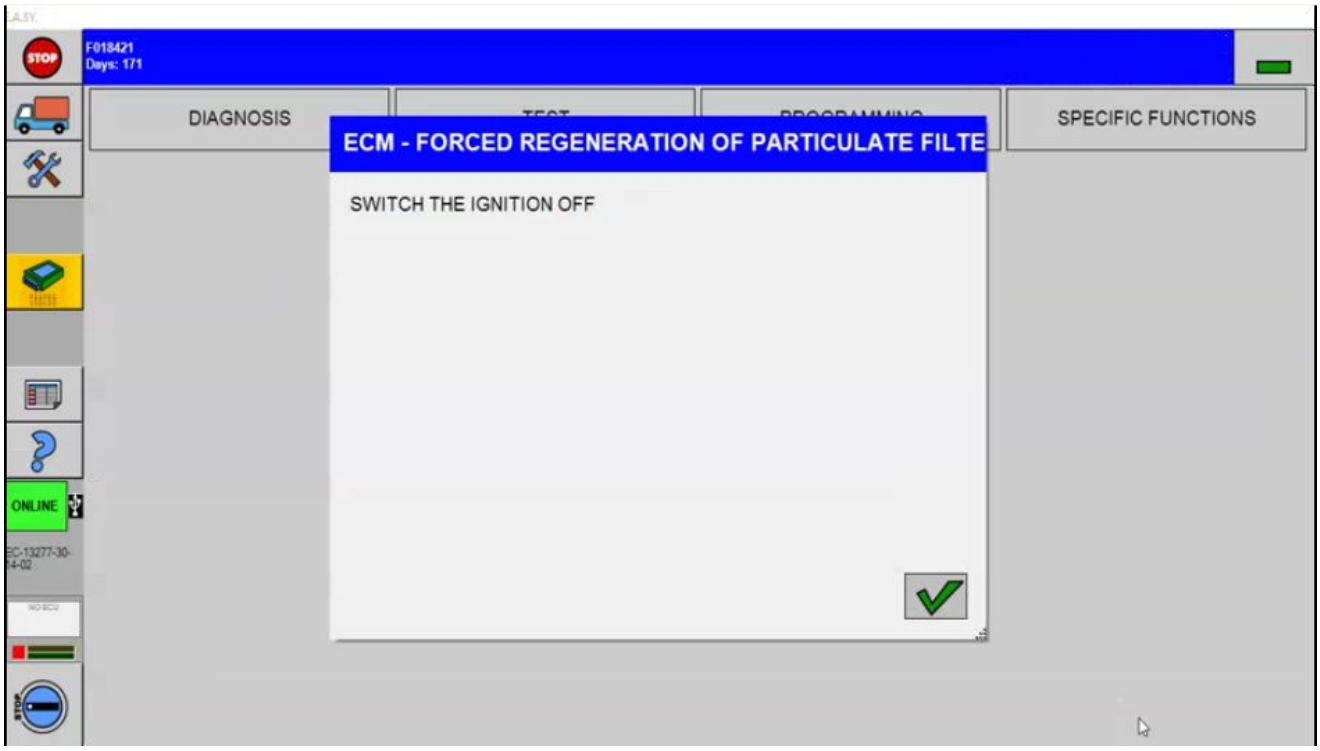

266051 1

2. Using the diagnostic tool, start the forced regeneration procedure of the DPF filter



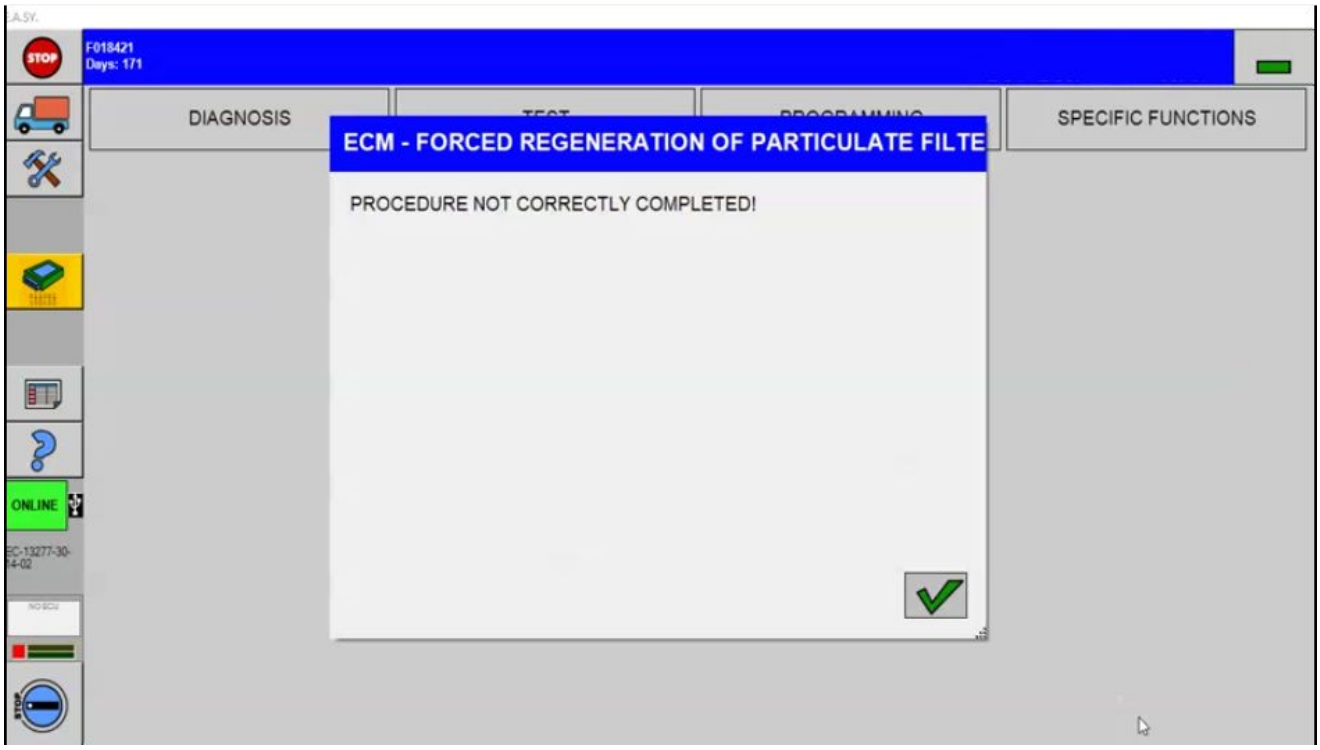

290081 2

3. Stop the forced regeneration procedure of the DPF filter before the cooling phase in order to obtain high temperatures in the exhaust gas after treatment system



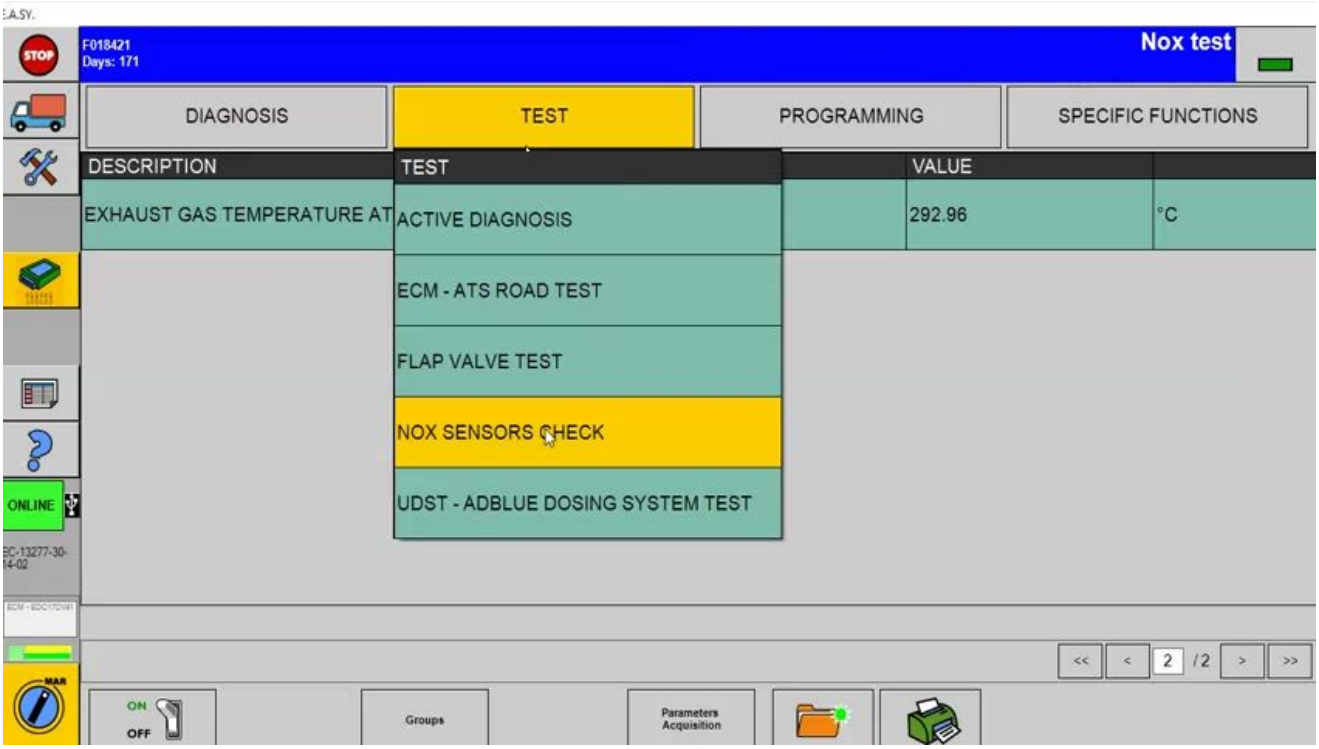

290085 3

4. The interruption of the forced regeneration procedure of the DPF filter will automatically stop the engine




290086 4

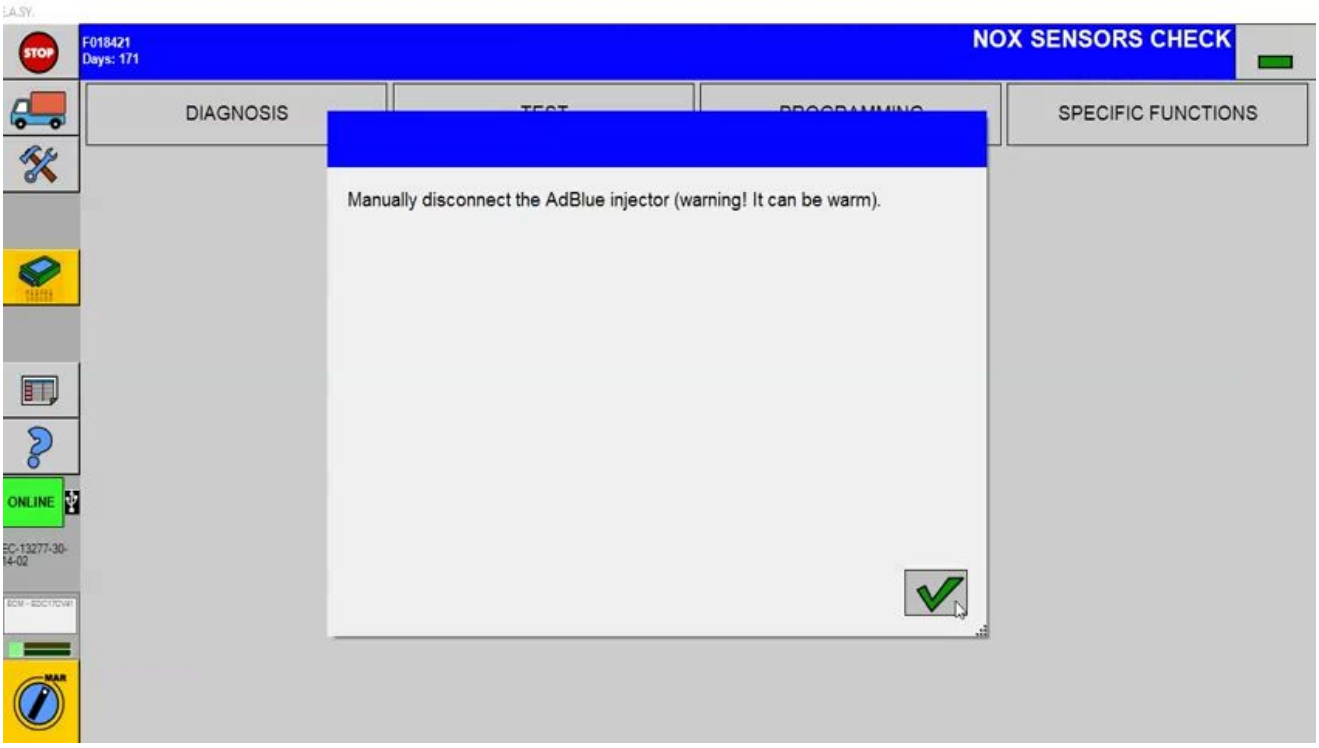
5. Using the diagnostic tool, start the active diagnosis of the NOx sensors




290087 5

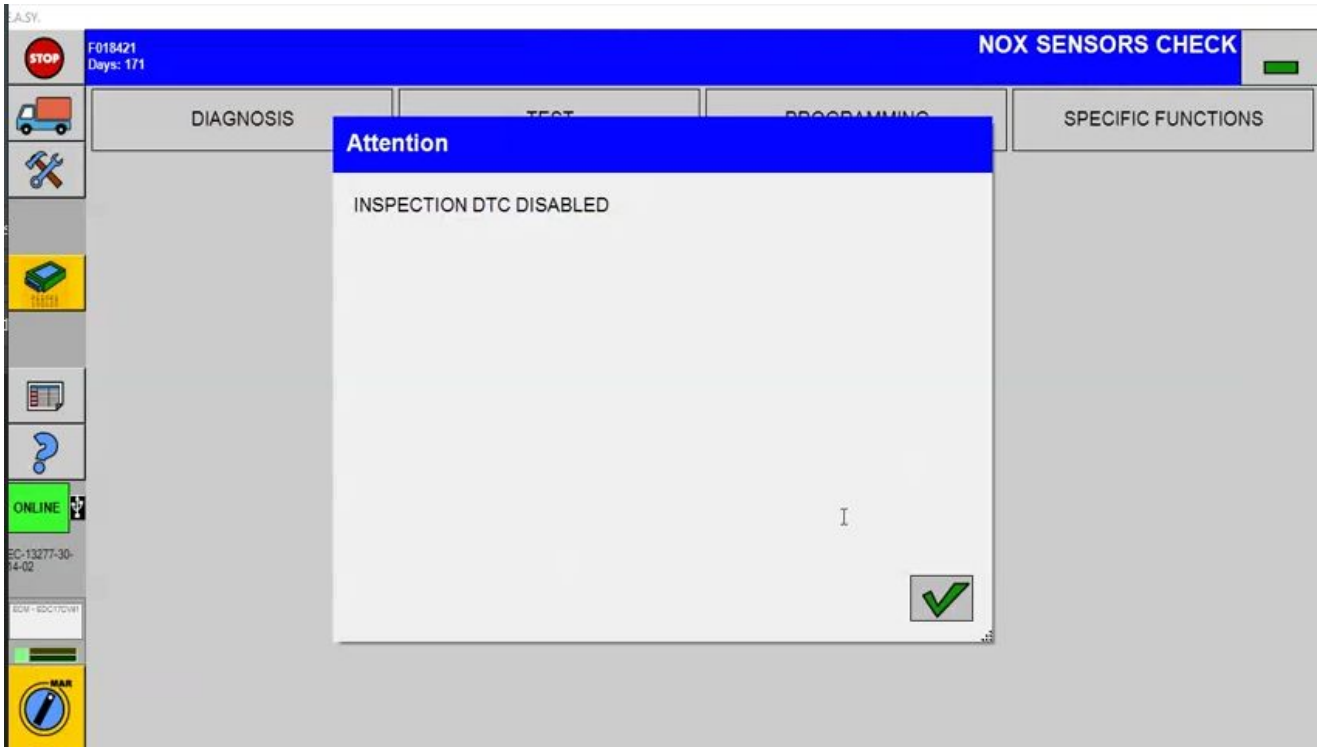
6. Manually disconnect the connector of the dosing module **X-F44** / **X-F44A**

Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury



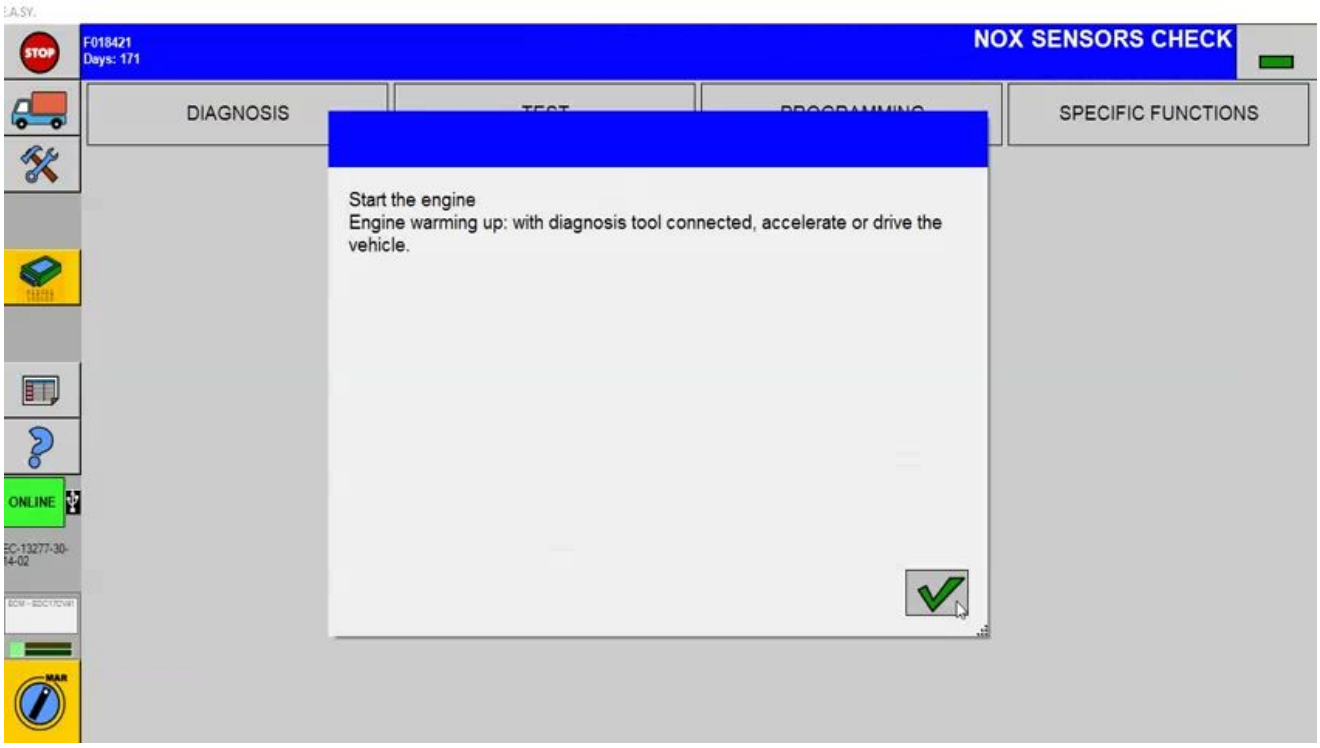

290089 6

7. Active diagnosis relating to NOx sensors will inhibit the errors setting



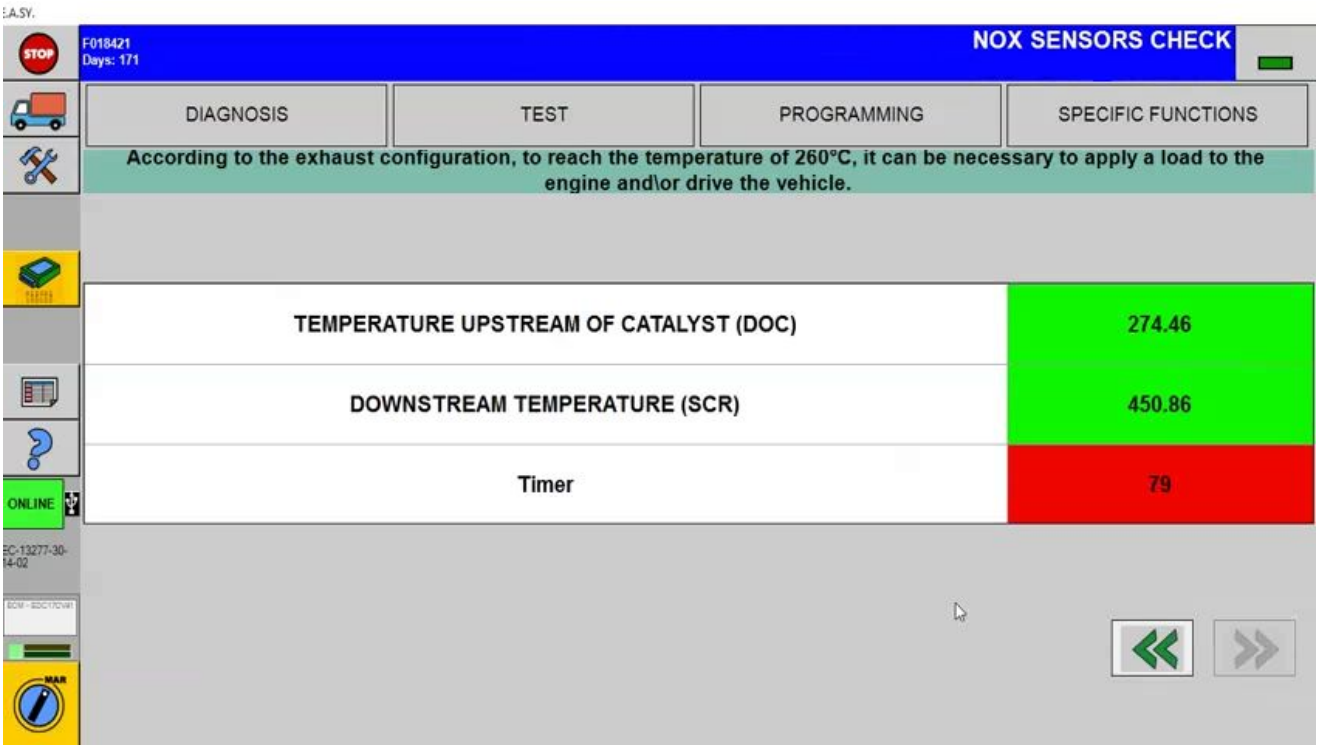

290088 7

8. Start the engine again and run it at a speed close to **1600 RPM** in order to maintain high temperatures in the exhaust gas after treatment system



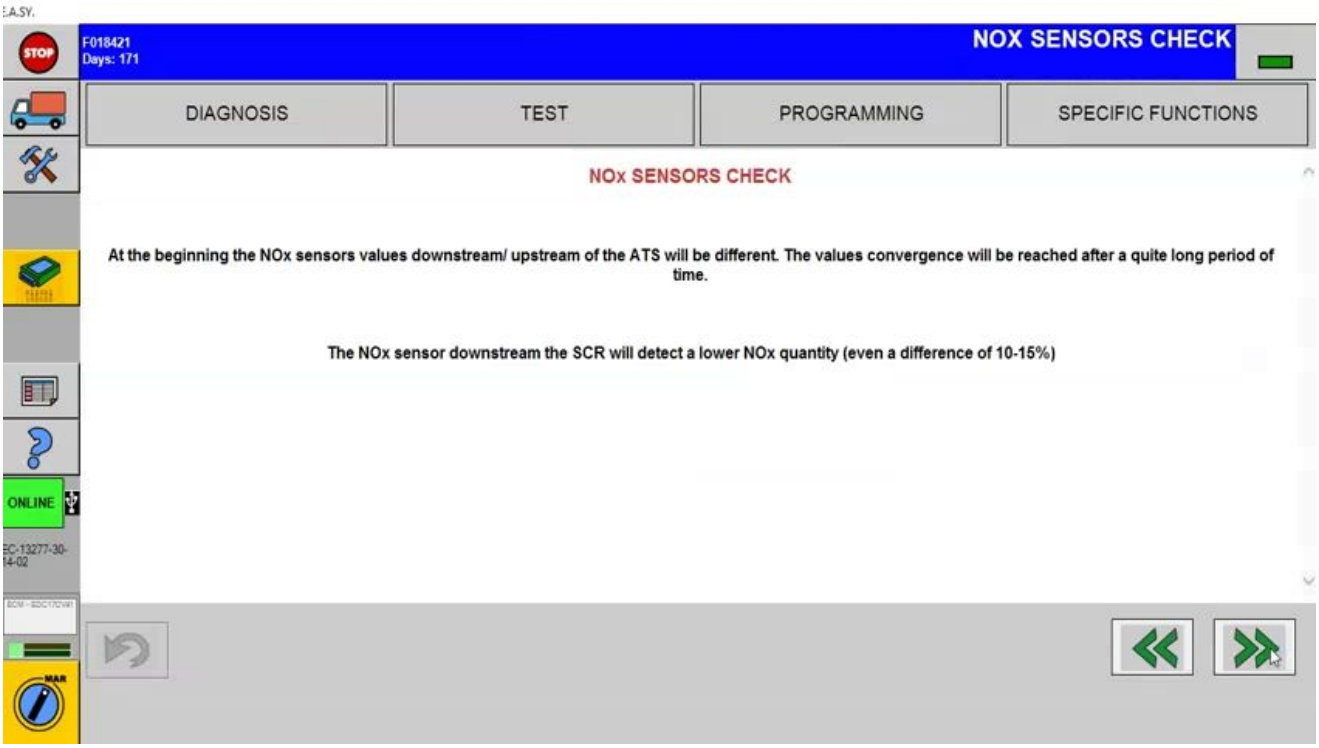

290090 8

9. Wait for the temperature to reach the indicated threshold and for the timer to finish the count.



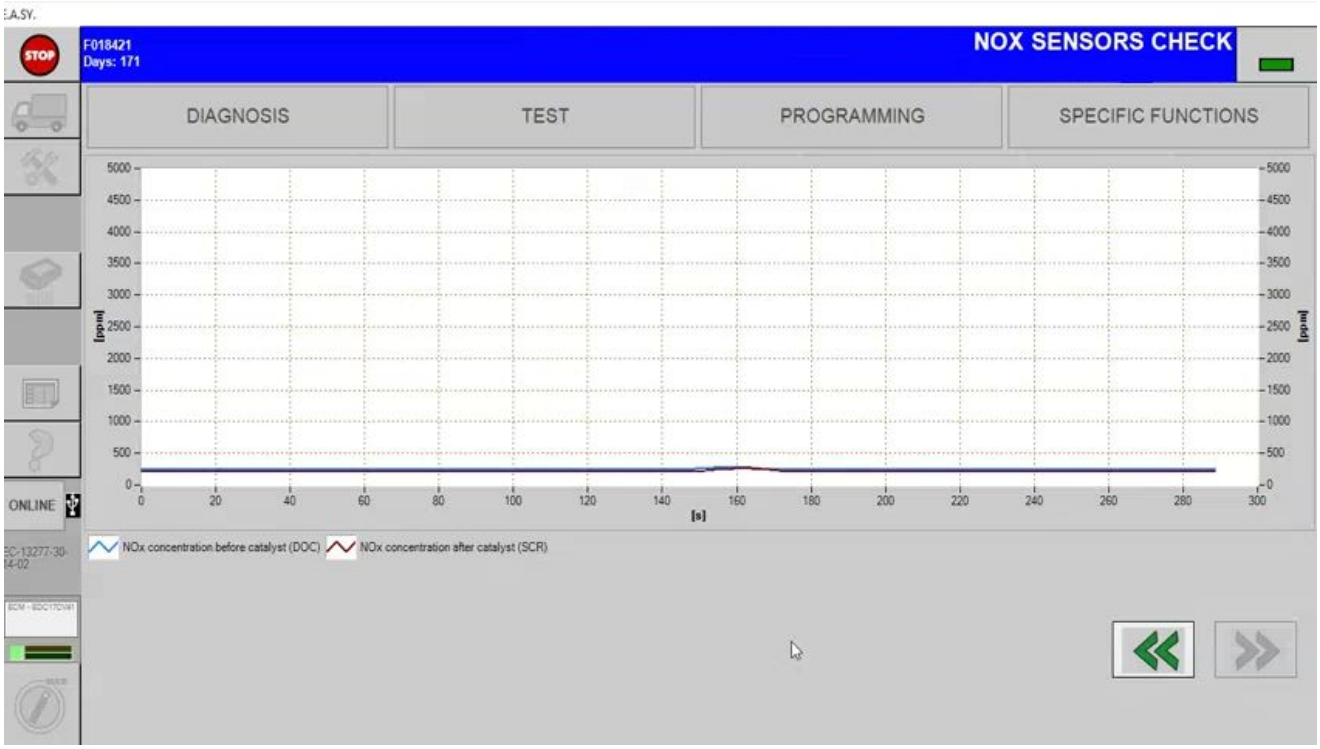

290091 9

10. Wait for the sensor values **B-F67** and **B-F49** to converge. In this phase, the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** residues inside the pipes of the exhaust system are gradually spent.




290092 10

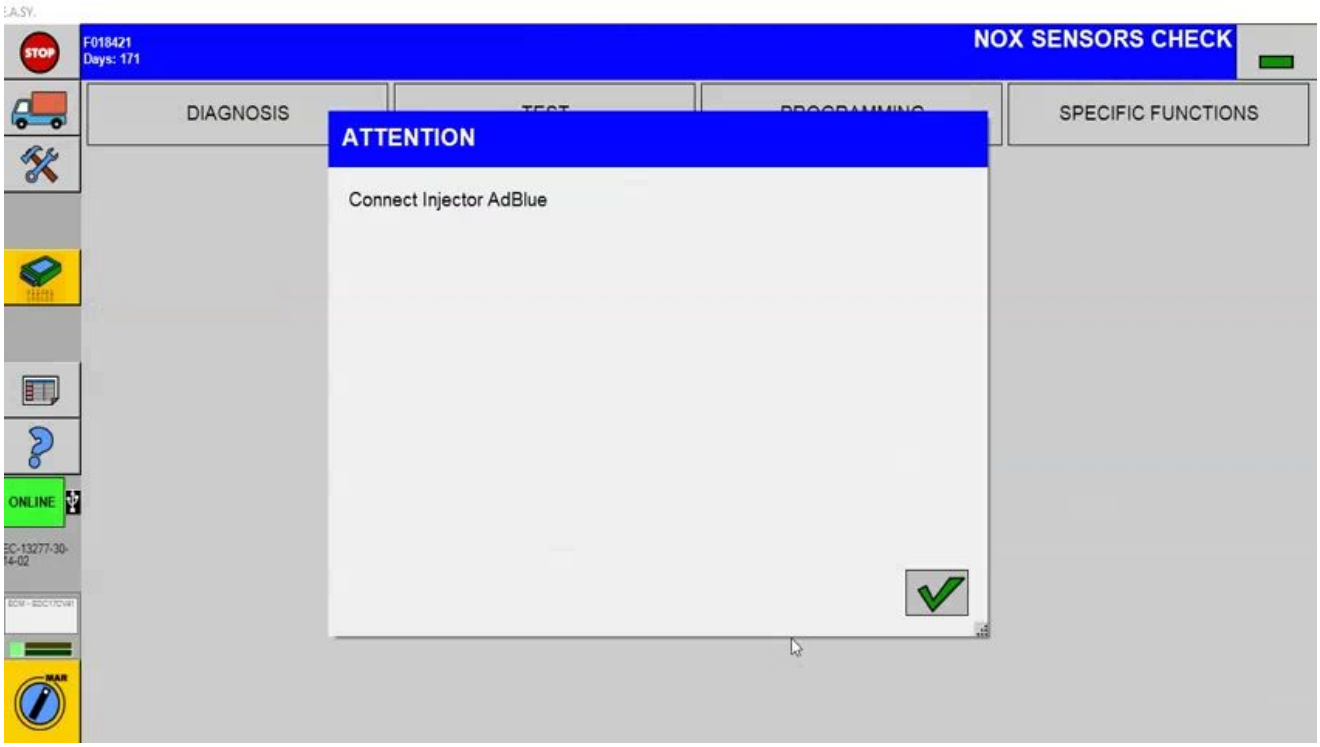
11. continue by selecting the “>>” key to wait for the graph to be completed




290093 11

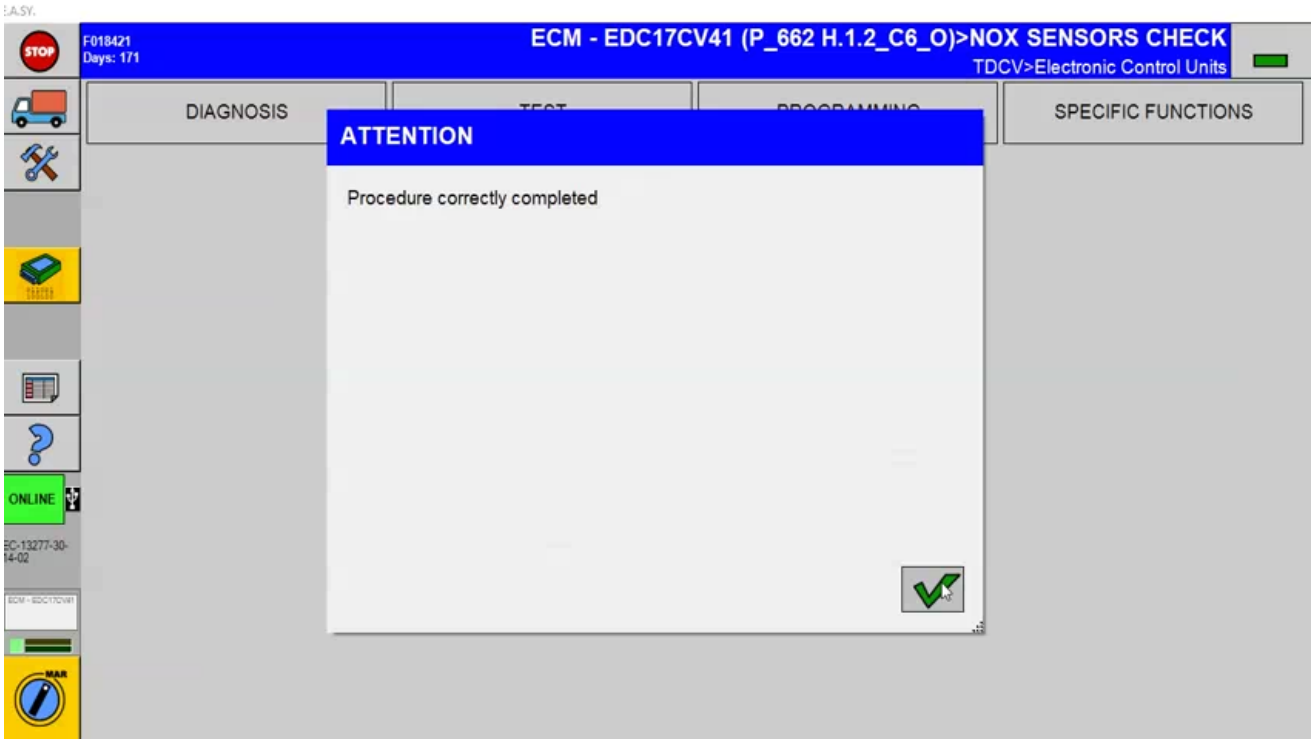
12. Reconnect the connector of the dosing module **X-F44**/ **X-F44A**

Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury




290094 12

13. The procedure is complete, clear the fault memory and go to the step **14**




290095 13

14. The procedure allows correct operation and plausibility of the sensors to be checked upstream and downstream of the Selective Catalytic Reduction (SCR).

    A. If both sensors return a similar value to each other, then the procedure is verified. Return to the troubleshooting procedure.

    B. If the sensors do not return similar values, there could be a malfunction on one of the two components. Return to the fault identification procedure.

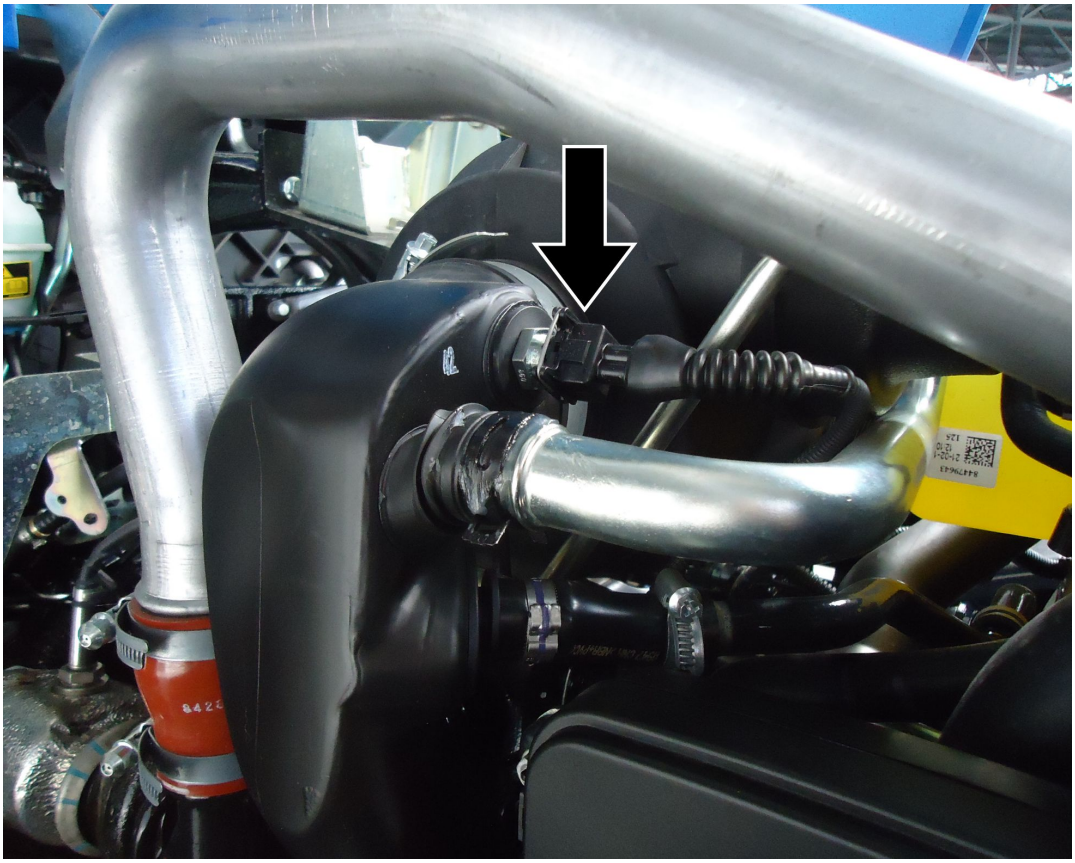
# 507436 HUMIDITY SENSOR - Test Check intake air humidity and temperature sensor

## Preparation

- Ignition switch set to OFF position.

## Visually check intake air humidity and temperature sensor

1. Visually check intake air humidity and temperature sensor
   - Visually check the connector of the sensor
   - Check if the sensor is installed correctly
   - Check if the screw of the sensor is tight
   - Check the sensor assembly to the intake air pipe
   - See figure below for explanation and go to **2**



275033 1

**Location of intake air humidity and temperature sensor**

2. Check the intake air humidity and temperature sensor.
   - A. Connector of the sensor not damaged and not contaminated
   - B. The sensor is mounted in the correct orientation.
   - C. The sensor is correctly fitted to the air intake pipe
   - D. The screws are not loose
   - E. If intake air humidity and temperature sensor is OK, go to **4**.
   - F. If intake air humidity and temperature sensor is NOT OK, go to **3**.

3. Possible root cause
   - Connector of the sensor damaged and/or contaminated
   - The sensor is not mounted in the correct orientation
   - The sensor is loosely fitted to the air intake pipe
   - Tighten the screws

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The intake air humidity and temperature sensor works properly.

# 507466 AD-BLUE COOLANT LEVEL SENSOR - Test - AdBlue quality, level and temperature SUN-A sensor

The AdBlue quality, level and temperature sensor is present in the exhaust gas after treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the AdBlue temperature, level and quality inside the tank.

To refer to the technical data relating to the AdBlue temperature, level, and quality sensor, see **AD-BLUE COOLANT LEVEL SENSOR - Technical Data (50.74)**.

## Diagnostics procedure

1. Check that the AdBlue fluid is not contaminated and that the concentration is correct ( **32.5%**). Proceed as follows:



Risk of injury:
If AdBlue is overheated inside the tank to more than 50°C (e.g. due to direct sunlight), the AdBlue could break down, forming ammonia vapours. Ammonia vapours have a pungent smell: Be careful when you loosen the tank cap.
Failure to comply with these prescriptions can result in the risk of serious injury

***NOTE:*** *Do not add water or any liquid other than the one specified into the AdBlue tank. This would cause serious damage to the after-treatment system.*

- AdBlue concentration must be **32.5 +/- 0.7%**. If the concentration is not within the specified value, the tank must be drained, washed with distilled water and refilled with the quality of fluid indicated.
- AdBlue concentration must be verified in the following cases:
  - The vehicle has been stationary for an extended period
  - There is the possibility that water might have been added to the AdBlue tank.
  - There is the possibility that water might have evaporated from the AdBlue tank.
  - The AdBlue filler cap has been removed from the tank for an extended period of time.
  - There is the possibility of a fault in the heating system in the AdBlue tank.
  - There is the possibility of incorrect refilling having been carried out.
- Checking of the AdBlue concentration is carried out using a refractometer. The refractometer consists of two prisms and a light source. The indication of concentration is read on a graded scale created by the curvature of the light beam that passes through the liquid. Proceed as follows:
  - Place a few droplets of the liquid to be analysed on the lens
  - Go to a well lit area and look at the lens
  - The quadrant will divide into two colours
  - The line separating the two colours will indicate the percentage of concentration.
- Refractometer calibration, proceed as follows:
  - Take a solvent for parenteral use to wash the light source and the lens cover.
  - Place three droplets of the solvent for parenteral use on the lens and lower the lens cover.
  - Look through the eyepiece and bring the droplets into focus.
  - Rotate the calibration screw until the instrument is calibrated to "0".

- AdBlue tank contamination:
  If the AdBlue tank has been contaminated, proceed as follows:
  - Remove the filter from the AdBlue dosing module.
  - Check that the filter does not show any sign of contaminated liquid having passed through it.
  - Drain the tank.
  - Wash it with distilled water.
  - Check and replace all line filters. Follow the procedure **AD-BLUE FILTER - Replace (50.74)**
  - Refill with liquid of the specified quality.

If the filter from the AdBlue dosing module shows signs of contamination, proceed as follows:

- Drain the tank.
- Wash it with distilled water.
- Replace all line filters. Follow the procedure **AD-BLUE FILTER - Replace (50.74)**
- Replace the dosing module filter.
- Disconnect all the lines and wash them with distilled water.
- Fill the tank with distilled water.
- Use the diagnostic tool to activate the pump module and repeat the test on the dosing module until clear liquid is obtained.
- Drain the distilled water from the tank and refill with liquid of the specified quality.

A. If the AdBlue concentration is correct, go to step **2**.

B. If the AdBlue concentration is not correct, repeat the verification.

2. Use the diagnostic tool to acquire the data relating to the temperature of the fluid in the AdBlue tank. Use a digital thermometer with a probe to measure the temperature relating to the fluid in the AdBlue tank. Compare the data provided by the diagnostic tool with the data measured directly using the digital thermometer.

   A. If the temperature values match, this indicates that the temperature read by the sensor is correct. Go to step **3**.

   B. If the temperature values do not coincide, this indicates that the sensor might not be working correctly. Go back to the fault identification procedure and then go to step **4**.

3. Use the diagnostic tool to acquire the data relating to the level of liquid present in the AdBlue® tank in the following conditions:
   - AdBlue tank completely empty ( **0%**).
   - AdBlue tank **50%** full, use the capacity data to determine the exact amount of fluid to be introduced.
   - AdBlue tank completely full ( **100%**)

   Analyse the three sets of data provided by the diagnostic instrument, checking that they are consistent with the three different test conditions.

   A. If the values relating to the level sensor are consistent, go to step **4**.

   B. If the temperature values are not consistent, this indicates that the sensor might not be working correctly. Go back to the fault identification procedure and then go to step **4**.

4. Use the diagnostic instrument to disable and delete the fault code. Restore vehicle operating conditions and check that the fault code relating to the quality, temperature, and level sensor AdBlue does not activate.

   A. If the fault code relating to the quality, temperature, and level sensor AdBlue is not active, the sensor is working correctly. Continue with the fault identification procedure.

   B. If the fault code relating to the AdBlue temperature, level and quality sensor is active, check the efficiency of the electrical wiring and continue with the fault identification procedure.

# 507466 AD-BLUE COOLANT LEVEL SENSOR - Test - AdBlue quality, level and temperature Wema sensor

The AdBlue quality, level and temperature sensor is present in the exhaust gas after treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the AdBlue temperature, level and quality inside the tank.

To refer to the technical data relating to the AdBlue temperature, level, and quality sensor, see **AD-BLUE COOLANT LEVEL SENSOR - Technical Data (50.74)**.

## Diagnostics procedure

1. Check that the AdBlue fluid is not contaminated and that the concentration is correct ( **32.5%**). Proceed as follows:

***NOTE:*** *Do not add water or any liquid other than the one specified into the AdBlue tank. This would cause serious damage to the after-treatment system.*

- AdBlue concentration must be **32.5 +/- 0.7%**. If the concentration is not within the specified value, the tank must be drained, washed with distilled water and refilled with the quality of fluid indicated.
- AdBlue concentration must be verified in the following cases:
  - The vehicle has been stationary for an extended period
  - There is the possibility that water might have been added to the AdBlue tank.
  - There is the possibility that water might have evaporated from the AdBlue tank.
  - The AdBlue filler cap has been removed from the tank for an extended period of time.
  - There is the possibility of a fault in the heating system in the AdBlue tank.
  - There is the possibility of incorrect refilling having been carried out.
- Checking of the AdBlue concentration is carried out using a refractometer. The refractometer consists of two prisms and a light source. The indication of concentration is read on a graded scale created by the curvature of the light beam that passes through the liquid. Proceed as follows:
  - Place a few droplets of the liquid to be analysed on the lens
  - Go to a well lit area and look at the lens
  - The quadrant will divide into two colours
  - The line separating the two colours will indicate the percentage of concentration.
- Refractometer calibration, proceed as follows:
  - Take a solvent for parenteral use to wash the light source and the lens cover.
  - Place three droplets of the solvent for parenteral use on the lens and lower the lens cover.
  - Look through the eyepiece and bring the droplets into focus.
  - Rotate the calibration screw until the instrument is calibrated to "0".

- AdBlue tank contamination:
  If the AdBlue tank has been contaminated, proceed as follows:
  - Remove the filter from the AdBlue dosing module.
  - Check that the filter does not show any sign of contaminated liquid having passed through it.
  - Drain the tank.
  - Wash it with distilled water.
  - Check and replace (if necessary) all the filters in the line.
  - Refill with liquid of the specified quality.

  If the filter from the AdBlue dosing module shows signs of contamination, proceed as follows:
- Drain the tank.
- Wash it with distilled water.
- Replace all the filters in the line.
- Replace the dosing module filter.
- Disconnect all the lines and wash them with distilled water.
- Fill the tank with distilled water.
- Use the diagnostic tool to activate the pump module and repeat the test on the dosing module until clear liquid is obtained.
- Drain the distilled water from the tank and refill with liquid of the specified quality.

A. If the AdBlue concentration is correct, go to step **2**.

B. If the AdBlue concentration is not correct, repeat the verification.

2. Use the diagnostic tool to measure the temperature of the fluid in the AdBlue tank. Use a digital thermometer with a probe to measure the temperature of the fluid in the AdBlue tank. Compare the data provided by the diagnostic tool with the value measured using the digital thermometer.

   A. If the temperature values match, this indicates that the temperature read by the sensor is correct. Go to step **3**.

   B. If the temperature values do not coincide, this indicates that the sensor might not be working correctly. Go back to the fault identification procedure and then go to step **4**.

3. Use the diagnostic tool to acquire the data relating to the level of liquid present in the AdBlue® tank in the following conditions:
   - AdBlue tank completely empty ( **0%**).
   - AdBlue tank **50%** full, use the capacity data to determine the exact amount of fluid to be introduced.
   - AdBlue tank completely full ( **100%**)

   Analyse the three sets of data provided by the diagnostic instrument, checking that they are consistent with the three different test conditions.

   A. If the values relating to the level sensor are consistent, go to step **4**.

   B. If the temperature values are not consistent, this indicates that the sensor might not be working correctly. Go back to the fault identification procedure and then go to step **4**.

4. Use the diagnostic tool to disable and delete the fault code. Restore vehicle operating conditions and check that the fault code relating to the quality, temperature, and level sensor does not activate.

   A. If the fault code relating to the quality, temperature, and level sensor AdBlue is not active, the sensor is working correctly. Continue with the fault identification procedure.

   B. If the fault code relating to the AdBlue temperature, level and quality sensor is active, check the efficiency of the electrical wiring and continue with the fault identification procedure.

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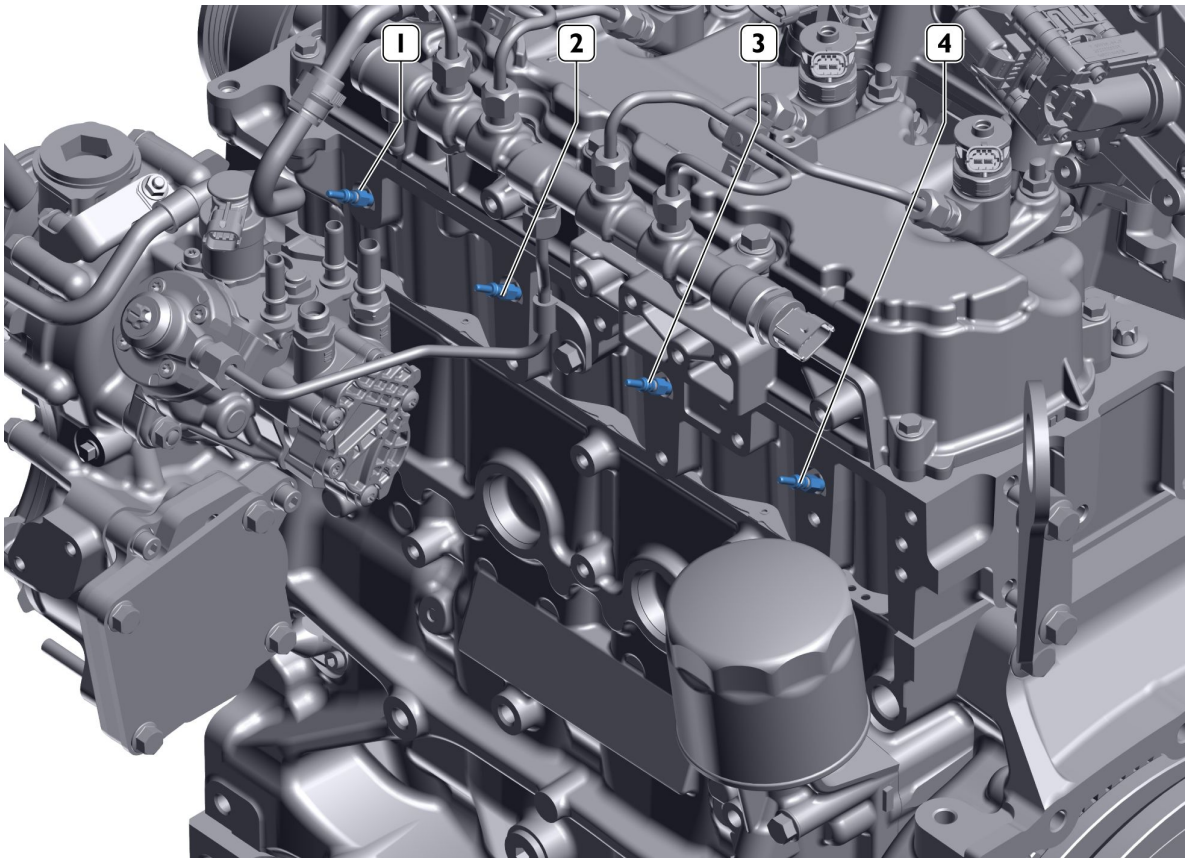
# 761911 THERMOSTARTER PLUG - Test Check spark plug heater

## Preparation

- Ignition switch set OFF position

## Visual check of glow plugs

1. Visual check of glow plugs
   - Check if the glow plugs are fitted correctly
   - Remove the glow plugs from their housing
   - Check there is no damage to the glow plug
   - See figure below for explanation and go to **2**




275041 1

**Location of the glow plug**

| Ref. | Description |
|---|---|
| **(1–4)** | Pre-heating glow plug |

2. Glow plugs check.
   A. Glow plugs fitted correctly
   B. Glow plugs neither faulty nor damaged
   C. If the glow plugs are efficient, go to **4**
   D. If the glow plugs are NOT efficient, go to **3**

3. Possible root cause
   - The electrical connection from the relay to the glow plugs could be damaged
   - Glow plugs faulty or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Glow plug activation check

4. General checks
   - Battery voltage is sufficient
   - Component related fuses are OK
   - Connectors/plugs OK. No loose contact or corrosion.
   - Offboard tool Diagnosis tester

## Preparation

5. - Connect the diagnostic tester
   - Start the engine
   - Carry out the run up test as per the instructions from the diagnostic tester
6. - Press the start button
   - Check and verify activation of the glow plug (measure the current flow on the wiring with a current clamp)
   - Go to **7**
7. Glow plug activation check
   A. Measurable current flow during activation
   B. Increase in temperature of the glow plugs
   C. If the glow plugs are efficient, go to **9**
   D. If the glow plugs are NOT efficient, go to **8**
8. Possible root cause
   - Communication loss with diagnosis tester
   - The electrical connection from the relay to the glow plugs could be damaged
   - Glow plug faulty or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

9. The glow plugs are working correctly.

# 764264 TIMING GEAR SPEED SENDER - Test Engine speed adjustment check

## Preparation

General checks

- Battery voltage is sufficient
- Vehicle fuses are OK
- Connectors/plugs OK. No loose contact or corrosion.
- Offboard tool: Diagnosis tester

## Engine speed adjustment check

## Preparation

This procedure is used to modify and maintain the engine rpm. Adjustment is possible in the range from idle to **2300 RPM**.

- Turn the key to ON position and start the engine at idle speed
- Connect the diagnostic tester
- Select Engine Speed item on diagnostic tester

## Check

1. 
   - Modify and maintain the engine rpm
   - Adjust the engine speed from idle to **2300 RPM**
   - Go to **2**
2. Engine speed adjustment check
   - The actual engine speed is into specified rpm range
   - If the engine speed adjustment check is OK, go to **4**
   - If the engine speed adjustment check is NOT OK, go to **3**
3. Possible root cause
   - Engine air system fault, e.g. air leak, faulty turbocharger etc.
   - Engine fuel system fault, e.g. leaking injector, faulty fuel pump etc.
   - Engine/transmission fault, e.g. head cylinder pressure leaking, wrong cam crank timing etc.

***NOTE:*** *Minimum speed should be engine idle speed.*

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The engine speed adjustment check works properly.

# 764264 TIMING GEAR SPEED SENDER - Test Check camshaft and crankshaft synchronization

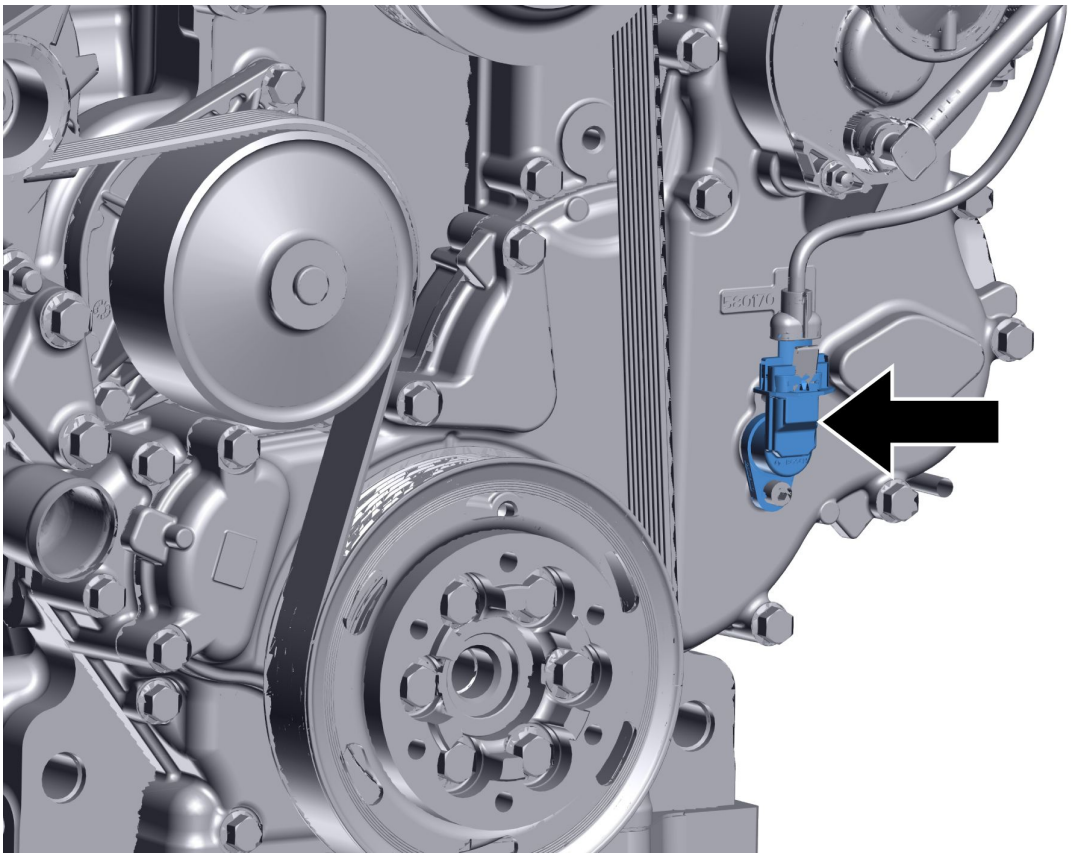
## Preparation

General checks

- Battery voltage is sufficient
- Electrical circuit is OK, like fuses, connectors, wiring harness, relays
- Offboard tool: oscilloscope

## Visual check the camshaft sensor

1. Visual check the camshaft sensor
   - Visually check the connector of the sensor
   - Check if the sensor is installed correctly
   - Check if the screw of the sensor is tight
   - Check the sensor assembly to the engine body
   - See figure below for aid and go to **2**



275057 1

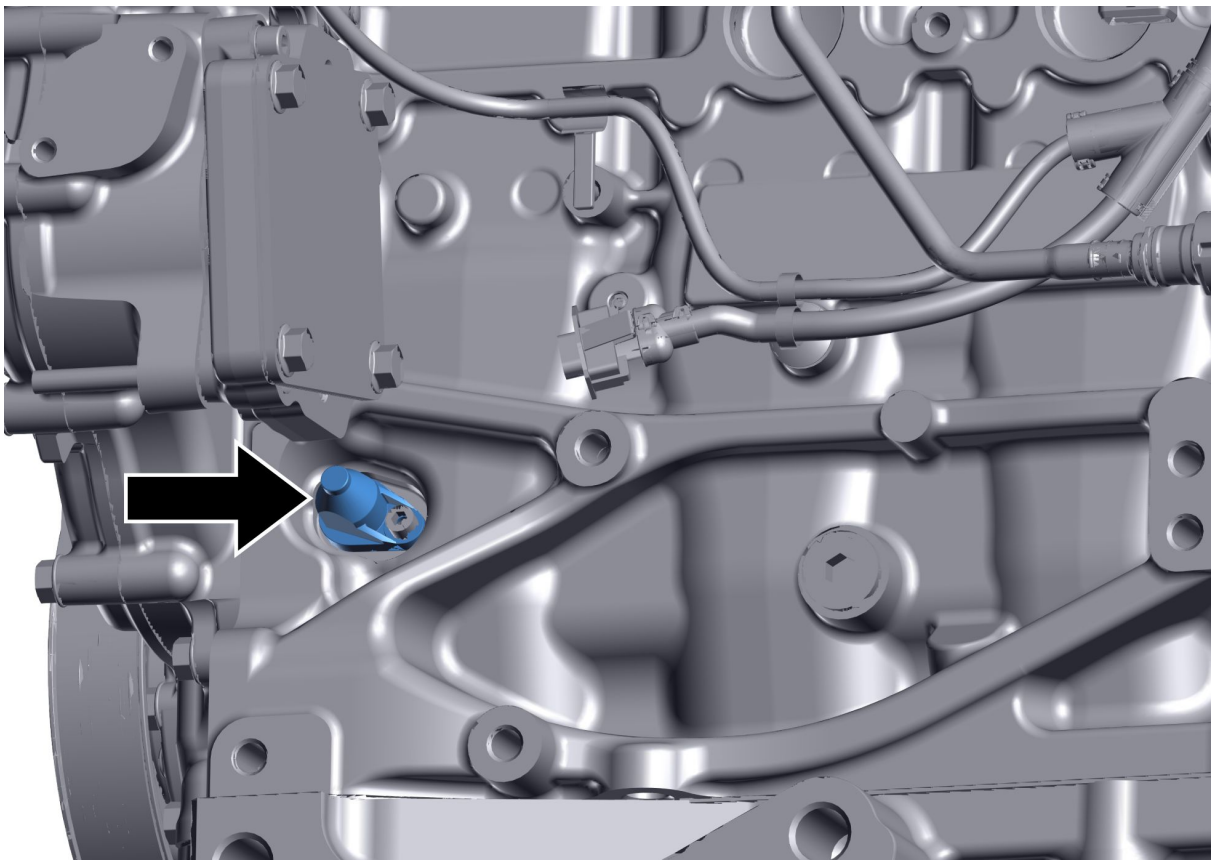
**Camshaft speed sensor**

2. Check the camshaft sensor
   A. Connector of the sensor not damaged and not contaminated
   B. The sensor is mounted in the correct orientation
   C. The sensor is correctly fitted to the engine body, no gap between the sensor and the engine body
   D. The screw is not loose
   E. If the camshaft sensor is OK, go to **4**
   F. If the camshaft sensor is NOT OK, go to **3**
3. Possible root cause
   - Connector of the sensor damaged and/or contaminated
   - The sensor is not mounted in the correct orientation
   - The sensor is loosely fitted to the engine body
   - Tighten the screw.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Visual check the crankshaft sensor

4. Visual check the crankshaft sensor
   - Visually check the connector of the sensor
   - Check if the sensor is installed correctly
   - Check if the screw of the sensor is tight
   - Check the sensor assembly to the engine body
   - See figure below for aid and go to **5**



275058 2

**Crankshaft speed sensor**

5. Check the crankshaft sensor
   A. Connector of the sensor not damaged and not contaminated
   B. The sensor is mounted in the correct orientation
   C. The sensor is correctly fitted to the engine body, no gap between the sensor and the engine body
   D. The screw is not loose
   E. If the crankshaft sensor is OK, go to **7**
   F. If the crankshaft sensor is NOT OK, go to **6**
6. Possible root cause
   - Connector of the sensor damaged and/or contaminated
   - The sensor is not mounted in the correct orientation
   - The sensor is loosely fitted to the engine body
   - Tighten the screw

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check camshaft and crankshaft synchronization

7. Check camshaft and crankshaft signals
   - Use an oscilloscope to check and compare the electrical signal of the camshaft and crankshaft sensor, go to **8**.

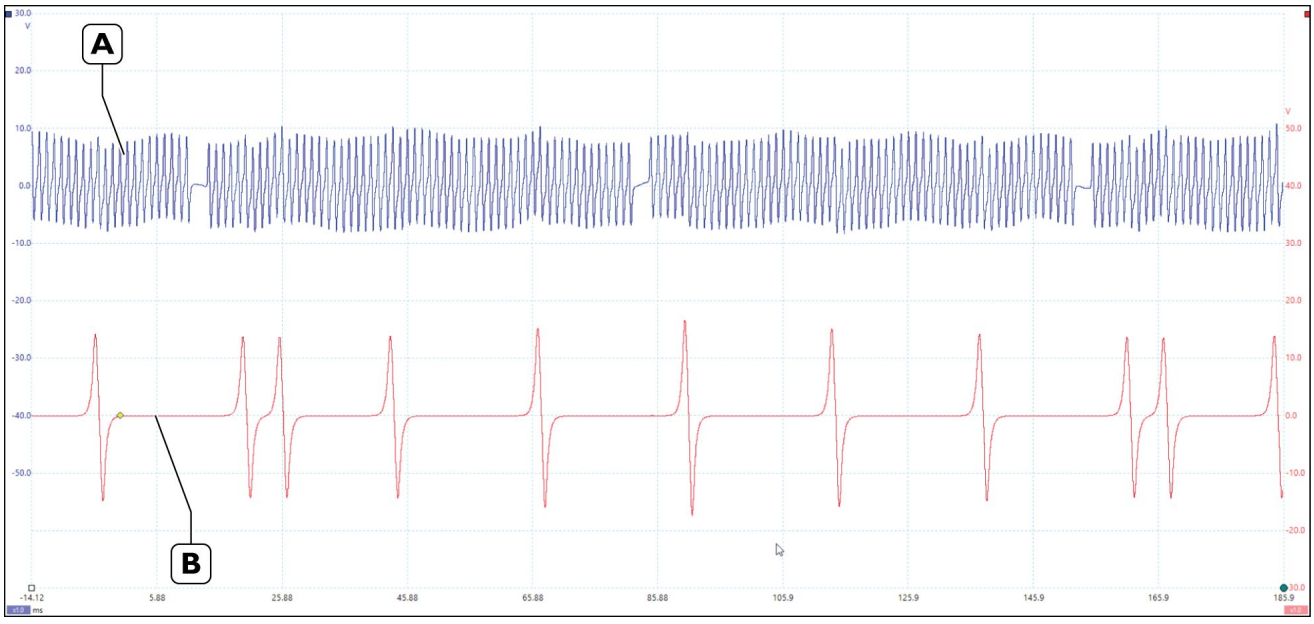
8. Signal check of Camshaft Speed Sensor ( Cm-SpdSens) by oscilloscope
   - Capture indicated CmSpdSens signal
   - Keep engine in low idle at least **1 min**
   - Go to **9**

| Component [Controller connector] | PIN | Destination [Controller connector] | PIN |
|---|---|---|---|
| CmSpdSens ECU Connector 2 | 68 | CmSpdSens ECU Connector 2 | 67 |

9. Signal check of Crankshaft Speed Sensor ( Cr-SpdSens) by oscilloscope
   - Capture indicated CrSpdSens signal
   - Keep engine in low idle at least **1 min**
   - Go to **10**

| Component [Controller connector] | PIN | Destination [Controller connector] | PIN |
|---|---|---|---|
| CrSpdSens ECU Connector 2 | 66 | CrSpdSens ECU Connector 2 | 65 |

10. Check camshaft and crankshaft synchronization
    A. The Camshaft and Crankshaft speed sensors' outputs should have a similar waveshape to the figure below:
    B. If the synchronization is OK, go to **12**
    C. If the synchronization is NOT OK, go to **11**




271859 3

**Camshaft and crankshaft sensors output signals comparison (sync in low idle speed)**

| Ref. | Description |
|---|---|
| **(A)** | Crankshaft speed sensor |
| **(B)** | Camshaft speed sensor |

***NOTE:*** *The maximum allowed output voltage peaks for the speed sensor is according to the control unit interface definition: "output V" minor to* ***100 V*** *and major to* ***-100 V***

11. Possible root cause
    - Wrong mechanical trimming
    - The sensor is loosely fitted to the engine

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

12. The camshaft and crankshaft synchronization works properly.

# 766161 ENGINE CONTROL UNIT - Test Check ECU power supply

## Preparation

- Ignition switch set to OFF position.
- Disconnect the wiring harness connector from the required ECU.

## Check power supply of indicated Electronic Control Unit (ECU)

1. Check power supply of Electronic Control Unit (ECU)
   - Measure the voltage between the required ECU wiring harness connector and ground point in accordance with the following table and go to **2**

| Ignition switch set OFF position | | | | | |
|---|---|---|---|---|---|
| **Component [Connector]** | **PIN** | **Via [fuse, relay]** | **Destination [Connector]** | **PIN** | **Typical Value** |
| ECU | 1 | Fuse F 7.5A | Vehicle ground point | – | From **11 V** to **14.8 V** |
| ECU | 3 | Fuse F-20A | Vehicle ground point | – | From **11 V** to **14.8 V** |
| ECU | 5 | Fuse F-20A | Vehicle ground point | – | From **11 V** to **14.8 V** |

***NOTE:*** *Please consider internal resistance of measurement equipment and breakout box used.*

2. Check power supply of indicated Electronic Control Unit (ECU)
   A. If all values within specified range or similar to typical value, go to **4**.
   B. If not all values within specified range or similar to typical value, go to **3**.
3. Possible root cause
   - Wiring harness damaged.
   - Wiring harness connector damaged.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check ECU Wiring Harness – Open Circuit check

4. Preparation
   - Ignition switch set to OFF position.
   - Disconnect the controller connectors and fuses or relays linked to the inspected terminals/cables.
   - Disconnect the wiring harness connector from the required ECU.
5. Open circuit check of indicated Electronic Control Unit (ECU)
   - Measure the resistance between the required ECU wiring harness connector and indicated connector/destination point in accordance with the following table and go to **6**

| Component [Connector] | PIN | Destination [Connector] | PIN | Typical Value |
|---|---|---|---|---|
| ECU | 1 | Battery pole (+) via Fuse F 7.5A | Not applicable | From **0 Ω** to **0.2 Ω** |
| ECU | 3 | Battery pole (+) via Fuse F 20A | Not applicable | From **0 Ω** to **0.2 Ω** |
| ECU | 5 | Battery pole (+) via Fuse F 20A | Not applicable | From **0 Ω** to **0.2 Ω** |
| ECU | 2 | Battery pole (-) | Not applicable | From **0 Ω** to **0.2 Ω** |
| ECU | 4 | Battery pole (-) | Not applicable | From **0 Ω** to **0.2 Ω** |
| ECU | 6 | Battery pole (-) | Not applicable | From **0 Ω** to **0.2 Ω** |

6. Open circuit check of indicated Electronic Control Unit (ECU)
   A. If all values within specified range, go to **8**.
   B. If not all values within specified range, go to **7**.
7. Possible root cause
   - Wiring harness damaged.
   - Wiring harness connector damaged.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

8. The ECU Power Supply works properly.

# 766161 ENGINE CONTROL UNIT - Test MIL activation check

## Preparation

General checks

- Battery voltage is sufficient
- Vehicle fuses are OK
- Connectors/plugs OK. No loose contact or corrosion.
- Offboard tool Diagnosis tester

## MIL Activation check

## Preparation

- Connect the diagnostic tester
- Turn the key to ON position
- Select MIL activation light item on diagnosis tester

## Check

1. 
   - Pressing the star button, you can verify the activation of MIL light on cluster
   - MIL is activated 3 times and you will get a visual feedback
   - Go to **2**
2. MIL Activation check
   - The diagnosis tester output shows the MIL providing a visual feedback. If the MIL Activation is not OK, go to **3**
   - If the MIL Activation is OK, go to **4**
3. Possible root cause
   - Defect cluster

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The MIL light on cluster works properly.

# 766161 ENGINE CONTROL UNIT - Test Read parameter check

## Preparation

General checks

- Battery voltage is sufficient
- Vehicle fuses are OK
- Connectors/plugs OK. No loose contact or corrosion.
- Off-board tool: Diagnosis tester

## Read Parameters check

## Preparation

- Set the key to ON.
- Connect the diagnostic tester

## Check

***NOTE:*** *This procedure is used to modify and maintain the engine rpm and analyse the performance of a number of pressure and injector parameters. Adjustment is possible in the range from idle to nominal speed. Tools for modifying the following parameters are arranged on the screen page (click on the instrument to visualize the name of the measurement channel)*

1. Procedure
   - Check and modify the boost air temperature: air temperature in intake manifold
   - Check and modify the relative boost air temperature: difference between absolute supercharging pressure and ambient pressure
   - Check and modify the target fuel pressure: target fuel pressure value to be reached by the ECU
   - Check and modify the fuel pressure: pressure in the rail
   - Check and modify the pre-injection fuel delivery: quantity of the fuel injected per cycle during pre-injection (certain rpm only)
   - Check and modify the main fuel delivery: main fuel quantity injected per cycle
   - Check and modify the total fuel delivery: quantity of fuel injected per cycle, including pre-injection and main injection
   - Check and modify the coolant temperature: temperature of coolant to obtain engine cooling effect
   - Go to **2**
2. Read parameter check
   - The following table shows the indicative reading parameters obtained by means of the diagnostics tool.
   - See the table below
   - If the parameters are OK, go to **4**
   - If the parameters are NOT OK, go to **3**

***NOTE:*** *The values shown in the table are purely indicative and do not refer to the current application*

| Description | Value | | | Unit |
|---|---|---|---|---|
| | IGN_On **0 RPM** | ENG_On **900 RPM** | ENG_On **1500 RPM** | |
| Engine Revolutions | 0 | 900 | 1,500 | Rpm |
| Injection Advance | 0 | 2.33 | 3.43 | ° |
| Battery Voltage | 12 | 14 | 14 | Volt |
| Turbocharger Actuator | 99 | 81 | 53 | % |
| Boost Pressure | 1016 | 1031 | 1097 | mBar |
| Oil Pressure | 30 | 4311 | 4898 | mBar |
| Coolant Temperature | 32 | 71 | 80 | °C |
| Fuel temperature sensor | 26 | 25 | 26 | °C |
| Oil Temperature | 32 | 53 | 68 | °C |
| Main Fuel Quantity | 0 | 37 | 39 | mg/str |
| Fuel Introduced Pre-Injection | 0 | 1.5 | 1.5 | mg/str |
| Total Fuel Introduced | 0 | 35 | 37 | mg/str |
| Current Injection Quantity | 0 | 35 | 37 | mg/str |
| Cylinder Air Mass | 0 | 1600 | 1660 | mg/str |
| Fuel Pressure | 2 | 500 | 877 | Bar |
| Fuel Pressure Setpoint | 323 | 500 | 875 | Bar |
| Intake Air Quantity | 0 | 1576 | 1662 | mg/str |
| Humidity sensor (if present) | 33 | 43 | 43 | % |
| Humidity sensor voltage (if present) | 1847 | 2097 | 2097 | mV |

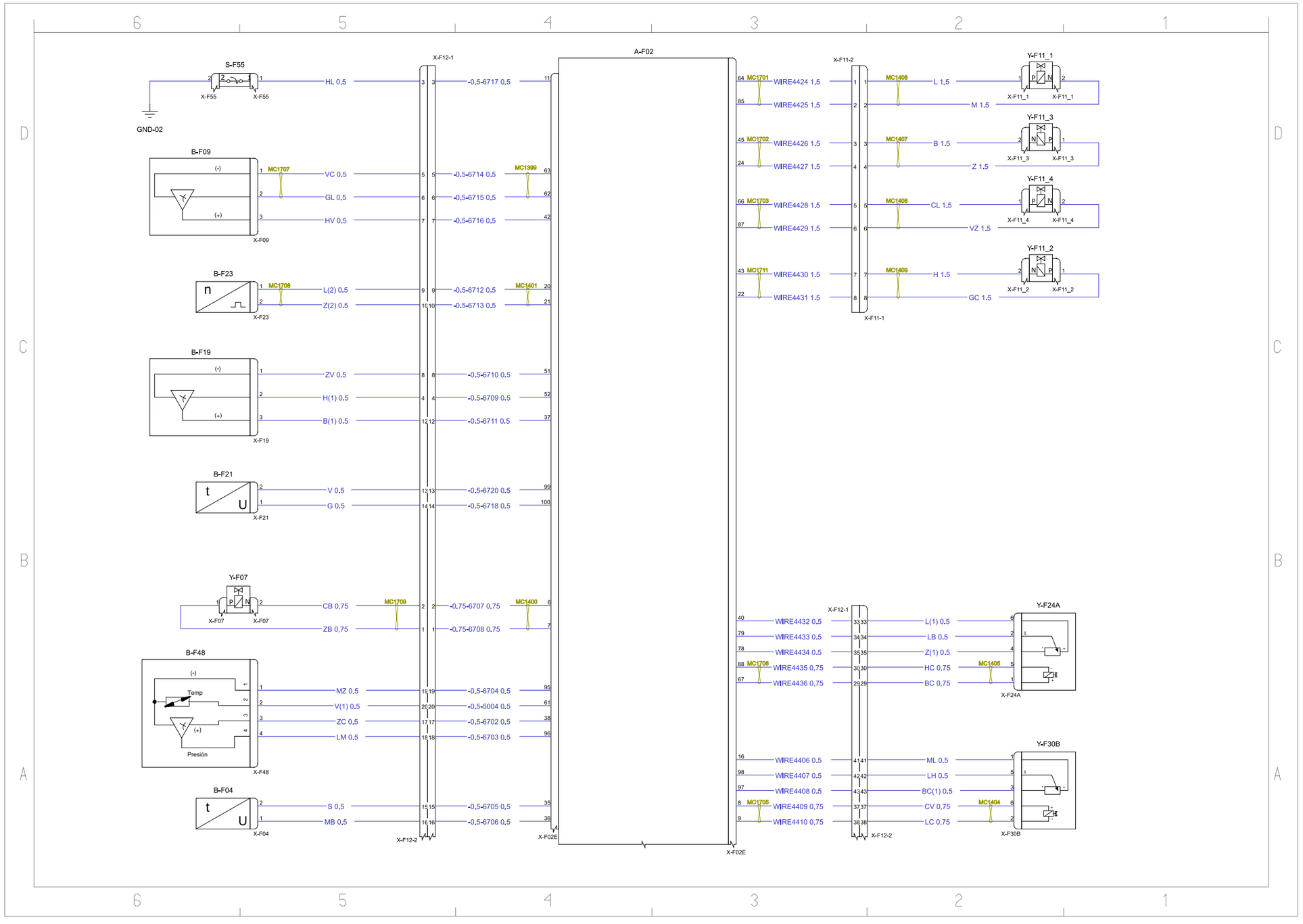
3. Possible root cause
   - Electrical defect of fuel and/or air system's components check wiring harness and component electrically
   - Mechanical defect of fuel and/or air system's components
   - Engine mechanical defect

***NOTE:*** *After having eliminated the cause of the error, delete the fault memory and repeat the reading.*

4. The engine control unit works properly.

# 769130 CONNECTIONS - Electrical schematic sheet 1 SH01 - ECU engine side

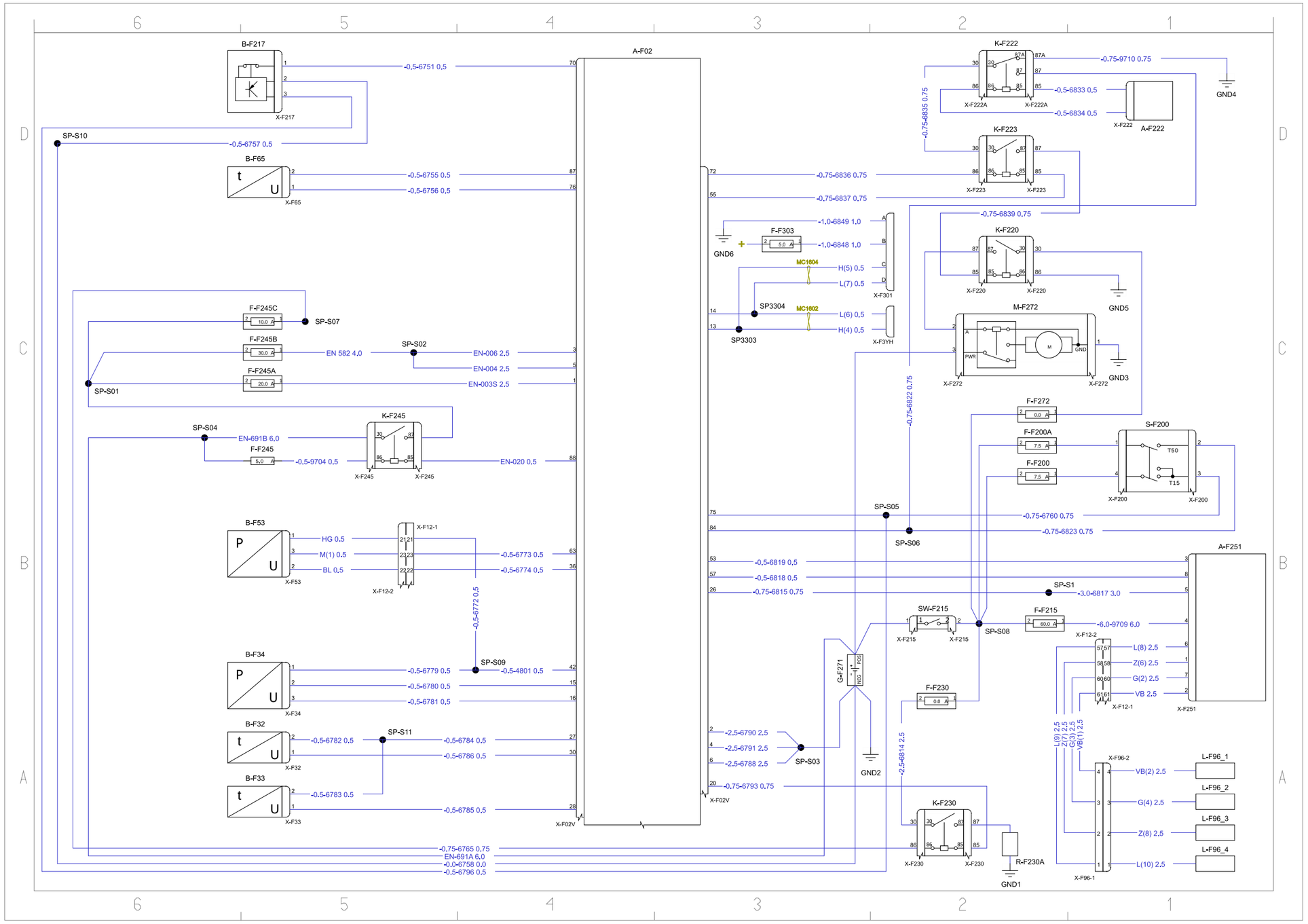
| Type | Component | Connector / Link |
|---|---|---|
| control unit | **A-F02** - Engine control unit (Control unit) | **X-F02V** - Engine control unit [A-F02] (5802751295)<br>**X-F02E** - Engine control unit [A-F02] (5802805180) |
| Sensor | **B-F04** - Temperature sensor in the fuel filter (Sensor) | **X-F04** - Temperature sensor in the fuel filter [B-F04] |
| Sensor | **B-F09** B -F09 - Pressure sensor on the rail (Sensor) | **X-F09** - Pressure sensor on the rail [B-F09] |
| Sensor | **B-F19** - Timing sensor (Sensor) | **X-F19** - Timing sensor [B-F19] |
| Sensor | **B-F21** - Engine coolant temperature sensor (Sensor) | **X-F21** - Engine coolant temperature sensor [B-F21] |
| Sensor | **B-F23** - RPM sensor (Sensor) | **X-F23** - RPM sensor [B-F23] |
| Sensor | **B-F48** - Overpressure air temperature and pressure sensor (Sensor) | **X-F48** - Boost air temperature and pressure sensor [B-F48] (5802350914) |
| Ground | **GND-02** - (Ground) | GND-02 |
| Switch | **S-F55** - Low engine oil level alarm switch (Switch) | **X-F55** - Low engine oil level alarm switch [S-F55] |
| Connector | | **X-F02E** - Engine control unit [A-F02] (5802805180) |
| Connector | | **X-F04** - Temperature sensor in the fuel filter [B-F04] |
| Connector | | **X-F07** - Fuel pressure regulating solenoid valve [Y-F07] |
| Connector | | **X-F09** - Pressure sensor on the rail [B-F09] |
| Connector | | **X-F11-1** - Connector SEZ.1 M (5801522803) |
| Connector | | **X-F11-2** - Connector SEZ.1 F (84152570) |
| Connector | | **X-F11_1** - Injector 1 [Y-F11_1] |
| Connector | | **X-F11_2** - Injector 2 [Y-F11_2] |
| Connector | | **X-F11_3** - Injector 3 [Y-F11_3] |
| Connector | | **X-F11_4** - Injector 4 [Y-F11_4] |
| Connector | | **X-F12-1** - Connector SEZ.2 F (5801909812) |
| Connector | | **X-F12-2** - Connector SEZ.2 M (5801939116) |
| Connector | | **X-F19** - Timing sensor [B-F19] |
| Connector | | **X-F21** - Engine coolant temperature sensor [B-F21] |
| Connector | | **X-F23** - RPM sensor [B-F23] |
| Connector | | **X-F24A** - EGR solenoid valve (Pierburg) [Y-F24A] |
| Connector | | **X-F30B** - Engine brake solenoid valve with position sensor [Y-F30B] |
| Connector | | **X-F48** - Boost air temperature and pressure sensor [B-F48] (5802350914) |
| Connector | | **X-F55** - Low engine oil level alarm switch [S-F55] |
| Solenoid | **Y-F07** - Solenoid valve for fuel pressure regulation (Solenoid) | **X-F07** - Fuel pressure regulating solenoid valve [Y-F07] |
| Solenoid | **Y-F11_1** - Injector 1 (Solenoid) | **X-F11_1** - Injector 1 [Y-F11_1] |
| Solenoid | **Y-F11_2** - Injector 2 (Solenoid) | **X-F11_2** - Injector 2 [Y-F11_2] |
| Solenoid | **Y-F11_3** - Injector 3 (Solenoid) | **X-F11_3** - Injector 3 [Y-F11_3] |
| Solenoid | **Y-F11_4** - Injector 4 (Solenoid) | **X-F11_4** - Injector 4 [Y-F11_4] |
| Solenoid | **Y-F24A** - EGR solenoid valve (Pierburg) (Solenoid) | **X-F24A** - EGR solenoid valve (Pierburg) [Y-F24A] |
| Solenoid | **Y-F30B** - Engine brake solenoid valve with position sensor (Solenoid) | **X-F30B** - Engine brake solenoid valve with position sensor [Y-F30B] |


S-F55
X-F55
X-F55
HL 0.5
GND-02
X-F12-1
A-F02
-0.5-6717 0.5
11
B-F09
(-)
(+)
X-F09
MC1707
VC 0.5
GL 0.5
HV 0.5
MC1399
-0.5-6714 0.5
-0.5-6715 0.5
-0.5-6716 0.5
63
62
42
B-F23
n
X-F23
MC1708
L(2) 0.5
Z(2) 0.5
MC1401
-0.5-6712 0.5
-0.5-6713 0.5
20
21
B-F19
(-)
(+)
X-F19
ZV 0.5
H(1) 0.5
B(1) 0.5
-0.5-6710 0.5
-0.5-6709 0.5
-0.5-6711 0.5
51
52
37
B-F21
t
U
X-F21
V 0.5
G 0.5
-0.5-6720 0.5
-0.5-6718 0.5
99
100
Y-F07
X-F07
X-F07
CB 0,75
ZB 0,75
MC1709
-0.75-6707 0.75
-0.75-6708 0.75
MC1400
6
7
B-F48
(-)
Temp
(+)
Presión
X-F48
MZ 0.5
V(1) 0.5
ZC 0.5
LM 0.5
-0.5-6704 0.5
-0.5-5004 0.5
-0.5-6702 0.5
-0.5-6703 0.5
95
61
38
96
B-F04
t
U
X-F04
S 0,5
MB 0,5
-0.5-6705 0.5
-0.5-6706 0.5
35
36
X-F12-2
X-F02E
X-F02E
X-F11-2
X-F11-1
MC1701
WIRE4424 1.5
WIRE4425 1.5
MC1406
L 1.5
M 1.5
MC1702
WIRE4426 1.5
WIRE4427 1.5
MC1407
B 1.5
Z 1.5
MC1703
WIRE4428 1.5
WIRE4429 1.5
MC1408
CL 1.5
VZ 1.5
MC1711
WIRE4430 1.5
WIRE4431 1.5
MC1409
H 1.5
GC 1.5
Y-F11_1
X-F11_1
X-F11_1
Y-F11_3
X-F11_3
X-F11_3
Y-F11_4
X-F11_4
X-F11_4
Y-F11_2
X-F11_2
X-F11_2
X-F12-1
X-F12-2
WIRE4432 0.5
WIRE4433 0.5
WIRE4434 0.5
MC1706
WIRE4435 0,75
WIRE4436 0,75
L(1) 0.5
LB 0.5
Z(1) 0.5
HC 0,75
BC 0,75
MC1405
Y-F24A
X-F24A
WIRE4406 0.5
WIRE4407 0.5
WIRE4408 0.5
MC1705
WIRE4409 0,75
WIRE4410 0,75
ML 0.5
LH 0.5
BC(1) 0.5
CV 0,75
LC 0,75
MC1404
Y-F30B
X-F30B

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# 769130 CONNECTIONS - Electrical schematic sheet 2 SH02 - ECU vehicle side

| Type | Component | Connector / Link |
|---|---|---|
| control unit | **A-F02** - Engine control unit (Control unit) | **X-F02V** - Engine control unit [A-F02] (5802751295)<br>**X-F02E** - Engine control unit [A-F02] (5802805180) |
| Control unit | **A-F222** - Start up control unit (Control unit) | **X-F222** - Starter control unit [A-F222] |
| Control unit | **A-F251** - Preheating glow-plugs control unit (Control unit) | **X-F251** - Preheating glow-plugs control unit [A-F251] (84356962) |
| Sensor | **B-F217** - Sensor detecting water in fuel (Sensor) | **X-F217** - Water in fuel sensor [B-F217] (87747172) |
| Sensor | **B-F32** - Exhaust gas temperature sensor upstream of the DOC (Sensor) | **X-F32** - Exhaust gas temperature sensor upstream of DOC [B-F32] |
| Sensor | **B-F33** - Exhaust gas temperature sensor upstream of the DPF (Sensor) | **X-F33** - Exhaust gas temperature sensor upstream of the DPF[[B-F33] |
| Sensor | **B-F34** - Differential pressure sensor on the DPF (Sensor) | **X-F34** - Differential pressure sensor on DPF [B-F34] |
| Sensor | **B-F53** - Exhaust gas pressure sensor (Sensor) | **X-F53** - Exhaust gas pressure sensor [B-F53] |
| Sensor | **B-F65** - Intake air temperature sensor (Sensor) | **X-F65** - Intake air temperature sensor [B-F65] |
| Fuse | **F-F200** - Fuse (Fuse) | |
| Fuse | **F-F200A** - Fuse (Fuse) | |
| Fuse | **F-F215** - Fuse (Fuse) | |
| Fuse | **F-F230** - Fuse (Fuse) | |
| Fuse | **F-F245** - Fuse (Fuse) | |
| Fuse | **F-F245A** - Fuse (Fuse) | |
| Fuse | **F-F245B** - Fuse (Fuse) | |
| Fuse | **F-F245C** - Fuse (Fuse) | |
| Fuse | **F-F272** - Fuse (Fuse) | |
| Fuse | **F-F303** - Fuse (Fuse) | |
| Energy source | **G-F271** - Battery (Power source) | |
| Relay | **K-F220** - Ignition contactor (Relay) | **X-F220** - Starter relay [K-F220] |
| Relay | **K-F222** - Contactor for start-up control from Body Controller (Relay) | **X-F222A** - Contactor for start-up control from Body Controller [K-F222] |
| Relay | **K-F223** - Ignition control contactor (Relay) | **X-F223** - Starter relay [K-F223] |
| Relay | **K-F230** - Fuel filter heating contactor (Relay) | **X-F230** - Fuel filter heating contactor [K-F230] |
| Relay | **K-F245** - Main contactor (Relay) | **X-F245** - Main contactor [K-F245] |
| Ash | **L-F96_1** - Pre-heating glow plug (Load) | |
| Ash | **L-F96_2** - Pre-heating glow plug (Load) | |
| Ash | **L-F96_3** - Pre-heating glow plug (Load) | |
| Ash | **L-F96_4** - Pre-heating glow plug (Load) | |
| Engine | **M-F272** - Starter motor (Motor) | **X-F272** - Starter motor [M-F272] |
| Resistance | **R-F230A** - Fuel filter resistor (Resistor) | |
| Switch | **S-F200** - Ignition switch (Switch) | **X-F200** - Ignition switch [S-F200] |
| Switch | **SW-F215** - Battery disconnect switch (BDS) (Switch) | **X-F215** - Battery cut-off switch (BDS) [SW-F215] |
| Connector | | **X-F02V** - Engine control unit [A-F02] (5802751295) |
| Connector | | **X-F12-1** - Connector SEZ.2 F (5801909812) |
| Connector | | **X-F12-2** - Connector SEZ.2 M (5801939116) |
| Connector | | **X-F200** - Ignition switch [S-F200] |
| Connector | | **X-F215** - Battery cut-off switch (BDS) [SW-F215] |
| Connector | | **X-F217** - Water in fuel sensor [B-F217] (87747172) |
| Connector | | **X-F220** - Starter relay [K-F220] |
| Connector | | **X-F222** - Starter control unit [A-F222] |
| Connector | | **X-F222A** - Contactor for start-up control from Body Controller [K-F222] |
| Connector | | **X-F223** - Starter relay [K-F223] |
| Connector | | **X-F230** - Fuel filter heating contactor [K-F230] |
| Connector | | **X-F245** - Main contactor [K-F245] |
| Connector | | **X-F251** - Preheating glow-plugs control unit [A-F251] (84356962) |
| Connector | | **X-F272** - Starter motor [M-F272] |
| Connector | | **X-F301** - Diagnostics connector |
| Connector | | **X-F32** - Exhaust gas temperature sensor upstream of DOC [B-F32] |
| Connector | | **X-F33** - Exhaust gas temperature sensor upstream of the DPF[[B-F33] |
| Connector | | **X-F34** - Differential pressure sensor on DPF [B-F34] |
| Connector | | **X-F3YH** - Connector CAN Interface 1 for interfacing with CAN network |
| Connector | | **X-F53** - Exhaust gas pressure sensor [B-F53] |
| Connector | | **X-F65** - Intake air temperature sensor [B-F65] |
| Connector | | **X-F96-1** - Connector SEZ.GP |
| Connector | | **X-F96-2** - Connector SEZ.EH |


B-F217
X-F217
SP-S10
-0.5-6751 0.5
-0.5-6757 0.5
B-F65
X-F65
-0.5-6755 0.5
-0.5-6756 0.5
A-F02
X-F02V
F-F245C
SP-S07
F-F245B
EN 582 4.0
SP-S02
EN-006 2.5
EN-004 2.5
F-F245A
SP-S01
EN-003S 2.5
SP-S04
EN-691B 6.0
F-F245
-0.5-9704 0.5
K-F245
X-F245
EN-020 0.5
B-F53
X-F53
HG 0.5
M(1) 0.5
BL 0.5
X-F12-1
X-F12-2
-0.5-6773 0.5
-0.5-6774 0.5
-0.5-6772 0.5
SP-S09
B-F34
X-F34
-0.5-6779 0.5
-0.5-6780 0.5
-0.5-6781 0.5
-0.5-4801 0.5
B-F32
X-F32
SP-S11
-0.5-6782 0.5
-0.5-6784 0.5
-0.5-6786 0.5
B-F33
X-F33
-0.5-6783 0.5
-0.5-6785 0.5
-0.75-6765 0.75
EN-691A 6.0
-0.0-6758 0.0
-0.5-6796 0.5
K-F222
X-F222A
-0.75-9710 0.75
-0.5-6833 0.5
-0.5-6834 0.5
-0.75-6835 0.75
A-F222
GND4
K-F223
X-F223
-0.75-6836 0.75
-0.75-6837 0.75
-0.75-6839 0.75
F-F303
-1.0-6849 1.0
-1.0-6848 1.0
GND6
MC1604
H(5) 0.5
L(7) 0.5
X-F301
SP3304
MC1602
L(6) 0.5
H(4) 0.5
SP3303
X-F3YH
K-F220
X-F220
GND5
M-F272
X-F272
GND3
-0.75-6822 0.75
F-F272
F-F200A
F-F200
S-F200
T50
T15
X-F200
SP-S05
SP-S06
-0.75-6760 0.75
-0.75-6823 0.75
-0.5-6819 0.5
-0.5-6818 0.5
-0.75-6815 0.75
A-F251
X-F251
SP-S1
-3.0-6817 3.0
SW-F215
X-F215
F-F215
SP-S08
-6.0-9709 6.0
X-F12-2
L(8) 2.5
Z(6) 2.5
G(2) 2.5
VB 2.5
X-F12-1
F-F230
G-F271
NEG
POS
-2.5-6790 2.5
-2.5-6791 2.5
-2.5-6788 2.5
SP-S03
GND2
-2.5-6814 2.5
L(9) 2.5
Z(7) 2.5
G(3) 2.5
VB(1) 2.5
X-F96-2
X-F96-1
VB(2) 2.5
G(4) 2.5
Z(8) 2.5
L(10) 2.5
L-F96_1
L-F96_2
L-F96_3
L-F96_4
K-F230
X-F230
R-F230A
GND1
-0.0-6793 0.75

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# 769130 CONNECTIONS - Component Diagram 00 Connector X-000 to X-009

***X-F02E - Engine control unit [ A-F02] (5802805180) (Receptacle)***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 6 | **X-F12-1 (Receptacle) pin 2** - Connector SEZ.2 F (5801909812) | -0.75-6707 | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 7 | **X-F12-1 (Receptacle) pin 1** - Connector SEZ.2 F (5801909812) | -0.75-6708 | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 8 | **X-F12-1 (Receptacle) pin 37** - Connector SEZ.2 F (5801909812) | WIRE4409 | Engine brake solenoid valve with position sensor | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 9 | **X-F12-1 (Receptacle) pin 38** - Connector SEZ.2 F (5801909812) | WIRE4410 | Engine brake solenoid valve with position sensor | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 11 | **X-F12-1 (Receptacle) pin 3** - Connector SEZ.2 F (5801909812) | -0.5-6717 | Low engine oil level alarm switch | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 16 | **X-F12-1 (Receptacle) pin 41** - Connector SEZ.2 F (5801909812) | WIRE4406 | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 20 | **X-F12-1 (Receptacle) pin 9** - Connector SEZ.2 F (5801909812) | -0.5-6712 | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 21 | **X-F12-1 (Receptacle) pin 10** - Connector SEZ.2 F (5801909812) | -0.5-6713 | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 22 | **X-F11-2 (Receptacle) pin 8** - Connector SEZ.1 F (84152570) | WIRE4431 | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 24 | **X-F11-2 (Receptacle) pin 4** - Connector SEZ.1 F (84152570) | WIRE4427 | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 35 | **X-F12-1 (Receptacle) pin 15** - Connector SEZ.2 F (5801909812) | -0.5-6705 | Temperature sensor in the fuel filter | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 36 | **X-F12-1 (Receptacle) pin 16** - Connector SEZ.2 F (5801909812) | -0.5-6706 | Temperature sensor in the fuel filter | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 37 | **X-F12-1 (Receptacle) pin 12** - Connector SEZ.2 F (5801909812) | -0.5-6711 | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 38 | **X-F12-1 (Receptacle) pin 17** - Connector SEZ.2 F (5801909812) | -0.5-6702 | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 40 | **X-F12-1 (Receptacle) pin 33** - Connector SEZ.2 F (5801909812) | WIRE4432 | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 42 | **X-F12-1 (Receptacle) pin 7** - Connector SEZ.2 F (5801909812) | -0.5-6716 | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 43 | **X-F11-2 (Receptacle) pin 7** - Connector SEZ.1 F (84152570) | WIRE4430 | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 45 | **X-F11-2 (Receptacle) pin 3** - Connector SEZ.1 F (84152570) | WIRE4426 | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 51 | **X-F12-1 (Receptacle) pin 8** - Connector SEZ.2 F (5801909812) | -0.5-6710 | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 52 | **X-F12-1 (Receptacle) pin 4** - Connector SEZ.2 F (5801909812) | -0.5-6709 | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 61 | **X-F12-1 (Receptacle) pin 20** - Connector SEZ.2 F (5801909812) | -0.5-5004 | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 62 | **X-F12-1 (Receptacle) pin 6** - Connector SEZ.2 F (5801909812) | -0.5-6715 | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 63 | **X-F12-1 (Receptacle) pin 5** - Connector SEZ.2 F (5801909812) | -0.5-6714 | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 64 | **X-F11-2 (Receptacle) pin 1** - Connector SEZ.1 F (84152570) | WIRE4424 | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 66 | **X-F11-2 (Receptacle) pin 5** - Connector SEZ.1 F (84152570) | WIRE4428 | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 67 | **X-F12-1 (Receptacle) pin 29** - Connector SEZ.2 F (5801909812) | WIRE4436 | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 78 | **X-F12-1 (Receptacle) pin 35** - Connector SEZ.2 F (5801909812) | WIRE4434 | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 79 | **X-F12-1 (Receptacle) pin 34** - Connector SEZ.2 F (5801909812) | WIRE4433 | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 85 | **X-F11-2 (Receptacle) pin 2** - Connector SEZ.1 F (84152570) | WIRE4425 | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 87 | **X-F11-2 (Receptacle) pin 6** - Connector SEZ.1 F (84152570) | WIRE4429 | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 88 | **X-F12-1 (Receptacle) pin 30** - Connector SEZ.2 F (5801909812) | WIRE4435 | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 95 | **X-F12-1 (Receptacle) pin 19** - Connector SEZ.2 F (5801909812) | -0.5-6704 | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 96 | **X-F12-1 (Receptacle) pin 18** - Connector SEZ.2 F (5801909812) | -0.5-6703 | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 97 | **X-F12-1 (Receptacle) pin 43** - Connector SEZ.2 F (5801909812) | WIRE4408 | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 98 | **X-F12-1 (Receptacle) pin 42** - Connector SEZ.2 F (5801909812) | WIRE4407 | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 99 | **X-F12-1 (Receptacle) pin 13** - Connector SEZ.2 F (5801909812) | -0.5-6720 | Engine coolant temperature sensor / Turbo temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 100 | **X-F12-1 (Receptacle) pin 14** - Connector SEZ.2 F (5801909812) | -0.5-6718 | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F02V - Engine control unit [ A-F02] (5802751295) (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | F-F245A-P-1 | EN-003S | Main contactor | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | SP-S03-P-1 | -2.5-6790 | Battery negative | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | SP-S02-P-1 | EN-006 | Main contactor | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 4 | SP-S03-P-1 | -2.5-6791 | Battery negative | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 5 | SP-S02-P-1 | EN-004 | Main contactor | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 6 | SP-S03-P-1 | -2.5-6788 | Battery negative | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 7 | | | Not Used | | |
| 8 | | | Not Used | | |
| 9 | | | Not Used | | |
| 10 | | | Not Used | | |
| 11 | | | Not Used | | |
| 12 | | | Not Used | | |
| 13 | SP3303-P-1 | -0.5-6842 | Connector CAN Interface 1 for interfacing with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 14 | SP3304-P-1 | -0.5-6841 | Connector CAN Interface 1 for interfacing with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 15 | **X-F34 pin 2** - Differential pressure sensor on DPF [B-F34] | -0.5-6780 | Differential pressure sensor on the DPF | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 16 | **X-F34 pin 3** - Differential pressure sensor on DPF [B-F34] | -0.5-6781 | Differential pressure sensor on the DPF | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 17 | | | Not Used | | |
| 18 | | | Not Used | | |
| 19 | | | Not Used | | |
| 20 | **X-F230 pin 85** - Fuel filter heating contactor [K-F230] | -0.75-6793 | Fuel filter heating contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 21 | | | Not Used | | |
| 22 | | | Not Used | | |
| 23 | | | Not Used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 24 | | | Not Used | | |
| 25 | | | Not Used | | |
| 26 | SP-S1-P-1 | -0.75-6815 | Preheating glow-plugs control unit | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 27 | SP-S11-P-1 | -0.5-6784 | Exhaust gas temperature sensor upstream of DOC (T4) / Exhaust gas temperature sensor upstream of DPF (T5) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 28 | **X-F33 pin 1** - Exhaust gas temperature sensor upstream of the DPF[[B-F33] | -0.5-6785 | Exhaust gas temperature sensor upstream of the DPF (T5) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 29 | | | Not Used | | |
| 30 | **X-F32 pin 1** - Exhaust gas temperature sensor upstream of DOC [B-F32] | -0.5-6786 | Exhaust gas temperature sensor upstream of DOC (T4) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 31 | | | Not Used | | |
| 32 | | | Not Used | | |
| 33 | | | Not Used | | |
| 34 | | | Not Used | | |
| 35 | | | Not Used | | |
| 36 | **X-F12-1 (Receptacle) pin 22** - Connector SEZ.2 F (5801909812) | -0.5-6774 | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 37 | | | Not Used | | |
| 38 | | | Not Used | | |
| 39 | | | Not Used | | |
| 40 | | | Not Used | | |
| 41 | | | Not Used | | |
| 42 | SP-S09-P-1 | -0.5-4801 | | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 43 | | | Not Used | | |
| 44 | | | Not Used | | |
| 45 | | | Not Used | | |
| 46 | | | Not Used | | |
| 47 | | | Not Used | | |
| 48 | | | Not Used | | |
| 49 | | | Not Used | | |
| 50 | | | Not Used | | |
| 51 | | | Not Used | | |
| 52 | | | Not Used | | |
| 53 | **X-F251 (Receptacle) pin 3** - Preheating glow-plugs control unit [A-F251] (84356962) | -0.5-6819 | Preheating glow-plugs control unit | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 54 | | | Not Used | | |
| 55 | **X-F223 pin 85** - Starter relay [K-F223] | -0.75-6837 | Starter control relay | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 56 | | | Not Used | | |
| 57 | **X-F251 (Receptacle) pin 8** - Preheating glow-plugs control unit [A-F251] (84356962) | -0.5-6818 | Preheating glow-plugs control unit | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 58 | | | Not Used | | |
| 59 | | | Not Used | | |
| 60 | | | Not Used | | |
| 61 | | | Not Used | | |
| 62 | | | Not Used | | |
| 63 | **X-F12-1 (Receptacle) pin 23** - Connector SEZ.2 F (5801909812) | -0.5-6773 | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 64 | | | Not Used | | |
| 65 | | | Not Used | | |
| 66 | | | Not Used | | |
| 67 | | | Not Used | | |
| 68 | | | Not Used | | |
| 69 | | | Not Used | | |
| 70 | **X-F217 (Receptacle) pin 1** - Water in fuel sensor [B-F217] (87747172) | -0.5-6751 | Water in fuel sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 71 | | | Not Used | | |
| 72 | **X-F223 pin 86** - Starter relay [K-F223] | -0.75-6836 | Starter control relay | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 73 | | | Not Used | | |
| 74 | | | Not Used | | |
| 75 | SP-S05-P-1 | -0.0-6795 | Starter switch | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 76 | **X-F65 pin 1** - Intake air temperature sensor [B-F65] | -0.5-6756 | Intake air temperature sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 77 | | | Not Used | | |
| 78 | | | Not Used | | |
| 79 | | | Not Used | | |
| 80 | | | Not Used | | |
| 81 | | | Not Used | | |
| 82 | | | Not Used | | |
| 83 | | | Not Used | | |
| 84 | SP-S06-P-1 | -0.0-6820 | Starter switch | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 85 | | | Not Used | | |
| 86 | | | Not Used | | |
| 87 | **X-F65 pin 2** - Intake air temperature sensor [B-F65] | -0.5-6755 | Intake air temperature sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 88 | **X-F245 pin 85** - Main contactor [K-F245] | EN-020 | Main contactor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F04 - Temperature sensor in the fuel filter [ B-F04]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 16** - Connector SEZ.2 M (5801939116) | MB | Temperature sensor in the fuel filter | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 15** - Connector SEZ.2 M (5801939116) | S | Temperature sensor in the fuel filter | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F07 - Fuel pressure regulating solenoid valve [ Y-F07] (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 1** - Connector SEZ.2 M (5801939116) | ZB | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 2** - Connector SEZ.2 M (5801939116) | CB | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |

### *X-F09 - Pressure sensor on the rail [ B-F09]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 5** - Connector SEZ.2 M (5801939116) | VC | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 6** - Connector SEZ.2 M (5801939116) | GL | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F12-2 (Plug) pin 7** - Connector SEZ.2 M (5801939116) | HV | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F11_1 - Injector 1 [ Y-F11_1]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F11-1 (Plug) pin 1** - Connector SEZ.1 M (5801522803) | L | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F11-1 (Plug) pin 2** - Connector SEZ.1 M (5801522803) | M | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F11_2 - Injector 2 [ Y-F11_2]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F11-1 (Plug) pin 8** - Connector SEZ.1 M (5801522803) | GC | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F11-1 (Plug) pin 7** - Connector SEZ.1 M (5801522803) | H | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F11_3 - Injector 3 [ Y-F11_3]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F11-1 (Plug) pin 4** - Connector SEZ.1 M (5801522803) | Z | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F11-1 (Plug) pin 3** - Connector SEZ.1 M (5801522803) | B | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F11_4 - Injector 4 [ Y-F11_4]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F11-1 (Plug) pin 5** - Connector SEZ.1 M (5801522803) | CL | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F11-1 (Plug) pin 6** - Connector SEZ.1 M (5801522803) | VZ | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F3YH - Connector CAN Interface 1 for interfacing with CAN network*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 2 | SP3303-P-1 | H(4) | Connector CAN Interface 1 for interfacing with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| PIN1 | SP3304-P-1 | L(6) | Connector for interface with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 01 Connector X-010 to X-019

### *X-F11-1 - Connector SEZ.1 M (5801522803) (Plug)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F11_1 pin 1** - Injector 1 [Y-F11_1] | L | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F11_1 pin 2** - Injector 1 [Y-F11_1] | M | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F11_3 pin 2** - Injector 3 [Y-F11_3] | B | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | **X-F11_3 pin 1** - Injector 3 [Y-F11_3] | Z | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 5 | **X-F11_4 pin 1** - Injector 4 [Y-F11_4] | CL | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F11_4 pin 2** - Injector 4 [Y-F11_4] | VZ | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 7 | **X-F11_2 pin 2** - Injector 2 [Y-F11_2] | H | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 8 | **X-F11_2 pin 1** - Injector 2 [Y-F11_2] | GC | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F11-2 - Connector SEZ.1 F (84152570) (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02E (Receptacle) pin 64** - Engine control unit [A-F02] (5802805180) | WIRE4424 | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F02E (Receptacle) pin 85** - Engine control unit [A-F02] (5802805180) | WIRE4425 | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F02E (Receptacle) pin 45** - Engine control unit [A-F02] (5802805180) | WIRE4426 | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | **X-F02E (Receptacle) pin 24** - Engine control unit [A-F02] (5802805180) | WIRE4427 | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 5 | **X-F02E (Receptacle) pin 66** - Engine control unit [A-F02] (5802805180) | WIRE4428 | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F02E (Receptacle) pin 87** - Engine control unit [A-F02] (5802805180) | WIRE4429 | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 7 | **X-F02E (Receptacle) pin 43** - Engine control unit [A-F02] (5802805180) | WIRE4430 | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 8 | **X-F02E (Receptacle) pin 22** - Engine control unit [A-F02] (5802805180) | WIRE4431 | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F12-1 - Connector SEZ.2 F (5801909812) (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02E (Receptacle) pin 7** - Engine control unit [A-F02] (5802805180) | -0.75-6708 | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F02E (Receptacle) pin 6** - Engine control unit [A-F02] (5802805180) | -0.75-6707 | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F02E (Receptacle) pin 11** - Engine control unit [A-F02] (5802805180) | -0.5-6717 | Low engine oil level alarm switch | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | **X-F02E (Receptacle) pin 52** - Engine control unit [A-F02] (5802805180) | -0.5-6709 | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 5 | **X-F02E (Receptacle) pin 63** - Engine control unit [A-F02] (5802805180) | -0.5-6714 | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F02E (Receptacle) pin 62** - Engine control unit [A-F02] (5802805180) | -0.5-6715 | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 7 | **X-F02E (Receptacle) pin 42** - Engine control unit [A-F02] (5802805180) | -0.5-6716 | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 8 | **X-F02E (Receptacle) pin 51** - Engine control unit [A-F02] (5802805180) | -0.5-6710 | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 9 | **X-F02E (Receptacle) pin 20** - Engine control unit [A-F02] (5802805180) | -0.5-6712 | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 10 | **X-F02E (Receptacle) pin 21** - Engine control unit [A-F02] (5802805180) | -0.5-6713 | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 11 | | | Not Used | | |
| 12 | **X-F02E (Receptacle) pin 37** - Engine control unit [A-F02] (5802805180) | -0.5-6711 | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 13 | **X-F02E (Receptacle) pin 99** - Engine control unit [A-F02] (5802805180) | -0.5-6720 | Engine coolant temperature sensor / Turbo temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 14 | **X-F02E (Receptacle) pin 100** - Engine control unit [A-F02] (5802805180) | -0.5-6718 | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 15 | **X-F02E (Receptacle) pin 35** - Engine control unit [A-F02] (5802805180) | -0.5-6705 | Temperature sensor in the fuel filter | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 16 | **X-F02E (Receptacle) pin 36** - Engine control unit [A-F02] (5802805180) | -0.5-6706 | Temperature sensor in the fuel filter | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 17 | **X-F02E (Receptacle) pin 38** - Engine control unit [A-F02] (5802805180) | -0.5-6702 | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 18 | **X-F02E (Receptacle) pin 96** - Engine control unit [A-F02] (5802805180) | -0.5-6703 | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 19 | **X-F02E (Receptacle) pin 95** - Engine control unit [A-F02] (5802805180) | -0.5-6704 | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 20 | **X-F02E (Receptacle) pin 61** - Engine control unit [A-F02] (5802805180) | -0.5-5004 | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 21 | SP-S09-P-1 | -0.5-6772 | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 22 | **X-F02V (Receptacle) pin 36** - Engine control unit [A-F02] (5802751295) | -0.5-6774 | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 23 | **X-F02V (Receptacle) pin 63** - Engine control unit [A-F02] (5802751295) | -0.5-6773 | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 24 | | | Not Used | | |
| 25 | | | Not Used | | |
| 26 | | | Not Used | | |
| 27 | | | Not Used | | |
| 28 | | | Not Used | | |
| 29 | **X-F02E (Receptacle) pin 67** - Engine control unit [A-F02] (5802805180) | WIRE4436 | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 30 | **X-F02E (Receptacle) pin 88** - Engine control unit [A-F02] (5802805180) | WIRE4435 | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 31 | | | Not Used | | |
| 32 | | | Not Used | | |
| 33 | **X-F02E (Receptacle) pin 40** - Engine control unit [A-F02] (5802805180) | WIRE4432 | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 34 | **X-F02E (Receptacle) pin 79** - Engine control unit [A-F02] (5802805180) | WIRE4433 | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 35 | **X-F02E (Receptacle) pin 78** - Engine control unit [A-F02] (5802805180) | WIRE4434 | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 36 | | | Not Used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 37 | **X-F02E (Receptacle) pin 8** - Engine control unit [A-F02] (5802805180) | WIRE4409 | Engine brake solenoid valve with position sensor | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 38 | **X-F02E (Receptacle) pin 9** - Engine control unit [A-F02] (5802805180) | WIRE4410 | Engine brake solenoid valve with position sensor | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 39 | | | Not Used | | |
| 40 | | | Not Used | | |
| 41 | **X-F02E (Receptacle) pin 16** - Engine control unit [A-F02] (5802805180) | WIRE4406 | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 42 | **X-F02E (Receptacle) pin 98** - Engine control unit [A-F02] (5802805180) | WIRE4407 | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 43 | **X-F02E (Receptacle) pin 97** - Engine control unit [A-F02] (5802805180) | WIRE4408 | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 44 | | | Not Used | | |
| 45 | | | Not Used | | |
| 46 | | | Not Used | | |
| 47 | | | Not Used | | |
| 48 | | | Not Used | | |
| 49 | | | Not Used | | |
| 50 | | | Not Used | | |
| 51 | | | Not Used | | |
| 52 | | | Not Used | | |
| 53 | | | Not Used | | |
| 54 | | | Not Used | | |
| 55 | | | Not Used | | |
| 56 | | | Not Used | | |
| 57 | **X-F251 (Receptacle) pin 6** - Preheating glow-plugs control unit [A-F251] (84356962) | L(8) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 58 | **X-F251 (Receptacle) pin 1** - Preheating glow-plugs control unit [A-F251] (84356962) | Z(6) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 59 | | | Not Used | | |
| 60 | **X-F251 (Receptacle) pin 7** - Preheating glow-plugs control unit [A-F251] (84356962) | G(2) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 61 | **X-F251 (Receptacle) pin 2** - Preheating glow-plugs control unit [A-F251] (84356962) | VB | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F12-2 - Connector SEZ.2 M (5801939116) (Plug)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F07 (Receptacle) pin 1** - Fuel pressure regulating solenoid valve [Y-F07] | ZB | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F07 (Receptacle) pin 2** - Fuel pressure regulating solenoid valve [Y-F07] | CB | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F55 pin 1** - Low engine oil level alarm switch [S-F55] | HL | Low engine oil level alarm switch | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | **X-F19 pin 2** - Timing sensor [B-F19] | H(1) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 5 | **X-F09 pin 1** - Pressure sensor on the rail [B-F09] | VC | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F09 pin 2** - Pressure sensor on the rail [B-F09] | GL | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 7 | **X-F09 pin 3** - Pressure sensor on the rail [B-F09] | HV | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 8 | **X-F19 pin 1** - Timing sensor [B-F19] | ZV | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 9 | **X-F23 (Receptacle) pin 1** - RPM sensor [B-F23] | L(2) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 10 | **X-F23 (Receptacle) pin 2** - RPM sensor [B-F23] | Z(2) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 11 | | | Not Used | | |
| 12 | **X-F19 pin 3** - Timing sensor [B-F19] | B(1) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 13 | **X-F21 pin 2** - Engine coolant temperature sensor [B-F21] | V | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 14 | **X-F21 pin 1** - Engine coolant temperature sensor [B-F21] | G | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 15 | **X-F04 pin 2** - Temperature sensor in the fuel filter [B-F04] | S | Temperature sensor in the fuel filter | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 16 | **X-F04 pin 1** - Temperature sensor in the fuel filter [B-F04] | MB | Temperature sensor in the fuel filter | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 17 | **X-F48 (Receptacle) pin 3** - Boost air temperature and pressure sensor [B-F48] (5802350914) | ZC | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 18 | **X-F48 (Receptacle) pin 4** - Boost air temperature and pressure sensor [B-F48] (5802350914) | LM | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 19 | **X-F48 (Receptacle) pin 1** - Boost air temperature and pressure sensor [B-F48] (5802350914) | MZ | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 20 | **X-F48 (Receptacle) pin 2** - Boost air temperature and pressure sensor [B-F48] (5802350914) | V(1) | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 21 | **X-F53 pin 1** - Exhaust gas pressure sensor [B-F53] | HG | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 22 | **X-F53 pin 2** - Exhaust gas pressure sensor [B-F53] | BL | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 23 | **X-F53 pin 3** - Exhaust gas pressure sensor [B-F53] | M(1) | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 24 | | | Not Used | | |
| 25 | | | Not Used | | |
| 26 | | | Not Used | | |
| 27 | | | Not Used | | |
| 28 | | | Not Used | | |
| 29 | **X-F24A pin 1** - EGR solenoid valve (Pierburg) [Y-F24A] | BC | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 30 | **X-F24A pin 5** - EGR solenoid valve (Pierburg) [Y-F24A] | HC | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 31 | | | Not Used | | |
| 32 | | | Not Used | | |
| 33 | **X-F24A pin 6** - EGR solenoid valve (Pierburg) [Y-F24A] | L(1) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 34 | **X-F24A pin 2** - EGR solenoid valve (Pierburg) [Y-F24A] | LB | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 35 | **X-F24A pin 4** - EGR solenoid valve (Pierburg) [Y-F24A] | Z(1) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 36 | | | Not Used | | |
| 37 | **X-F30B pin 6** - Engine brake solenoid valve with position sensor [Y-F30B] | CV | Engine brake solenoid valve with position sensor | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 38 | **X-F30B pin 2** - Engine brake solenoid valve with position sensor [Y-F30B] | LC | Engine brake solenoid valve with position sensor | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 39 | | | Not Used | | |
| 40 | | | Not Used | | |
| 41 | **X-F30B pin 1** - Engine brake solenoid valve with position sensor [Y-F30B] | ML | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 42 | **X-F30B pin 5** - Engine brake solenoid valve with position sensor [Y-F30B] | LH | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 43 | **X-F30B pin 3** - Engine brake solenoid valve with position sensor [Y-F30B] | BC(1) | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 44 | | | Not Used | | |
| 45 | | | Not Used | | |
| 46 | | | Not Used | | |
| 47 | | | Not Used | | |
| 48 | | | Not Used | | |
| 49 | | | Not Used | | |
| 50 | | | Not Used | | |
| 51 | | | Not Used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 52 | | | Not Used | | |
| 53 | | | Not Used | | |
| 54 | | | Not Used | | |
| 55 | | | Not Used | | |
| 56 | | | Not Used | | |
| 57 | **X-F96-1 pin 1** - Connector SEZ.GP | L(9) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 58 | **X-F96-1 pin 2** - Connector SEZ.GP | Z(7) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 59 | | | Not Used | | |
| 60 | **X-F96-1 pin 3** - Connector SEZ.GP | G(3) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 61 | **X-F96-1 pin 4** - Connector SEZ.GP | VB(1) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F19 - Timing sensor [ B-F19]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 8** - Connector SEZ.2 M (5801939116) | ZV | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 4** - Connector SEZ.2 M (5801939116) | H(1) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F12-2 (Plug) pin 12** - Connector SEZ.2 M (5801939116) | B(1) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Component diagram 02 Connector X-020 to X-029

### *X-F21 - Engine coolant temperature sensor [ B-F21]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 14** - Connector SEZ.2 M (5801939116) | G | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 13** - Connector SEZ.2 M (5801939116) | V | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F23 - RPM sensor [ B-F23] (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 9** - Connector SEZ.2 M (5801939116) | L(2) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 10** - Connector SEZ.2 M (5801939116) | Z(2) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F24A - EGR solenoid valve (Pierburg) [ Y-F24A]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 29** - Connector SEZ.2 M (5801939116) | BC | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 34** - Connector SEZ.2 M (5801939116) | LB | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | | | Not used | | |
| 4 | **X-F12-2 (Plug) pin 35** - Connector SEZ.2 M (5801939116) | Z(1) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 5 | **X-F12-2 (Plug) pin 30** - Connector SEZ.2 M (5801939116) | HC | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F12-2 (Plug) pin 33** - Connector SEZ.2 M (5801939116) | L(1) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Component diagram 03 Connector X-030 to X-039

### *X-F30B - Engine brake solenoid valve with position sensor [ Y-F30B]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 41** - Connector SEZ.2 M (5801939116) | ML | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 38** - Connector SEZ.2 M (5801939116) | LC | Engine brake solenoid valve with position sensor | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F12-2 (Plug) pin 43** - Connector SEZ.2 M (5801939116) | BC(1) | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | | | Not used | | |
| 5 | **X-F12-2 (Plug) pin 42** - Connector SEZ.2 M (5801939116) | LH | Engine brake solenoid valve with position sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F12-2 (Plug) pin 37** - Connector SEZ.2 M (5801939116) | CV | Engine brake solenoid valve with position sensor | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |

### *X-F32 - Exhaust gas temperature sensor upstream of DOC [ B-F32]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02V (Receptacle) pin 30** - Engine control unit [A-F02] (5802751295) | -0.5-6786 | Exhaust gas temperature sensor upstream of DOC (T4) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | SP-S11-P-1 | -0.5-6782 | Exhaust gas temperature sensor upstream of DOC (T4) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F33 - Exhaust gas temperature sensor upstream of the DPF[ B-F33]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02V (Receptacle) pin 28** - Engine control unit [A-F02] (5802751295) | -0.5-6785 | Exhaust gas temperature sensor upstream of the DPF (T5) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | SP-S11-P-1 | -0.5-6783 | Exhaust gas temperature sensor upstream of the DPF (T5) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F34 - Differential pressure sensor on DPF [ B-F34]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | SP-S09-P-1 | -0.5-6779 | Differential pressure sensor on the DPF | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F02V (Receptacle) pin 15** - Engine control unit [A-F02] (5802751295) | -0.5-6780 | Differential pressure sensor on the DPF | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | **X-F02V (Receptacle) pin 16** - Engine control unit [A-F02] (5802751295) | -0.5-6781 | Differential pressure sensor on the DPF | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 04 Connector X-040 to X-049

***X-F48 - Boost air temperature and pressure sensor [ B-F48] (5802350914) (Receptacle)***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 19** - Connector SEZ.2 M (5801939116) | MZ | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 20** - Connector SEZ.2 M (5801939116) | V(1) | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F12-2 (Plug) pin 17** - Connector SEZ.2 M (5801939116) | ZC | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | **X-F12-2 (Plug) pin 18** - Connector SEZ.2 M (5801939116) | LM | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Component diagram 05 Connector X-050 to X-059

### *X-F53 - Exhaust gas pressure sensor [ B-F53]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 21** - Connector SEZ.2 M (5801939116) | HG | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F12-2 (Plug) pin 22** - Connector SEZ.2 M (5801939116) | BL | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | **X-F12-2 (Plug) pin 23** - Connector SEZ.2 M (5801939116) | M(1) | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F55 - Low engine oil level alarm switch [ S-F55]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 3** - Connector SEZ.2 M (5801939116) | HL | Low engine oil level alarm switch | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | GND-02-P-1 | WIRE4457 | Mass | none - 0.0 | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Component diagram 06 Connector X-060 to X-069

***X-F65 - Intake air temperature sensor [ B-F65]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02V (Receptacle) pin 76** - Engine control unit [A-F02] (5802751295) | -0.5-6756 | Intake air temperature sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F02V (Receptacle) pin 87** - Engine control unit [A-F02] (5802751295) | -0.5-6755 | Intake air temperature sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 09 Connector X-090 to X-099

### *X-F96-1 - Connector SEZ.GP*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 57** - Connector SEZ.2 M (5801939116) | L(9) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F12-2 (Plug) pin 58** - Connector SEZ.2 M (5801939116) | Z(7) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | **X-F12-2 (Plug) pin 60** - Connector SEZ.2 M (5801939116) | G(3) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 4 | **X-F12-2 (Plug) pin 61** - Connector SEZ.2 M (5801939116) | VB(1) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F96-2 - Connector SEZ.EH*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | L-F96_4-P-PIN1 | L(10) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | L-F96_3-P-PIN1 | Z(8) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | L-F96_2-P-PIN1 | G(4) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 4 | L-F96_1-P-PIN1 | VB(2) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 20 Connector X-200 to X-209

***X-F200 - Ignition switch [ S-F200]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | F-F200A-P-1 | -0.0-6824 | Ignition switch | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | SP-S06-P-1 | -0.75-6823 | Starter switch | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | SP-S05-P-1 | -0.75-6760 | Starter switch | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 4 | F-F200-P-1 | -0.0-6825 | Ignition switch | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 21 Connector X-210 to X-219

### *X-F215 - Battery cut-off switch (BDS) [ SW-F215]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | G-F271-P-POS | -0.0-6794 | Battery positive | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | SP-S08-P-1 | -0.0-6810 | Battery positive | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F217 - Water in fuel sensor [ B-F217] (87747172) (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02V (Receptacle) pin 70** - Engine control unit [A-F02] (5802751295) | -0.5-6751 | Water in fuel sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | SP-S10-P-1 | -0.5-6757 | Water in fuel sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | SP-S05-P-1 | -0.5-6796 | Water in fuel sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 22 Connector X-220 to X-229

***X-F220 - Starter relay [ K-F220]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | | | Not used | | |
| 2 | | | Not used | | |
| 3 | | | Not used | | |
| 4 | | | Not used | | |
| 5 | | | Not used | | |
| 6 | | | Not used | | |
| 7 | | | Not used | | |
| 8 | | | Not used | | |
| 9 | | | Not used | | |
| 10 | | | Not used | | |
| 11 | | | Not used | | |
| 12 | | | Not used | | |
| 13 | | | Not used | | |
| 14 | | | Not used | | |
| 15 | | | Not used | | |
| 16 | | | Not used | | |
| 17 | | | Not used | | |
| 18 | | | Not used | | |
| 19 | | | Not used | | |
| 20 | | | Not used | | |
| 21 | | | Not used | | |
| 22 | | | Not used | | |
| 23 | | | Not used | | |
| 24 | | | Not used | | |
| 25 | | | Not used | | |
| 26 | | | Not used | | |
| 27 | | | Not used | | |
| 28 | | | Not used | | |
| 29 | | | Not used | | |
| 30 | F-F272-P-1 | -0.0-6829 | Starter contactor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 31 | | | Not used | | |
| 32 | | | Not used | | |
| 33 | | | Not used | | |
| 34 | | | Not used | | |
| 35 | | | Not used | | |
| 36 | | | Not used | | |
| 37 | | | Not used | | |
| 38 | | | Not used | | |
| 39 | | | Not used | | |
| 40 | | | Not used | | |
| 41 | | | Not used | | |
| 42 | | | Not used | | |
| 43 | | | Not used | | |
| 44 | | | Not used | | |
| 45 | | | Not used | | |
| 46 | | | Not used | | |
| 47 | | | Not used | | |
| 48 | | | Not used | | |
| 49 | | | Not used | | |
| 50 | | | Not used | | |
| 51 | | | Not used | | |
| 52 | | | Not used | | |
| 53 | | | Not used | | |
| 54 | | | Not used | | |
| 55 | | | Not used | | |
| 56 | | | Not used | | |
| 57 | | | Not used | | |
| 58 | | | Not used | | |
| 59 | | | Not used | | |
| 60 | | | Not used | | |
| 61 | | | Not used | | |
| 62 | | | Not used | | |
| 63 | | | Not used | | |
| 64 | | | Not used | | |
| 65 | | | Not used | | |
| 66 | | | Not used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 67 | | | Not used | | |
| 68 | | | Not used | | |
| 69 | | | Not used | | |
| 70 | | | Not used | | |
| 71 | | | Not used | | |
| 72 | | | Not used | | |
| 73 | | | Not used | | |
| 74 | | | Not used | | |
| 75 | | | Not used | | |
| 76 | | | Not used | | |
| 77 | | | Not used | | |
| 78 | | | Not used | | |
| 79 | | | Not used | | |
| 80 | | | Not used | | |
| 81 | | | Not used | | |
| 82 | | | Not used | | |
| 83 | | | Not used | | |
| 84 | | | Not used | | |
| 85 | **X-F223 pin 87** - Starter relay [K-F223] | -0.75-6839 | Starter contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 86 | GND5-P-1 | -0.0-6838 | Starter contactor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 87 | **X-F272 pin 2** - Starter motor [M-F272] | -0.0-6840 | Starter motor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F222 - Starter control unit [ A-F222]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F222A pin 85** - Contactor for start-up control from Body Controller [K-F222] | -0.5-6833 | Contactor for start-up control from Body Controller | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F222A pin 86** - Contactor for start-up control from Body Controller [K-F222] | -0.5-6834 | Contactor for start-up control from Body Controller | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F222A - Contactor for start-up control from Body Controller [ K-F222]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 30 | **X-F223 pin 30** - Starter relay [K-F223] | -0.75-6835 | Starter control relay | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 85 | **X-F222 pin 1** - Starter control unit [A-F222] | -0.5-6833 | Contactor for start-up control from Body Controller | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 86 | **X-F222 pin 2** - Starter control unit [A-F222] | -0.5-6834 | Contactor for start-up control from Body Controller | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 87 | SP-S06-P-1 | -0.75-6822 | Contactor for start-up control from Body Controller | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 87A | GND4-P-1 | -0.75-9710 | Contactor for start-up control from Body Controller | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F223 - Starter relay [ K-F223]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | | | Not used | | |
| 2 | | | Not used | | |
| 3 | | | Not used | | |
| 4 | | | Not used | | |
| 5 | | | Not used | | |
| 6 | | | Not used | | |
| 7 | | | Not used | | |
| 8 | | | Not used | | |
| 9 | | | Not used | | |
| 10 | | | Not used | | |
| 11 | | | Not used | | |
| 12 | | | Not used | | |
| 13 | | | Not used | | |
| 14 | | | Not used | | |
| 15 | | | Not used | | |
| 16 | | | Not used | | |
| 17 | | | Not used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 18 | | | Not used | | |
| 19 | | | Not used | | |
| 20 | | | Not used | | |
| 21 | | | Not used | | |
| 22 | | | Not used | | |
| 23 | | | Not used | | |
| 24 | | | Not used | | |
| 25 | | | Not used | | |
| 26 | | | Not used | | |
| 27 | | | Not used | | |
| 28 | | | Not used | | |
| 29 | | | Not used | | |
| 30 | **X-F222A pin 30** - Contactor for start-up control from Body Controller [K-F222] | -0.75-6835 | Starter control contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 31 | | | Not used | | |
| 32 | | | Not used | | |
| 33 | | | Not used | | |
| 34 | | | Not used | | |
| 35 | | | Not used | | |
| 36 | | | Not used | | |
| 37 | | | Not used | | |
| 38 | | | Not used | | |
| 39 | | | Not used | | |
| 40 | | | Not used | | |
| 41 | | | Not used | | |
| 42 | | | Not used | | |
| 43 | | | Not used | | |
| 44 | | | Not used | | |
| 45 | | | Not used | | |
| 46 | | | Not used | | |
| 47 | | | Not used | | |
| 48 | | | Not used | | |
| 49 | | | Not used | | |
| 50 | | | Not used | | |
| 51 | | | Not used | | |
| 52 | | | Not used | | |
| 53 | | | Not used | | |
| 54 | | | Not used | | |
| 55 | | | Not used | | |
| 56 | | | Not used | | |
| 57 | | | Not used | | |
| 58 | | | Not used | | |
| 59 | | | Not used | | |
| 60 | | | Not used | | |
| 61 | | | Not used | | |
| 62 | | | Not used | | |
| 63 | | | Not used | | |
| 64 | | | Not used | | |
| 65 | | | Not used | | |
| 66 | | | Not used | | |
| 67 | | | Not used | | |
| 68 | | | Not used | | |
| 69 | | | Not used | | |
| 70 | | | Not used | | |
| 71 | | | Not used | | |
| 72 | | | Not used | | |
| 73 | | | Not used | | |
| 74 | | | Not used | | |
| 75 | | | Not used | | |
| 76 | | | Not used | | |
| 77 | | | Not used | | |
| 78 | | | Not used | | |
| 79 | | | Not used | | |
| 80 | | | Not used | | |
| 81 | | | Not used | | |
| 82 | | | Not used | | |
| 83 | | | Not used | | |
| 84 | | | Not used | | |
| 85 | **X-F02V (Receptacle) pin 55** - Engine control unit [A-F02] (5802751295) | -0.75-6837 | Starter control contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 86 | **X-F02V (Receptacle) pin 72** - Engine control unit [A-F02] (5802751295) | -0.75-6836 | Starter control contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 87 | **X-F220 pin 85** - Starter relay [K-F220] | -0.75-6839 | Starter contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 23 Connector X-230 to X-239

***X-F230 - Fuel filter heating contactor [ K-F230]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | | | Not Used | | |
| 2 | | | Not Used | | |
| 3 | | | Not Used | | |
| 4 | | | Not Used | | |
| 5 | | | Not Used | | |
| 6 | | | Not Used | | |
| 7 | | | Not Used | | |
| 8 | | | Not Used | | |
| 9 | | | Not Used | | |
| 10 | | | Not Used | | |
| 11 | | | Not Used | | |
| 12 | | | Not Used | | |
| 13 | | | Not Used | | |
| 14 | | | Not Used | | |
| 15 | | | Not Used | | |
| 16 | | | Not Used | | |
| 17 | | | Not Used | | |
| 18 | | | Not Used | | |
| 19 | | | Not Used | | |
| 20 | | | Not Used | | |
| 21 | | | Not Used | | |
| 22 | | | Not Used | | |
| 23 | | | Not Used | | |
| 24 | | | Not Used | | |
| 25 | | | Not Used | | |
| 26 | | | Not Used | | |
| 27 | | | Not Used | | |
| 28 | | | Not Used | | |
| 29 | | | Not Used | | |
| 30 | F-F230-P-2 | -2.5-6814 | Fuel filter heating contactor | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 31 | | | Not Used | | |
| 32 | | | Not Used | | |
| 33 | | | Not Used | | |
| 34 | | | Not Used | | |
| 35 | | | Not Used | | |
| 36 | | | Not Used | | |
| 37 | | | Not Used | | |
| 38 | | | Not Used | | |
| 39 | | | Not Used | | |
| 40 | | | Not Used | | |
| 41 | | | Not Used | | |
| 42 | | | Not Used | | |
| 43 | | | Not Used | | |
| 44 | | | Not Used | | |
| 45 | | | Not Used | | |
| 46 | | | Not Used | | |
| 47 | | | Not Used | | |
| 48 | | | Not Used | | |
| 49 | | | Not Used | | |
| 50 | | | Not Used | | |
| 51 | | | Not Used | | |
| 52 | | | Not Used | | |
| 53 | | | Not Used | | |
| 54 | | | Not Used | | |
| 55 | | | Not Used | | |
| 56 | | | Not Used | | |
| 57 | | | Not Used | | |
| 58 | | | Not Used | | |
| 59 | | | Not Used | | |
| 60 | | | Not Used | | |
| 61 | | | Not Used | | |
| 62 | | | Not Used | | |
| 63 | | | Not Used | | |
| 64 | | | Not Used | | |
| 65 | | | Not Used | | |
| 66 | | | Not Used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 67 | | | Not Used | | |
| 68 | | | Not Used | | |
| 69 | | | Not Used | | |
| 70 | | | Not Used | | |
| 71 | | | Not Used | | |
| 72 | | | Not Used | | |
| 73 | | | Not Used | | |
| 74 | | | Not Used | | |
| 75 | | | Not Used | | |
| 76 | | | Not Used | | |
| 77 | | | Not Used | | |
| 78 | | | Not Used | | |
| 79 | | | Not Used | | |
| 80 | | | Not Used | | |
| 81 | | | Not Used | | |
| 82 | | | Not Used | | |
| 83 | | | Not Used | | |
| 84 | | | Not Used | | |
| 85 | **X-F02V (Receptacle) pin 20** - Engine control unit [A-F02] (5802751295) | -0.75-6793 | Fuel filter heating contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 86 | SP-S07-P-1 | -0.75-6765 | Fuel filter heating contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 87 | R-F230A-P-1 | -2.5-6767 | Fuel filter resistor | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 24 Connector X-240 to X-249

***X-F245 - Main contactor [ K-F245]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | | | Not Used | | |
| 2 | | | Not Used | | |
| 3 | | | Not Used | | |
| 4 | | | Not Used | | |
| 5 | | | Not Used | | |
| 6 | | | Not Used | | |
| 7 | | | Not Used | | |
| 8 | | | Not Used | | |
| 9 | | | Not Used | | |
| 10 | | | Not Used | | |
| 11 | | | Not Used | | |
| 12 | | | Not Used | | |
| 13 | | | Not Used | | |
| 14 | | | Not Used | | |
| 15 | | | Not Used | | |
| 16 | | | Not Used | | |
| 17 | | | Not Used | | |
| 18 | | | Not Used | | |
| 19 | | | Not Used | | |
| 20 | | | Not Used | | |
| 21 | | | Not Used | | |
| 22 | | | Not Used | | |
| 23 | | | Not Used | | |
| 24 | | | Not Used | | |
| 25 | | | Not Used | | |
| 26 | | | Not Used | | |
| 27 | | | Not Used | | |
| 28 | | | Not Used | | |
| 29 | | | Not Used | | |
| 30 | SP-S04-P-1 | EN-691B | Battery positive | none - 6.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 31 | | | Not Used | | |
| 32 | | | Not Used | | |
| 33 | | | Not Used | | |
| 34 | | | Not Used | | |
| 35 | | | Not Used | | |
| 36 | | | Not Used | | |
| 37 | | | Not Used | | |
| 38 | | | Not Used | | |
| 39 | | | Not Used | | |
| 40 | | | Not Used | | |
| 41 | | | Not Used | | |
| 42 | | | Not Used | | |
| 43 | | | Not Used | | |
| 44 | | | Not Used | | |
| 45 | | | Not Used | | |
| 46 | | | Not Used | | |
| 47 | | | Not Used | | |
| 48 | | | Not Used | | |
| 49 | | | Not Used | | |
| 50 | | | Not Used | | |
| 51 | | | Not Used | | |
| 52 | | | Not Used | | |
| 53 | | | Not Used | | |
| 54 | | | Not Used | | |
| 55 | | | Not Used | | |
| 56 | | | Not Used | | |
| 57 | | | Not Used | | |
| 58 | | | Not Used | | |
| 59 | | | Not Used | | |
| 60 | | | Not Used | | |
| 61 | | | Not Used | | |
| 62 | | | Not Used | | |
| 63 | | | Not Used | | |
| 64 | | | Not Used | | |
| 65 | | | Not Used | | |
| 66 | | | Not Used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 67 | | | Not Used | | |
| 68 | | | Not Used | | |
| 69 | | | Not Used | | |
| 70 | | | Not Used | | |
| 71 | | | Not Used | | |
| 72 | | | Not Used | | |
| 73 | | | Not Used | | |
| 74 | | | Not Used | | |
| 75 | | | Not Used | | |
| 76 | | | Not Used | | |
| 77 | | | Not Used | | |
| 78 | | | Not Used | | |
| 79 | | | Not Used | | |
| 80 | | | Not Used | | |
| 81 | | | Not Used | | |
| 82 | | | Not Used | | |
| 83 | | | Not Used | | |
| 84 | | | Not Used | | |
| 85 | **X-F02V (Receptacle) pin 88** - Engine control unit [A-F02] (5802751295) | EN-020 | Main contactor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 86 | F-F245-P-2 | -0.5-9704 | Main contactor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 87 | SP-S01-P-1 | EN-030 | Main contactor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 25 Connector X-250 to X-259

***X-F251 - Preheating glow-plugs control unit [ A-F251] (84356962) (Receptacle)***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-1 (Receptacle) pin 58** - Connector SEZ.2 F (5801909812) | Z(6) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F12-1 (Receptacle) pin 61** - Connector SEZ.2 F (5801909812) | VB | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | **X-F02V (Receptacle) pin 53** - Engine control unit [A-F02] (5802751295) | -0.5-6819 | Preheating glow-plugs control unit | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 4 | F-F215-P-1 | -6.0-9709 | Spark plug | none - 6.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 5 | SP-S1-P-1 | -3.0-6817 | Preheating glow-plugs control unit | none - 3.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 6 | **X-F12-1 (Receptacle) pin 57** - Connector SEZ.2 F (5801909812) | L(8) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 7 | **X-F12-1 (Receptacle) pin 60** - Connector SEZ.2 F (5801909812) | G(2) | Spark plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 8 | **X-F02V (Receptacle) pin 57** - Engine control unit [A-F02] (5802751295) | -0.5-6818 | Preheating glow-plugs control unit | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 27 Connector X-270 to X-279

***X-F272 - Starter motor [ M-F272]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | GND3-P-1 | -0.0-6830 | Starter motor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F220 pin 87** - Starter relay [K-F220] | -0.0-6840 | Starter motor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | G-F271-P-POS | -0.0-6831 | Battery positive | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 30 Connector X-300 to X-309

***X-F301 - Diagnostics connector***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| A | GND6-P-1 | -1.0-6849 | Connector for interface with CAN network | none - 1.0 | **SHEET 2 SH02 - ECU vehicle side** |
| B | F-F303-P-1 | -1.0-6848 | Connector for interface with CAN network | none - 1.0 | **SHEET 2 SH02 - ECU vehicle side** |
| C | SP3303-P-1 | H(5) | Connector for interface with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| D | SP3304-P-1 | L(7) | Connector for interface with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - ECU description

***A-F02 - Engine control unit (Control unit)***

| | |
|---|---|
| Component Type | Control unit |
| Wiring frames | **SHEET 1 SH01 - ECU engine side**<br>**SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F02V (Receptacle)** - Engine control unit [A-F02] (5802751295)<br>**X-F02E (Receptacle)** - Engine control unit [A-F02] (5802805180) |

***A-F222 - Start up control unit (Control unit)***

| | |
|---|---|
| Component Type | Control unit |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F222** - Starter control unit [A-F222] |

***A-F251 - Preheating glow-plugs control unit (Control unit)***

| | |
|---|---|
| Component Type | Control unit |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F251 (Receptacle)** - Preheating glow-plugs control unit [A-F251] (84356962) |

# 769130 CONNECTIONS - Sensor description

***B-F04 - Temperature sensor in the fuel filter (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F04** - Temperature sensor in the fuel filter [B-F04] |

***B -F09 - Pressure sensor on the rail (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F09** - Pressure sensor on the rail [B-F09] |

***B-F19 - Timing sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F19** - Timing sensor [B-F19] |

***B-F21 - Engine coolant temperature sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F21** - Engine coolant temperature sensor [B-F21] |

***B-F217 - Sensor detecting water in fuel (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F217 (Receptacle)** - Water in fuel sensor [B-F217] (87747172) |

***B-F23 - RPM sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F23 (Receptacle)** - RPM sensor [B-F23] |

***B-F32 - Exhaust gas temperature sensor upstream of the DOC (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F32** - Exhaust gas temperature sensor upstream of DOC [B-F32] |

***B-F33 - Exhaust gas temperature sensor upstream of the DPF (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F33** - Exhaust gas temperature sensor upstream of the DPF[[B-F33] |

***B-F34 - Differential pressure sensor on the DPF (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F34** - Differential pressure sensor on DPF [B-F34] |

***B-F48 - Overpressure air temperature and pressure sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |

| | |
|---|---|
| Connectors | **X-F48 (Receptacle)** - Boost air temperature and pressure sensor [B-F48] (5802350914) |

***B-F53 - Exhaust gas pressure sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F53** - Exhaust gas pressure sensor [B-F53] |

***B-F65 - Intake air temperature sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F65** - Intake air temperature sensor [B-F65] |

# 769130 CONNECTIONS - Fuse description

***F-F200 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F200A - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F215 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F230 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F245 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F245A - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F245B - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F245C - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F272 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F303 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Voltage source description

***G-F271 - Battery (Power source)***

| Component Type | Power source |
|---|---|
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Ground description

***GND-02 - (Ground)***

| | |
|---|---|
| Component Type | Ground |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Relay description

***K-F220 - Ignition contactor (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F220** - Starter relay [K-F220] |

***K-F222 - Contactor for start-up control from Body Controller (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F222A** - Contactor for start-up control from Body Controller [K-F222] |

***K-F223 - Ignition control contactor (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F223** - Starter relay [K-F223] |

***K-F230 - Fuel filter heating contactor (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F230** - Fuel filter heating contactor [K-F230] |

***K-F245 - Main contactor (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F245** - Main contactor [K-F245] |

# 769130 CONNECTIONS - Load description

***L-F96_1 - Pre-heating glow plug (Load)***

| | |
|---|---|
| Component Type | Ash |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***L-F96_2 - Pre-heating glow plug (Load)***

| | |
|---|---|
| Component Type | Ash |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***L-F96_3 - Pre-heating glow plug (Load)***

| | |
|---|---|
| Component Type | Ash |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***L-F96_4 - Pre-heating glow plug (Load)***

| | |
|---|---|
| Component Type | Ash |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Motor description

***M-F272 - Starter motor (Motor)***

| | |
|---|---|
| Component Type | Engine |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F272** - Starter motor [M-F272] |

# 769130 CONNECTIONS - Resistor description

***R-F230A - Fuel filter resistor (Resistor)***

| | |
|---|---|
| Component Type | Resistor |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Switch description

***S-F200 - Ignition switch (Switch)***

| | |
|---|---|
| Component Type | Switch |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F200** - Ignition switch [S-F200] |

***S-F55 - Low engine oil level alarm switch (Switch)***

| | |
|---|---|
| Component Type | Switch |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F55** - Low engine oil level alarm switch [S-F55] |

***SW-F215 - Battery disconnect switch (BDS) (Switch)***

| | |
|---|---|
| Component Type | Switch |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F215** - Battery cut-off switch (BDS) [SW-F215] |

# 769130 CONNECTIONS - Solenoid description

***Y-F07 - Solenoid valve for fuel pressure regulation (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F07 (Receptacle)** - Fuel pressure regulating solenoid valve [Y-F07] |

***Y-F11_1 - Injector 1 (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F11_1** - Injector 1 [Y-F11_1] |

***Y-F11_2 - Injector 2 (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F11_2** - Injector 2 [Y-F11_2] |

***Y-F11_3 - Injector 3 (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F11_3** - Injector 3 [Y-F11_3] |

***Y-F11_4 - Injector 4 (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F11_4** - Injector 4 [Y-F11_4] |

***Y-F24A - EGR solenoid valve (Pierburg) (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F24A** - EGR solenoid valve (Pierburg) [Y-F24A] |

***Y-F30B - Engine brake solenoid valve with position sensor (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F30B** - Engine brake solenoid valve with position sensor [Y-F30B] |

# 766364 RELAY' - Test - AdBlue line heater HCU relay

## Description

The **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852 K-F45** line heater relay is present in the exhaust gas after-treatment systems **AD-BLUE SYSTEM - Overview (50.74)** and checks the resistors on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** flexible lines.

The **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** line heater relay **K-F45** communicates with the Electronic Engine Control Unit (ECM) **A-F02** via CAN.

To refer to the technical data relating to the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** line heater relay **K-F45**, see **RELAY' - Technical Data (76.63)**.

## Troubleshooting

1. Use a multimeter to check continuity of the resistance carrying out the test between the G1-G2-G4 outputs and ground.
   A. If continuity is verified, this indicates that the relay might not be working correctly. Continue with the fault identification procedure.
   B. If the continuity is not verified, this indicates that the resistors could be open. Continue with the fault identification procedure and then go to step **2**.
2. Use the diagnostic tool to disable and delete the fault code. Restore vehicle operating conditions and check that the fault code relating to the NOx sensor is not active.
   A. If the fault code relating to the HCU relay **K-F45** is not active, diagnosis is terminated.
   B. If the fault code relating to the HCU relay **K-F45** is active, go back to the fault identification procedure.

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670400 1127-0 - Turbocharger control: pressure value above the upper threshold [FPT ECU] . . . . . 463

# 295467 630A12 2659-18 - EGR control: low flow rate detected in the EGR valve

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the EGR system to ensure it is working properly. To detect low flow (obstructed or tampered EGR path), pressure signals before the intake valve and/or pressure in the exhaust manifold upstream of the turbine are evaluated. The function must be performed every time after starting the engine. The closed EGR valve carries out a closed/open/closed sequence. During this sequence, the pressure signals in the intake manifold (P2) and the pressure in the gradients of the exhaust manifold (P3) are checked and if a deviation from the expected behaviour is detected, the error appears.

**Cause:**
The ECU **A-F02** detects a slow response in the EGR actuator **Y-F24A**

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.

2. Check the correct operation of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the EGR actuator **Y-F24A**.

   B. If code remains inactive, return the machine to service.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 2791-31 E70A1F - EGR Valve: Current limited

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the current sent to the actuator of the EGR pilot valve **Y-F24A** If it exceeds a set limit for a time longer than the anti-bouncing time, a slow actuator condition is detected.

**Cause:**
The activation current of the EGR valve **Y-F24A** exceeds the current permitted to reach the required position: there could be an electrical problem inside the EGR valve actuator,a wiring problem ("short circuit") or a mechanical block-age in the valve.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **5**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 4** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 5** | Battery positive | There should be no continuity |

   A. If there is continuity, there is a short circuit condition in the wiring. repair or replace as required.

   B. If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to **3**age.

3. Check for short circuit to ground in the circuit of the EGR valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 1** | Chassis ground | There should be no continuity |
| **X-F24A (Receptacle) pin 2** | Chassis ground | There should be no continuity |
| **X-F24A (Receptacle) pin 6** | Chassis ground | There should be no continuity |

   A. If there is continuity, there is a short circuit condition in the wiring. repair or replace as required.

   B. If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to **4**age.

4. Check for a mechanical block in the EGR actuator **Y-F24A** and remove it if necessary.

Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

A. If code returns in an active status, replace the EGR actuator **Y-F24A**.

B. If code remains inactive, return the machine to service.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 1B0014 27-20 - EGR Valve: leak in valve in closed position

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors movement of the EGR valve **Y-F24A** from the closed position through the feedback signal which must be within specified limits.

**Cause:**
The EGR valve **Y-F24A** does not close completely: the EGR valve is mechanically blocked due to dirt or the position sensor is not aligned.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.

2. Check monitoring of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, correctly mount the EGR actuator **Y-F24A**.

   B. If code remains inactive, return the machine to service.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5DE1E5 516445-5 - EGR Valve: open circuit error in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge) and signals an open circuit error.

**Cause:**
The ECU **A-F02** detects electrical problems in the EGR valve actuator: broken wiring, false connector contacts, internal problems in the actuator.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.

2. Check for an open circuit in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 67** | **X-F24A pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 88** | **X-F24A pin 5** | There should be continuity. |
| **X-F02E (Receptacle) pin 78** | **X-F24A pin 4** | There should be continuity. |
| **X-F02E (Receptacle) pin 79** | **X-F24A pin 2** | There should be continuity. |
| **X-F02E (Receptacle) pin 40** | **X-F24A pin 6** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, return the machine to service.required.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 1DECE6 519197-6 - EGR Valve: overcurrent error in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge) and signals an overcurrent error.

**Cause:**
The ECU **A-F02** detects electrical problems in the EGR valve actuator **Y-F24A**: short circuit to battery in the wiring or short circuit inside the actuator.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Battery positive | There should be no reading |
| **X-F24A (Receptacle) pin 4** | Battery positive | There should be no reading |
| **X-F24A (Receptacle) pin 5** | Battery positive | There should be no reading |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, leave the connectors disconnected and go to **3**age.

3. Check the correct operation of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the EGR actuator **Y-F24A**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 519198-6 1EECE6 - EGR Valve: overtemperature error in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the power stage of the EGR valve actuator **Y-F24A** and signals an over temperature error.

**Cause:**
High battery voltage, high temperature inside ECU, high load or wiring problem

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check for an open circuit in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 67** | **X-F24A pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 88** | **X-F24A pin 5** | There should be continuity. |
| **X-F02E (Receptacle) pin 78** | **X-F24A pin 4** | There should be continuity. |
| **X-F02E (Receptacle) pin 79** | **X-F24A pin 2** | There should be continuity. |
| **X-F02E (Receptacle) pin 40** | **X-F24A pin 6** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the engine control unit (ECU) **A-F02**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 516445-3 5DE1E3 - EGR Valve: short circuit to battery on output 1 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge). The H-Bridge has 2 switches (high side and low side). Each circuit is monitored separately and a short circuit to battery is signalled on Out1.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **3**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 5** | Battery positive | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, return the machine to service.age.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 1EECE3 519198-3 - EGR Valve: short circuit to battery on output 2 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge). The H-Bridge has 2 switches (high side and low side). Each circuit is monitored separately and a short circuit to battery is signalled on Out2.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **3**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 4** | Battery positive | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, return the machine to service.age.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 5DE1E4 516445-4 - EGR Valve: short circuit to ground on output 1 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge). The H-Bridge has 2 switches (high side and low side). Each circuit is monitored separately and a short circuit to ground is signalled on Out1.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring of the EGR valve **Y-F24A**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.

2. Check for short circuit to ground in the circuit of the EGR valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 67** | Mass | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, return the machine to service.required.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 1EECE4 519198-4 - EGR Valve: short circuit to ground on output 2 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge). The H-Bridge has 2 switches (high side and low side). Each circuit is monitored separately and a short circuit to ground is signalled on Out2.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **3**age.

2. Check for short circuit to ground in the circuit of the EGR valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Ground | There should be no continuity |
| **X-F24A (Receptacle) pin 6** | Ground | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, return the machine to service.age.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 519199-6 1FECE6 - EGR Valve: plausibility error from overload on the power stage outputs

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02**monitors the power stage of the EGR valve electric actuator **Y-F24A** (bridge H) An overload error is not directly detectable if the wiring length is greater than 1m and the fault occurs close to the actuator. Therefore, a plausibility check is required if a "Short circuit to battery" (SCB) or "Short circuit to ground" (SCG) fault is detected. Therefore the switch (low side in the case of SCB, high side in the case of SCG) is closed. If the short circuit fault disappears, it is cleared and the short circuit overload fault is activated. In the event of a short circuit to ground fault, the high side switches are closed. If there is no longer a short circuit to ground fault, it is detected as a short circuit overload fault. In the event of a short circuit to battery error, the switches on the lower side are closed. If there is no longer a short circuit to battery error, it is detected as a short circuit overload error. If a short circuit overload fault is detected, the pre-existing SCG / SCB fault is resolved.

**Cause:**
The ECU **A-F02** detects a short circuit in the wiring of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **3**age.
2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 4** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 5** | Battery positive | There should be no continuity |

   A. If there is continuity, there is a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to **3**.
3. Check for short circuit to ground in the circuit of the EGR valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 1** | Chassis ground | There should be no continuity |
| **X-F24A (Receptacle) pin 2** | Chassis ground | There should be no continuity |

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 6** | Chassis ground | There should be no continuity |

A. If there is continuity, there is a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

B. If there is no continuity, the wiring is operating correctly, return the machine to service.age.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 1FECE5 519199-5 - EGR Valve: voltage below the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge) and signals an error of voltage below the permitted threshold.

**Cause:**
Voltage fluctuations too high in the system or internal fault in the control unit.('ECU) **A-F02**

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.
2. Check for continuity in the high side of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 1** | **X-F02E (Receptacle) pin 67** | There should be no continuity |
| **X-F24A (Receptacle) pin 5** | **X-F02E (Receptacle) pin 88** | There should be no continuity |

   A. If there is continuity, there is an error in the circuit, For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to **3**age.
3. Check the correct operation of the engine control unit (ECU) **A-F02**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 E70A07 2791-7 - EGR Valve: stuck in the closed position

## Control Module: FPT ECU

**Fault Description:**
The EGR valve actuator **Y-F24A** with a position sensor provides feedback to the engine control unit (ECU) **A-F02**. If there is a deviation between the position requested and the position detected, a deviation error (min or max) is triggered. The system then tries to "release" the closing or opening of the fast actuator. If it is not possible to "release" the actuator, the fault "Valve jammed" is triggered. The valve stuck in the closed state is detected if the deviation is permanent, the valve release attempts have failed or the EGR actuator prosecution is below a predetermined threshold.

**Cause:**
The EGR valve **Y-F24A** does not open within the set time. The EGR valve **Y-F24A** is mechanically blocked or stuck. The position sensor is not aligned.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.
2. Check monitoring of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, correctly mount the EGR actuator **Y-F24A** or replace it if necessary.

   B. If code remains inactive, return the machine to service.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 519201-7 21ECE7 - EGR Valve: stuck on open position

## Control Module: FPT ECU

**Fault Description:**
The EGR valve actuator **Y-F24A** with a position sensor provides feedback to the engine control unit (ECU) **A-F02**. If there is a deviation between the position requested and the position detected, a deviation error (min or max) is triggered. The system then tries to "release" the closing or opening of the fast actuator. If it is not possible to "release" the actuator, the fault "Valve jammed" is triggered. The valve stuck in the open state is detected if the deviation is permanent, the valve release attempts have failed or the EGR actuator prosecution is above a predetermined threshold.

**Cause:**
The EGR valve **Y-F24A** does not closed within the set time. The EGR valve **Y-F24A** is mechanically blocked or stuck. The sensor is not aligned.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.
2. Check monitoring of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, correctly mount the EGR actuator **Y-F24A** or replace it if necessary.

   B. If code remains inactive, return the machine to service.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 676-5 A40205 - Ignition glow plug: open circuit in the power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. An open circuit error is reported.

**Cause:**
The ECU **A-F02** has detected a wiring problem in the direction of the glow plug control unit **A-F251** which may be broken or disconnected.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.

2. Check for an open circuit in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 53** | **X-F251 (Receptacle) pin 3** | There should be continuity. |
| **X-F02V (Receptacle) pin 57** | **X-F251 (Receptacle) pin 8** | There should be continuity. |
| **X-F02V (Receptacle) pin 26** | **X-F251 (Receptacle) pin 5** | There should be continuity. |
| **X-F96 (Plug) pin 4** | **X-F251 (Plug) pin 2** | There should be continuity. |
| **X-F96 (Plug) pin 3** | **X-F251 (Plug) pin 7** | There should be continuity. |
| **X-F96 (Plug) pin 2** | **X-F251 (Plug) pin 1** | There should be continuity. |
| **X-F96 (Plug) pin 1** | **X-F251 (Plug) pin 6** | There should be continuity. |

   A. If there is no continuity, there is an open circuit condition in the wiring harness. repair or replace as required.

   B. If there is continuity, the wiring is operating correctly, pass on to point **3**age.

3. Check the correct operation of the spark plugs **L-F96_1**, **L-F96_2**, **L-F96_3** and **L-F96_4**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the spark plugs one at a time until the fault is inactive again.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 E70A01 2791-1 - EGR Valve: position sensor voltage below the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the electric signal of the EGR valve position sensor **Y-F24A**. If a fault is detected, the value read is taken as a replacement value. The signal detected is lower than a predetermined threshold.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring or a malfunction on the position sensor of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.

2. Check for short circuit to ground in the circuit of the EGR valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 1** | Ground | There should be no continuity |
| **X-F24A (Receptacle) pin 2** | Ground | There should be no continuity |
| **X-F24A (Receptacle) pin 6** | Ground | There should be no continuity |

   A. If there is continuity, there is a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If there is continuity, the wiring is operating correctly, leave the connectors disconnected and go to **3**age.

3. Check the correct operation of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the EGR actuator **Y-F24A**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 E70A00 2791-0 - EGR Valve: position sensor voltage above the maximum threshold

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the electric signal of the EGR valve position sensor **Y-F24A**. If a fault is detected, the value read is taken as a replacement value. The signal detected is higher than a predetermined threshold.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring or a malfunction on the position sensor of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 4** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 5** | Battery positive | There should be no continuity |

   A. If there is continuity, there is a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to **3**age.

3. Check the correct operation of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the EGR actuator **Y-F24A**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 518500-19 64E9F3 - Ignition glow plug: Ignition control error from power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A fault is detected in the diagnostic data transmission or a protocol error.

**Cause:**
The ECU **A-F02** has detected a fault in the glow plug system due to an open circuit in the wiring, or a malfunction of the preheating glow plug control unit **A-F251**, or a malfunction of the glow plugs **L-F96_1**, **L-F96_2**, **L-F96_3** or **L-F96_4**

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.

2. Check for an open circuit in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251** .

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 53** | **X-F251 (Receptacle) pin 3** | There should be continuity. |
| **X-F02V (Receptacle) pin 57** | **X-F251 (Receptacle) pin 8** | There should be continuity. |
| **X-F02V (Receptacle) pin 26** | **X-F251 (Receptacle) pin 5** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the preheating glow plug control unit **A-F251**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the preheating glow plug control unit **A-F251**.

   B. If code remains inactive, go to step **4**

4. Check the correct operation of the spark plugs **L-F96_1**, **L-F96_2**, **L-F96_3** and **L-F96_4**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the spark plugs one at a time until the fault is inactive again.

B. If code remains inactive, return the machine to service.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 A40206 676-6 - Ignition glow plug: Power stage Overtemperature

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. An overtemperature is reported.

**Cause:**
The ECU **A-F02** detects a high battery voltage, a high temperature inside the engine control unit (ECU) **A-F02**, a high load or a wiring problem or a problem with the glow plug control unit **A-F251**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.
2. Check for an open circuit in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 53** | **X-F251 (Receptacle) pin 3** | There should be continuity. |
| **X-F02V (Receptacle) pin 57** | **X-F251 (Receptacle) pin 8** | There should be continuity. |
| **X-F02V (Receptacle) pin 26** | **X-F251 (Receptacle) pin 5** | There should be continuity. |
| **X-F96 (Plug) pin 4** | **X-F251 (Plug) pin 2** | There should be continuity. |
| **X-F96 (Plug) pin 3** | **X-F251 (Plug) pin 7** | There should be continuity. |
| **X-F96 (Plug) pin 2** | **X-F251 (Plug) pin 1** | There should be continuity. |
| **X-F96 (Plug) pin 1** | **X-F251 (Plug) pin 6** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**
3. Check the correct operation of the engine control unit (ECU) **A-F02**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 A40203 676-3 - Ignition glow plug: Open circuit to battery in the power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit to battery error is reported.

**Cause:**
The ECU **A-F02** has detected a fault in the glow plug system due to a short circuit to battery in the wiring, or a malfunction of the preheating glow plug control unit **A-F251**, or a malfunction of the glow plugs **L-F96_1**, **L-F96_2**, **L-F96_3** or **L-F96_4**

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **5**age.

2. Check for a short circuit to battery in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 53** | Battery positive | There should be no continuity |
| **X-F02V (Receptacle) pin 26** | Battery positive | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the preheating glow plug control unit **A-F251**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the preheating glow plug control unit **A-F251**.

   B. If code remains inactive, go to step **4**

4. Check the correct operation of the spark plugs **L-F96_1**, **L-F96_2**, **L-F96_3** and **L-F96_4**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the spark plugs one at a time until the fault is inactive again.

B. If code remains inactive, return the machine to service.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 A40204 676-4 - Ignition glow plug: Open circuit to ground in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit to ground error is reported.

**Cause:**
The ECU **A-F02** has detected a fault in the glow plug system due to a short circuit to ground in the wiring, or a malfunction of the preheating glow plug control unit **A-F251**, or a malfunction of the glow plugs **L-F96_1**, **L-F96_2**, **L-F96_3** or **L-F96_4**

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **5**age.

2. Check for a short circuit to ground in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 53** | Chassis ground | There should be no continuity |
| **X-F02V (Receptacle) pin 57** | Chassis ground | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the preheating glow plug control unit **A-F251**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the preheating glow plug control unit **A-F251**.

   B. If code remains inactive, go to step **4**

4. Check the correct operation of the spark plugs **L-F96_1**, **L-F96_2**, **L-F96_3** and **L-F96_4**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the spark plugs one at a time until the fault is inactive again.

B. If code remains inactive, return the machine to service.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 5324-4 CC1404 - Short circuit or voltage above the threshold on the ignition glow plug of cylinder 1

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit or overcurrent in the glow plug of cylinder 1 **L-F96_1** is reported.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the wring or an overcurrent in the glow plug of cylinder 1 **L-F96_1** .

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to battery in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251** .

   Disconnect the engine wiring of the glow plug **L-F96_1**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F251 (Receptacle) pin 2** | **X-F96 pin 4** | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, Leave the connectors disconnected and go to **3**
3. Check the correct operation of the spark plug **L-F96_1**. .

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace ignition glow plugs **L-F96_1**. .

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 CE1404 5326-4 - Short circuit or voltage above the threshold on the ignition glow plug of cylinder 3

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit or overcurrent in the glow plug of cylinder 3 **L-F96_3** is reported.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the wring ot an overcurrent in the glow plug of cylinder 3 **L-F96_3** .

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check for a short circuit to battery in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251** .

   Disconnect the engine wiring of the glow plug **L-F96_3** .

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F251 (Receptacle) pin 1** | **X-F96 pin 2** | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the spark plug **L-F96_3**. .

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace ignition glow plugs **L-F96_3**. .

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5327-4 CF1404 - Short circuit or voltage above the threshold on the ignition glow plug of cylinder 4

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit or overcurrent in the glow plug of cylinder 4 **L-F96_4** is reported.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the wring ot an overcurrent in the glow plug of cylinder 4 **L-F96_4** .

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to battery in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251** .

   Disconnect the engine wiring of the glow plug **L-F96_4** .

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F251 (Receptacle) pin 6** | **X-F96 pin 1** | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, Leave the connectors disconnected and go to **3**
3. Check the correct operation of the spark plug **L-F96_4**. .

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace ignition glow plugs **L-F96_4**. .

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5325-4 CD1404 - Short circuit or voltage above the threshold on the ignition glow plug of cylinder 2

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit or overcurrent in the glow plug of cylinder 2 **L-F96_2** is reported.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the wring or an overcurrent in the glow plug of cylinder 2 **L-F96_2**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check for a short circuit to battery in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251** .

   Disconnect the engine wiring of the glow plug **L-F96_2**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F251 (Receptacle) pin 7** | **X-F96 pin 3** | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the spark plug **L-F96_2**. .

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace ignition glow plugs **L-F96_2**. .

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 7026-3 721B03 - Short circuit to battery on the fuel metering unit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the fuel pressure regulation solenoid valve **Y-F07**. If the ECU **A-F02** detects a short circuit to battery, this fault occurs.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring towards the solenoid valve for fuel pressure adjustment **Y-F07** or a malfunction of the same solenoid valve.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to battery in the circuit of the fuel pressure regulating solenoid valve **Y-F07**.

   Disconnect the fuel pressure regulating solenoid valve **Y-F07** at the connector **X-F07**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 6** | Battery positive | There should be no continuity |
| **X-F02E (Receptacle) pin 7** | Battery positive | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, leave the connectors disconnected and go to **3**required.
3. Check the correct operation of the fuel pressure regulating solenoid valve **Y-F07**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the fuel pressure regulating solenoid valve **Y-F07**.

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 721B04 7026-4 - Short circuit to ground on the fuel metering unit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the fuel pressure regulation solenoid valve **Y-F07**. If the ECU **A-F02** detects a short circuit to ground, this fault occurs.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring towards the solenoid valve for fuel pressure adjustment **Y-F07** or a malfunction of the same solenoid valve.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check for a short circuit to ground in the circuit of the fuel pressure regulating solenoid valve **Y-F07**.

   Disconnect the fuel pressure regulating solenoid valve **Y-F07** at the connector **X-F07**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 6** | Mass | There should be no continuity |
| **X-F02E (Receptacle) pin 7** | Mass | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, leave the connectors disconnected and go to **3**required.

3. Check the correct operation of the fuel pressure regulating solenoid valve **Y-F07**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the fuel pressure regulating solenoid valve **Y-F07**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 9C000C 156-12 - ECU internal error - Plausibility error of injection times for temperature compensation

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the plausibility of the injector valve closing correction times of all configured injection types. The valve closing correction times are not plausible. The valve closure correction times of VCC or VCA are tested on their plausible value ranges.

**Cause:**
A malfunction in the ECU **A-F02** or incorrect calibration is detected.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, Contact the THD.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **2**required.

2. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 156-31 9C001F - ECU internal error - Plausibility error of injection closing times

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the plausibility of the injector valve closing correction times of all configured injection types. The valve closing correction times are not plausible. The valve closure correction times of VCC or VCA are tested on their plausible value ranges.

**Cause:**
A malfunction in the ECU **A-F02** or incorrect calibration is detected.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, Contact the THD.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **2**required.

2. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 640001 100-1 - Engine oil pressure below the minimum value

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the engine oil pressure value for plausibility. When the engine is running, the pressure must be higher than a defined minimum value, detected by the low oil level alarm switch **S-F55**. The oil pressure signal is acquired from the connected oil pressure sensor. There is no oil pressure signal or the digital oil pressure switch is not active.

**Cause:**
The ECU **A-F02** detects low engine oil pressure or the low oil level alarm switch **S-F55** is blocked.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check that the engine oil level is correct and top up if necessary.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, go to **3**required.

   B. If code remains inactive, return the machine to service.

3. Check the correct operation of the low oil level alarm switch **S-F55**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the low oil level alarm switch **S-F55**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 100-2 640002 - Engine oil pressure not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the engine oil pressure value for plausibility. When the engine is running, the pressure must be lower than a defined maximum value, detected by the low oil level alarm switch **S-F55**. The oil pressure signal is acquired from the connected oil pressure sensor. The signal is present and the oil pressure digital switch is active.

**Cause:**
The ECU **A-F02** detects a fault in the low oil level alarm switch **S-F55**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.
2. Check the correct operation of the low oil level alarm switch **S-F55**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the low oil level alarm switch **S-F55**.

   B. If code remains inactive, return the machine to service.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5018-18 9A1312 - Temperature monitoring on OxiCat catalyst: passive monitoring

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the conversion of HC in the catalyst, namely, the performance of the catalyst according to OBD regulations by calculating the minimum expected exothermic energy input in the exhaust (i.e. temperature increase) and comparing it with the measured energy input (temperature increase compared to Oxicat). The following temperatures are used: temperature measured before Oxicat (signal of the temperature sensor before turbine), measured temperature after Oxicat (measured thermal energy) (signal from temperature sensor before turbine), calculated temperature after Oxicat (including thermal energy due to HC conversion) (temperature after turbine), calculated temperature after Oxicat without heat energy by HC conversion (reference temperature) (temperature after the turbine). The "expected/measured" ratio of HC conversion energy is lower than the predetermined threshold

**Cause:**
Temperature sensors before and after Oxicat exchanged. Thermal oxicat aged (efficiency too low) or damaged. Post-injection does not work.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **8**required.
2. Check whether the exhaust gas temperature sensor upstream of the DOC **B-F32** and the exhaust gas temperature sensor upstream of the DPF have been interchanged **B-F33**.

   A. If the sensors have been switched, invert their position.

   B. If the sensors have not been switched, go to **3**required.
3. Check for open circuit in the exhaust gas temperature sensor circuit upstream of the DOC **B-F32** and in the exhaust gas temperature sensor circuit upstream of the DPF **B-F33**.

   Disconnect the exhaust gas temperature sensor upstream of the DOC **B-F32** at the connector **X-F32** and the exhaust gas temperature sensor upstream of the DPF **B-F33** at the connector **X-F33**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 27** | **X-F32 pin 2** | There should be continuity. |
| **X-F02V (Receptacle) pin 30** | **X-F32 pin 1** | There should be continuity. |
| **X-F02V (Receptacle) pin 29** | **X-F33 pin 1** | There should be continuity. |
| **X-F02V (Receptacle) pin 27** | **X-F33 pin 2** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, go to **4**required.
4. Check the correct operation of the exhaust gas temperature sensor upstream of the DOC **B-F32**.

A. If the sensor is not working correctly, replace the exhaust gas temperature sensor upstream of the DOC **B-F32**.

B. If the sensor is working correctly, go to **5**required.

5. Check the correct operation of the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   A. If the sensor is not working correctly, replace the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   B. If the sensor is working correctly, go to **6**required.

6. Check the correct operation of the DOC oxidation catalyst.

   A. If the DOC oxidation catalyst is not working correctly, replace the DOC oxidation catalyst.

   B. If the DOC oxidation catalyst is working correctly, go to **7**required.

7. Check the correct operation of injectors **Y-F11_1**, **Y-F11_2**, **Y-F11_3**, and **Y-F11_4**

   A. If the injectors are not working correctly, replace the injectors which are not working correctly.

   B. If the injectors are working correctly, return the machine to service.

8. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 2CE1EE 516396-14 - Fuel pressure relief valve: Engine speed does not reach the value calculated

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the engine's restart behaviour after the engine has been stopped due to an error. The error is recognised if the engine idle speed on restarting after the engine has been shut down due to the fault does not reach the minimum number of revolutions within a set minimum time.

**Cause:**
The ECU **A-F02** detects a malfunction in the PRV valve.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.
2. Check the correct operation of the PRV valve.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, Replace PRV valve.

   B. If code remains inactive, return the machine to service.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 C3150C 5571-12 - Fuel pressure relief valve: failed pressure balance test

## Control Module: FPT ECU

**Fault Description:**
To determine mechanical exhaustion, the pressure relief valve can be forced to open by performing a rail pressure shock defined in two stages: waiting for the rail pressure to rise and performing pressure shocks. The two steps are recorded in the fault memory. Pressure shock is only possible in a defined range of engine speed/injection quantity. The engine control unit (ECU) **A-F02** reports the error when the pressure shock is rejected because the amount of fuel is outside the predetermined range.

**Cause:**
The ECU **A-F02** detects a pressure shock request outside of the possible range due to a rail pressure sensor failure **B-F09**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check for an open circuit in the circuit of the rail pressure sensor . **B-F09**

   Disconnect the rail pressure sensor **B-F09**at the connector **X-F09**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 63** | **X-F09 pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 62** | **X-F09 pin 2** | There should be continuity. |
| **X-F02E (Receptacle) pin 42** | **X-F09 pin 3** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the rail pressure sensor **B-F09**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, Replace the rail pressure sensor **B-F09**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 C31502 5571-2 - Fuel pressure relief valve: average pressure value not correct

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the rail pressure gradients and the pressure relief valve is classified as open after the positive evaluation. If the mean rail pressure is outside the expected range, the pressure relief valve opening evaluation via the mean rail pressure has failed. The average rail pressure is outside the defined expected range.

**Cause:**
The pressure relief valve is not open or not fully open also due to a possible obstruction. The ECU **A-F02** detects incorrect pressure due to faulty pressure relief valve or due to a failure of the PRV valve or rail pressure sensor **B-F09** (intermittent connection).

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check the correct operation of the PRV valve.

   A. If the PRV valve is not working correctly, Replace PRV valve.

   B. If the PRV valve is working correctly, go to **3**required.

3. Check the correct operation of the rail pressure sensor **B-F09**.

   A. If the rail pressure sensor **B-F09** is not working Replace the rail pressure sensor **B-F09**.

   B. If the rail pressure sensor **B-F09** is working return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 B90407 1209-7 - Low pressure upstream of turbine

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the pressure upstream of the turbine which is acquired via the connected exhaust gas pressure sensor **B-F53**. The control unit detects **A-F02** a pressure lower than a predetermined threshold and creates this error.

**Cause:**
The ECU **A-F02** detects a pressure loss due to possible leakage in the exhaust gas circuit or detects a malfunction in the exhaust gas pressure sensor **B-F53**

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**required.

2. Check for leaks in the exhaust gas circuit.

   A. If there are leaks in the exhaust gas circuit, eliminate the leaks restoring the correct circuit.

   B. If there are no leaks in the exhaust gas circuit, go to **3**required.

3. Check the correct operation of the exhaust gas pressure sensor **B-F53**.

   A. If the sensor is not working correctly, replace the exhaust gas pressure sensor **B-F53**.

   B. If the sensor is working correctly, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 B90403 1209-3 - Pressure sensor upstream of turbine: high value

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the pressure upstream of the turbine via the exhaust gas pressure sensor **B-F53**. The error appears when the acquired signal is higher than the preset threshold.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring or a malfunction of the exhaust gas pressure sensor **B-F53**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**required.

2. Check for a short circuit to battery in the exhaust gas pressure sensor circuit **B-F53**.

   Disconnect the exhaust gas pressure sensor **B-F53** at the connector **X-F53**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 42** | Battery positive | There should be no continuity |
| **X-F02V (Receptacle) pin 63** | Battery positive | There should be no continuity |
| **X-F02V (Receptacle) pin 36** | Battery positive | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, leave the connectors disconnected and go to **3**required.

3. Check the correct operation of the exhaust gas pressure sensor **B-F53**.

   A. If the sensor is not working correctly, replace the exhaust gas pressure sensor **B-F53**.

   B. If the sensor is working correctly, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 B90404 1209-4 - Pressure sensor upstream of turbine: low value

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the pressure upstream of the turbine via the exhaust gas pressure sensor **B-F53**. The error appears when the acquired signal is lower than the preset threshold.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring or a malfunction of the exhaust gas pressure sensor **B-F53**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**required.

2. Check for a short circuit to ground in the exhaust gas pressure sensor circuit **B-F53**.

   Disconnect the exhaust gas pressure sensor **B-F53** at the connector **X-F53**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 42** | Mass | There should be no continuity |
| **X-F02V (Receptacle) pin 63** | Mass | There should be no continuity |
| **X-F02V (Receptacle) pin 36** | Mass | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, leave the connectors disconnected and go to **3**required.

3. Check the correct operation of the exhaust gas pressure sensor **B-F53**.

   A. If the sensor is not working correctly, replace the exhaust gas pressure sensor **B-F53**.

   B. If the sensor is working correctly, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 980002 152-2 - ECU has an internal fault: software resets in DSM 2

## Control Module: FPT ECU

**Fault Description:**
An internal software error occurred which led to a software reset of the engine control unit (ECU) **A-F02**. The evaluation of the reason for the reset is performed after each reset, the reset is activated by the application software.

**Cause:**
Electronic interference, various internal ECU hardware defects **A-F02** or configuration problems. Resets are activated by the application software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **5**required.
2. Check for sources of electromagnetic disturbance on the engine control unit (ECU) **A-F02**.

   A. If there are no sources of electromagnetic disturbance, go to **3**required.

   B. If there are sources of electromagnetic disturbance, eliminate the sources of electromagnetic disturbance.
3. Check the correct power supply of the engine control unit (ECU) **A-F02**.

   A. If the power supply is correct, go to **4**required.

   B. If the power supply is not correct, Restore the correct power supply.
4. Connect the diagnostic tool to the engine control unit (ECU) **A-F02** and re-flash the control unit software with the latest version available.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.
5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 8631-14 B7210E - Information: turbine in cold start protection condition

## Control Module: FPT ECU

**Fault Description:**
In a cold start condition, the turbocharger speed may be limited. When this condition occurs, the ECU **A-F02** activates this information error.

# 295467 700410 1136-16 - Temperature sensor inside ECU: temperature too high

## Control Module: FPT ECU

**Fault Description:**
High temperatures can damage the engine control unit processor **A-F02** and one or more sensors monitor the temperature. The temperature must be within a set range. The sensors detect a temperature above the maximum allowed.

**Cause:**
The ECU **A-F02** receives an excessively high temperature signal from the control unit.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **3**required.

2. Let the engine control unit **A-F02** cool down. Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 1136-18 700412 - Temperature sensor inside ECU: Temperature too low

## Control Module: FPT ECU

**Fault Description:**
Low temperatures can damage the engine control unit processor and one or more sensors monitor the temperature. The temperature must be within a set range. The sensors detect a temperature which is lower than the minimum permitted.

**Cause:**
The ECU **A-F02** receives an excessively low temperature signal from the control unit.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **3**required.

2. Take the vehicle to a place with a higher ambient temperature and wait for the engine control unit to reach the same temperature as the ambient temperature. Let the engine control unit **A-F02** cool down. Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 03F0E5 520195-5 - Throttle valve (TVA): open circuit error in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) bridge H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects an open circuit,, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an open circuit in the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in the wiring harness, open circuit.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check the continuity of the wiring of the throttle valve solenoid valve (TVA) **Y-F30B**.

   Disconnect the wiring of the solenoid valve throttle valve (TVA) **Y-F30B**, connector **X-F30B**.

   Disconnect the wiring from the ECU **A-F02** at connector **X-F02E**.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | **X-F02E (Receptacle) pin 16** | There should be continuity |
| **X-F30B pin 5** | **X-F02E (Receptacle) pin 98** | There should be continuity |
| **X-F30B pin 3** | **X-F02E (Receptacle) pin 97** | There should be continuity |
| **X-F30B pin 6** | **X-F02E (Receptacle) pin 8** | There should be continuity |
| **X-F30B pin 2** | **X-F02E (Receptacle) pin 9** | There should be continuity |

   A. If continuity is detected,continue with step **3**.

   B. If there is no continuity,locate and repair the broken connector.
3. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 03F0E6 520195-6 - Throttle valve (TVA): overcurrent error in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) bridge H, of the throttle solenoid valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a short circuit this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit in the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in the wiring, short circuit.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**, internal short circuit.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | chassis ground | There should be no continuity |
| **X-F30B pin 5** | chassis ground | There should be no continuity |
| **X-F30B pin 6** | chassis ground | There should be no continuity |

   A. If there is no continuity,continue with step **3**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Check for a short circuit to battery working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-On condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 2** | Battery + | There should be no continuity |
| **X-F30B pin 5** | Battery + | There should be no continuity |
| **X-F30B pin 3** | Battery + | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit towards the battery is present.Locate and repair the shorted conductor.
4. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520195-15 03F0EF - Throttle valve (TVA): overtemperature error in the power stage

## Control Module: FPT ECU

***NOTE:*** *If this fault occurs for the first time, no action is required.*

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) bridge H, of the throttle solenoid valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a malfunction of the throttle solenoid valve (TVA) **Y-F30B** due to an excessive temperature or an error on the power status, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a malfunction in the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in the wiring.
2. Fault in the battery, voltage too high.
3. Fault in the engine control unit (ECU) **A-F02**, high internal temperature

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check the correct operation of the battery.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| Battery + | Battery – | it must be **12 V** |

   A. If it is correct, continue with step **3**.

   B. If it is not correct,repair or replace the battery.
3. Check the continuity of the wiring of the throttle valve solenoid valve (TVA) **Y-F30B**.

   Disconnect the wiring of the solenoid valve throttle valve (TVA) **Y-F30B**, connector **X-F102**.

   Disconnect the wiring from the ECU **A-F02** at connector **X-F02E**.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | **X-F02E (Receptacle) pin 16** | There should be continuity |
| **X-F30B pin 5** | **X-F02E (Receptacle) pin 98** | There should be continuity |
| **X-F30B pin 3** | **X-F02E (Receptacle) pin 97** | There should be continuity |
| **X-F30B pin 6** | **X-F02E (Receptacle) pin 8** | There should be continuity |
| **X-F30B pin 2** | **X-F02E (Receptacle) pin 9** | There should be continuity |

   A. If continuity is detected,go to **4**.

B. If there is no continuity,locate and repair the broken connector.

4. Check the correct operation of the engine control unit (ECU) **A-F02**.

   A. If it is working correctly, return the machine to service.

   B. If it is not working correctly, replace the engine control unit (ECU) **A-F02**.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520195-3 03F0E3 - Throttle valve (TVA): short circuit to battery on output 1 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) jumper H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a short circuit to battery on output 1, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery on output 1 of the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in the wiring, short circuit to battery.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 3** | Battery + | There should be no continuity |
| **X-F30B pin 5** | Battery + | There should be no continuity |
| **X-F30B pin 2** | Battery + | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit towards the battery is present.Locate and repair the shorted conductor.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 02F0E3 520194-3 - Throttle valve (TVA): short circuit to battery on output 2 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) jumper H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a short circuit to battery on output 2, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery on output 2 of the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in the wiring, short circuit to battery.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 3** | Battery + | There should be no continuity |
| **X-F30B pin 5** | Battery + | There should be no continuity |
| **X-F30B pin 2** | Battery + | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit towards the battery is present.Locate and repair the shorted conductor.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520195-4 03F0E4 - Throttle valve (TVA): short circuit to ground on output 1 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) jumper H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a short circuit to ground on output 1, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground on output 1 of the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Faulty wiring, short circuit to ground.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | chassis ground | There should be no continuity |
| **X-F30B pin 5** | chassis ground | There should be no continuity |
| **X-F30B pin 6** | chassis ground | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520194-4 02F0E4 - Throttle valve (TVA): short circuit to ground on output 2 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) jumper H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a short circuit to ground on output 2, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground on output 2 of the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Faulty wiring, short circuit to ground.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | chassis ground | There should be no continuity |
| **X-F30B pin 5** | chassis ground | There should be no continuity |
| **X-F30B pin 6** | chassis ground | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520194-15 02F0EF - Throttle valve (TVA): plausibility error from overload on the power stage outputs

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) bridge H, of the throttle solenoid valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a plausibility error which could be due to a short circuit to ground or a short circuit to battery, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a plausibility error due to a short circuit to ground or a short circuit to battery in the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in wiring, short circuit to ground or short circuit to battery.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | chassis ground | There should be no continuity |
| **X-F30B pin 5** | chassis ground | There should be no continuity |
| **X-F30B pin 6** | chassis ground | There should be no continuity |

   A. If there is no continuity,continue with step **3**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Check for a short circuit to battery working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-On condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 2** | Battery + | There should be no continuity |
| **X-F30B pin 5** | Battery + | There should be no continuity |
| **X-F30B pin 3** | Battery + | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit towards the battery is present.Locate and repair the shorted conductor.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520194-5 02F0E5 - Throttle valve (TVA): voltage below the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the command circuit of the pulse width modulated (PWM) jumper H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects an excessively high output driver supply voltage, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an excessively high output driver supply voltage.

**Possible failure modes:**

1. Fault in the power supply of the vehicle.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, Continue to step **4**required.
2. Check the correct operation of the battery

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly, go to **3**required.
3. Check that the ECU control unit **A-F02** is operating correctly

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 02F0E7 520194-7 - Throttle valve (TVA): stuck in the closed position

## Control Module: FPT ECU

**Fault Description:**
**A-F02** The engine control unit (ECU) monitors the correct operation of the throttle solenoid valve (TVA) **Y-F30B**. If the position sensor inside the TVA sends the ECU a throttle valve position (TVA) **Y-F30B** which differs from the one requested, this fault occurs. The system then tries to release the actuator, open it or close the valve quickly. If it is not possible to release the actuator valve, the fault is activated.

**Cause:**
The ECU **A-F02** has detected a block in the throttle solenoid valve (TVA) **Y-F30B** in the closed position.

**Possible failure modes:**

1. Fault in the throttle solenoid valve (TVA) **Y-F30B** mechanically blocked, dirty.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B** error between the position of the valve and the sensor signal.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**, check the correct position, check that there is no dirt preventing the valve from opening and closing.

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 03F0E7 520195-7 - Throttle valve (TVA): stuck on open position

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the throttle solenoid valve (TVA) **Y-F30B**. If the position sensor inside the TVA sends the ECU a throttle valve position (TVA) **Y-F30B** which differs from the one requested, this fault occurs. The system then tries to release the actuator, open it or close the valve quickly. If it is not possible to release the actuator valve, the fault is activated.

**Cause:**
The ECU **A-F02** has detected a block in the throttle solenoid valve (TVA) **Y-F30B** in the open position.

**Possible failure modes:**

1. Fault in the throttle solenoid valve (TVA) **Y-F30B** mechanically blocked, dirty.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B** error between the position of the valve and the sensor signal.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**, check the correct position, check that there is no dirt preventing the valve from opening and closing.

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5419-3 2B1503 - Throttle valve (TVA): position sensor voltage above the maximum threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the throttle solenoid valve (TVA) **Y-F30B**. If the position sensor inside the TVA sends the ECU a throttle solenoid valve (TVA) **Y-F30B** position which differs from the one required, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to external source or throttle solenoid valve (TVA) **Y-F30B** faulty.

**Possible failure modes:**

1. Fault in the wiring, short circuit to external source.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.
3. The ECU **A-F02** has failed.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | Battery + | There should be no continuity |
| **X-F30B pin 5** | Battery + | There should be no continuity |
| **X-F30B pin 6** | Battery + | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5419-4 2B1504 - Throttle valve (TVA): position sensor voltage below the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the throttle solenoid valve (TVA) **Y-F30B**. If the position sensor inside the TVA sends the ECU a throttle solenoid valve (TVA) **Y-F30B** position which differs from the one required, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit ground or the throttle solenoid valve (TVA) **Y-F30B** is faulty.

**Possible failure modes:**

1. Faulty wiring, short circuit to ground.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.
3. The ECU **A-F02** has failed.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | chassis ground | There should be no continuity |
| **X-F30B pin 6** | chassis ground | There should be no continuity |
| **X-F30B pin 5** | chassis ground | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 4766-16 9E1210 - Temperature downstream of the oxidation catalyst is above the maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02 A-F02** monitors the exhaust temperature sensor downstream of the Diesel Oxidation Catalyst (DOC) **B-F33**. If the ECU **A-F02** determines that there is a temperature signal beyond the allowable threshold of the exhaust temperature sensor downstream of the DOC **B-F33**, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** to the last valid value detected or to a fixed replacement value, once the fault is validated.

**Cause:**
The ECU **A-F02** detects excessive temperature on the exhaust temperature sensor downstream of the DOC **B-F33**.

**Possible failure modes:**

1. Fault in the wiring of the exhaust temperature sensor downstream of the DOC **B-F33**.
2. Fault in the exhaust temperature sensor downstream of the DOC **B-F33**, accuracy.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**.
2. Check the temperature signal circuit of the exhaust temperature sensor at the exhaust downstream of the DOC **B-F33**.

   Disconnect the engine wiring from the ECU control unit **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F33 pin 1** | **X-F02V (Receptacle) pin 29** | There should be no continuity. |
| **X-F33 pin 2** | **X-F02V (Receptacle) pin 27** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33**, Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to **3**.
3. Check the correct operation f the exhaust temperature sensor downstream of the DOC **B-F33** following the procedure indicated **TEMPERATURE SENSOR - Test (50.74)** .

   A. If the sensor is okay, go to **5**.

   B. If the sensor is not working correctly, go to **4**.
4. Replace the exhaust temperature sensor downstream of the DOC **B-F33**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 4765-16 9D1210 - Temperature upstream of the oxidation catalyst is above the maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the exhaust temperature sensor upstream of the Diesel Oxidation Catalyst (DOC) **B-F32**. If the ECU **A-F02** determines that there is a temperature signal beyond the allowable threshold of the exhaust temperature sensor upstream of the DOC **B-F32**, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** to the last valid value detected or to a fixed replacement value, once the fault is validated.

**Cause:**
The ECU **A-F02** detects excessive temperature on the exhaust temperature sensor upstream of the DOC **B-F32**.

**Possible failure modes:**

1. Fault in the wiring of the exhaust temperature sensor upstream of the DOC **B-F32**.
2. Fault in the exhaust temperature sensor upstream of the DOC **B-F32**, accuracy.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **5**.
2. Check the temperature signal circuit of the exhaust temperature sensor at the upstream of the DOC **B-F32**.

   Disconnect the engine wiring from the ECU control unit **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F32 pin 1** | **X-F02V (Receptacle) pin 30** | There should be no continuity. |
| **X-F32 pin 2** | **X-F02V (Receptacle) pin 27** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F32**, Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.
3. Check the correct operation of the exhaust temperature sensor downstream of the DOC **B-F32** following the procedure indicated **TEMPERATURE SENSOR - Test (50.74)** .

   A. If the sensor is okay, go to step **5**.

   B. If the sensor is not working correctly, go to step **4**.
4. Replace the exhaust temperature sensor upstream of the DOC **B-F32**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 172-2 AC0002 - Plausibility error in temperature sensor 1

## Control Module: FPT ECU

**Fault Description:**
On engine start up, the Engine Control Unit (ECU) **A-F02** monitors up to five temperature sensors for mutual plausibility. If the temperature sensor **B-F65** assigned to position 1 of the plausibility check sends a non-plausible temperature value, this fault is generated.

**Cause:**
A non-plausible temperature value has been detected.

**Possible failure modes:**

1. Fault in the intake air temperature sensor **B-F65**, hardware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**.
2. Check the conditions of the temperature sensor **B-F65**.

   Disconnect the engine wiring (EN) from the temperature sensor **B-F65** connector **X-F65**

   With the ignition switch set to OFF, use a multimeter to measure the resistance of each temperature sensor **B-F65**:

| From | To | Value |
|---|---|---|
| **X-F65 pin 1** | **X-F65 pin 2** | The resistance should be **2 kΩ** |

   A. If the measured resistance is not within the permitted range, this indicates that the temperature sensor **B-F65** has failed internally. Replace sensor.

   B. If the measured resistance is within specification, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 AC000E 172-14 - Plausibility error in temperature sensor 2

## Control Module: FPT ECU

**Fault Description:**
At engine start-up, the Engine Control Unit (ECU) **A-F02** monitors up to five temperature sensors for mutual plausibility. If the pressure and temperature sensor of the intake manifold **B-F48** assigned to position 2 of the plausibility check sends a non-plausible temperature value, this fault is generated.

**Cause:**
A non-plausible temperature value has been detected.

**Possible failure modes:**

1. Faulty intake manifold pressure and temperature sensor **B-F48**, hardware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2** .

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **4** .
2. Check the conditions of the pressure and temperature sensor of the intake manifold **B-F48**.

   Disconnect the engine wiring (EN) from the intake manifold pressure and temperature sensor **B-F48** connector **X-F48**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance on the intake manifold pressure and temperature sensor **B-F48**:

| From | A | Value |
|---|---|---|
| **X-F48 (Plug) pin 1** | **X-F48 (Plug) pin 3** | This should be approximately **2.5 kΩ** at **20.0 °C** (**68.0 °F**). |

   A. If the measured resistance is not within specification, the intake manifold pressure and temperature sensor **B-F48** has failed internally. Replace the sensor.

   B. If the measured resistance is within specification, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damages are found and the display shows normal values, erase fault code.

# 295467 AB0002 171-2 - Plausibility error in temperature sensor 3

## Control Module: FPT ECU

**Fault Description:**
At engine start-up, the Engine Control Unit (ECU) **A-F02** monitors up to five temperature sensors for mutual plausibility. If the oil pressure and temperature sensor **B-F290** assigned to position 3 of the plausibility check sends a non-plausible temperature value, this fault is generated.

**Cause:**
A non-plausible temperature value has been detected.

**Possible failure modes:**

1. Faulty oil pressure and temperature sensor **B-F290**, hardware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **4**.
2. Check the conditions of the oil pressure and temperature sensor **B-F290**.

   Disconnect the engine wiring (EN) from the oil temperature and pressure sensor **B-F290**, connector **X-F290**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance on the oil pressure and temperature sensor **B-F290**:

| From | A | Value |
|---|---|---|
| **X-F290 (Receptacle) pin 1** | **X-F290 (Receptacle) pin 3** | This should be approximately **2.5 kΩ** at **20.0 °C** (**68.0 °F**). |

   A. If the measured resistance is not within specification, the oil pressure and temperature sensor **B-F290** has failed internally. Replace the sensor.

   B. If the measured resistance is within specification, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 7FEDE2 519551-2 - Plausibility error in one or more temperature sensors

## Control Module: FPT ECU

**Fault Description:**
At engine start up, the Engine Control Unit (ECU) **A-F02** monitors up to five temperature sensors for mutual plausibility. If the deviation concerns more than one sensor and it is not possible to clearly identify which of these indicates an incorrect value, this general fault is generated.

**Cause:**
A non-plausible temperature value has been detected.

**Possible failure modes:**

1. Fault in the fuel temperature sensor **B-F04**, hardware.
2. Fault in the intake air temperature sensor **B-F65**, hardware.
3. Faulty intake manifold pressure and temperature sensor **B-F48**, hardware.
4. Faulty oil pressure and temperature sensor **B-F20**, hardware.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2** .

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4** .
2. Check the conditions of each sensor.

   Disconnect the engine wiring (EN) from the fuel temperature sensor **B-F04** connector **X-F04**.

   Disconnect the engine wiring (EN) from the oil temperature and pressure sensor **B-F20**, connector **X-F20**.

   Disconnect the engine wiring (EN) from the intake manifold pressure and temperature sensor **B-F48** connector **X-F48**.

   Disconnect the engine wiring (EN) from the intake air temperature sensor **B-F65** connector **X-F65**.

   With the ignition switch **S-F200** set to OFF, use a multimeter to measure the resistance of each sensor:

| From | To | Value |
|---|---|---|
| **X-F04 (Plug) pin 1** | **X-F04 (Plug) pin 2** | The resistance should be **2 kΩ** |
| **X-F48 (Plug) pin 1** | **X-F48 (Plug) pin 3** | |
| **X-F20 (Plug) pin 1** | **X-F20 (Plug) pin 3** | |
| **X-F65 pin 1** | **X-F65 pin 2** | |

   A. If the resistance measured is not within the specified range, the sensor has failed internally. Replace sensor.

   B. If the measured resistance is within specification, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 168-3 A80003 - ECU internal voltage 5V, transfer box: Battery Voltage is too high

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the battery voltage using internal interfaces. If the ECU **A-F02** determines that the battery voltage is too high, this fault occurs.

**Cause:**
Battery voltage is too high.

**Possible failure modes:**

1. Faulty wiring of the power supply circuit.
2. Faulty battery and/or recharging system.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **6**.

2. Check the battery voltage.

   Engine running.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Battery terminal (+) | Battery terminal (-) | The value should be approximately **12 V** |

   A. If the voltage is not approximately **12 V**, go to **4**.

   B. If the value is approximately **12 V**, go to **3**.

3. Check the power supply circuit.

   Engine running.

   Disconnect the engine wiring from the ECU control unit **A-F02** at connector **X-F02V**.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 1** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 3** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 5** | Frame ground | It must be approx. **12 V** |

   With the engine off and the ignition switch set to OFF.

Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| Engine wiring side of connector **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| Engine wiring side of connector **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| Engine wiring side of connector **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If a value of approximately **12 V** is not detected, or if there is no continuity, go to **4**.

B. If a value of approximately **12 V** is detected and there is continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Check the charging system for proper operation.

   A. If the charging system is not functioning properly, repair the charging system as necessary.

   B. If the charging system is functioning properly, carry out an eddy current absorption test in order to measure the excessive current absorption by the battery. In case of excessive absorption, identify and repair as needed, then recommission the machine..

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 168-4 A80004 - ECU internal voltage 5V, transfer box: Battery voltage too low

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the battery voltage using internal interfaces. If the ECU **A-F02** determines that the battery voltage is too low, this fault occurs.

**Cause:**
Battery voltage is too low.

**Possible failure modes:**

1. Faulty wiring of the power supply circuit.
2. Faulty battery and/or recharging system.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **6**.

2. Check the battery voltage.

   Engine running.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Battery terminal (+) | Battery terminal (-) | The value should be approximately **12 V** |

   A. If the voltage is not approximately **12 V**, go to **4**.

   B. If the value is approximately **12 V**, go to **3**.

3. Check the power supply circuit.

   Engine running.

   Disconnect the engine wiring (EN) from the ECU control unit **A-F02** at connector **X-F02V**.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 1** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 3** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 5** | Frame ground | It must be approx. **12 V** |

   With the engine off and the ignition switch set to OFF.

Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If a value of approximately **12 V** is not detected, or if there is no continuity, go to **4**.

B. If a value of approximately **12 V** is detected and there is continuity, check the ECU **A-096** for the appropriate software and update if necessary.

4. Check the charging system for proper operation.

   A. If the charging system is not functioning properly, repair the charging system as necessary.

   B. If the charging system is functioning properly, carry out an eddy current absorption test in order to measure the excessive current absorption by the battery. In case of excessive absorption, identify and repair as needed, then recommission the machine..

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 EC0F03 4076-3 - Coolant temperature sensor : Engine high temperature

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the signal circuit of the coolant temperature sensor **B-F21**. If the ECU **A-F02** determines that the voltage in the temperature signal circuit is greater than expected, a replacement value is used, calculated according to a curve based on the difference between the oil temperature and the ambient temperature; then this fault occurs.

**Cause:**
The ECU **A-F02** has detected a too high voltage in the temperature signal circuit of the coolant temperature sensor **B-F21**.

**Possible failure modes:**

1. Faulty coolant temperature sensor **B-F21**, internal fault.
2. Faulty temperature signal circuit in the coolant temperature sensor **B-F21** short circuit towards a high voltage source or open circuit.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to step **6**.

2. Check the conditions of the coolant temperature sensor **B-F21**.

   Disconnect the engine wiring from the coolant temperature sensor **B-F21** at connector **X-F21**.

   Use a multimeter to measure the resistance of the coolant temperature sensor **B-F21**:

| From | To | Value |
|---|---|---|
| Coolant temperature sensor **X-F21 pin 1** | Coolant temperature sensor **X-F21 pin 2** | There must be a measurable quantity of resistance according to the effective coolant temperature, between **100 – 50,000 Ω**. |

   A. If there is a measurable amount of resistance, leave the connector disconnected and go to **3**.

   B. If there is infinite resistance, the coolant temperature sensor **B-F21** has failed internally. Replace sensor.

3. Check the circuit of the coolant temperature sensor **B-F21** for an interruption.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | **X-F21 pin 1** | There should be continuity. |

   A. If continuity is detected, leave the connectors disconnected and go to **4**.

B. If there is no continuity, it means that there is an open circuit in the engine wiring between the connector **X-F21 pin 1** of the coolant temperature sensor **B-F21** and the connector **X-F02E (Receptacle) pin 100** of the ECU **A-F02**.Locate and repair the conductor interruption.

4. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards another circuit (high voltage source).

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit (high voltage source) in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connectors disconnected and go to **5**.

5. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards the power supply.

   With the ignition switch set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards power supply in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. In the absence of voltage, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 4076-4 EC0F04 - Coolant temperature sensor : low engine temperature

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the signal circuit of the coolant temperature sensor **B-F21**. If the ECU **A-F02** determines that the voltage in the temperature signal circuit is lower than expected, a replacement value is used, calculated according to a curve based on the difference between the oil temperature and the ambient temperature; then this fault occurs.

**Cause:**
The ECU **A-F02** has detected a too low voltage in the temperature signal circuit of the coolant temperature sensor **B-F21**.

**Possible failure modes:**

1. Faulty coolant temperature sensor **B-F21**, internal fault.
2. Faulty temperature signal circuit in the coolant temperature sensor **B-F21** short circuit towards a low voltage source or short circuit.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.

2. Check the conditions of the coolant temperature sensor **B-F21**.

   Disconnect the engine wiring from the coolant temperature sensor **B-F21** at connector **X-F21**.

   Use a multimeter to measure the resistance of the coolant temperature sensor **B-F21**:

| From | To | Value |
|---|---|---|
| Coolant temperature sensor **X-F21 pin 1** | Coolant temperature sensor **X-F21 pin 2** | There must be a measurable quantity of resistance according to the effective coolant temperature, between **100 – 50,000 Ω**. |

   A. If there is a measurable amount of resistance, leave the connector disconnected and go to **3**.

   B. If there is no resistance, the coolant temperature sensor **B-F21** has failed internally. Replace sensor.

3. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch in the OFF position, use a multimeter to perform the following continuity check:

| From | A | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 99** | **X-F02E (Receptacle) pin 100** | There should be no continuity. |

   A. If there is no continuity, leave the connectors disconnected and go to **4**.

B. If there is continuity, there is a short circuit in the engine wiring between the coolant temperature sensor **B-F21** and the ECU **A-F02**.Locate and repair the shorted conductors.

4. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards another circuit (high voltage source).

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 99** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit (low voltage source) in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. If there is no continuity, leave the connectors disconnected and go to **5**.

5. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit to ground.

   With the ignition switch in the OFF position, use a multimeter to perform the following continuity check:

| From | A | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 99** | Frame ground | There should be no continuity. |

   A. If there is continuity, there is a short circuit to ground condition in the signal of the coolant temperature sensor **B-F21**.Locate and repair the shorted circuit.

   B. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 DE0C00 3294-0 - Clear fault memory: the internal counter of the ECU has exceeded the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The number of fault memory cancel requests is monitored. If the counter exceeds 250 requests, the fault memory cancellation is inhibited unless the counter is reset through a procedure protected by "seed and key" algorithm or if the system reaches at least 250 driving cycles without any request of fault memory cancellation.

# 295467 F5E9E9 518645-9 - Timeout error of CAN-receive-frame BC2EDC2 from the body computer

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message BC2EDC2 from the vehicle control unit containing the information on the switch status or ignition request, engine brake, brake, PDF, clutch, neutral gear, vehicle speed limitation, heaters, engine start-up, engine stop, air conditioning system, cab tilting, fan, oil duration monitoring. If the ECU **A-F02** detects a timeout error of message BC2EDC2, this fault occurs.

**Cause:**
The ECU **A-F02** has sensed a timeout error of message BC2EDC2.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN fault or low voltage in vehicle control unit.
2. fault in the power supply voltage or ground, missing.
3. Faulty CAN wiring harness, open or short circuit.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.go to step **7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**required.

5. Check the CAN circuit of the ECU **A-F02** for a short circuit.

Disconnect the engine wiring from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to **6**.

6. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | CAN H terminal | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | CAN L terminal | There should be continuity. |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If there is continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 1231-11 CF040B - CAN error: error on the CAN network node 1

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** is capable of connecting to and communicating on two separate CAN networks. Correct configuration and monitoring of the two twisted pair configured networks is also a function of the ECU **A-F02**. Node 1 of the CAN bus is the vehicle interface bus. The ECU **A-F02** provides a CAN terminating resistor for node 1 of the CAN Bus inside the ECU **A-F02**. There are three states for the CAN node: "active error", "passive error" and "bus off". When the CAN control unit detects that there are no CAN nodes connected, it switches to "passive error If the CAN control unit detects that a cable is reconnected or a new node is added, it switches to "active error If the CAN node is in short circuit or produces only incorrect information, the state switches to "bus off". If the CAN control unit of the ECU **A-F02** detects a "bus off" fault in node 1 of the CAN for more than 2 events, this fault occurs.

**Cause:**
The ECU **A-F02** has sensed a "Bus Off" state on node 1 of the CAN.

**Possible failure modes:**

1. Fault in the CAN configuration, incorrect phasing.
2. faulty CAN circuit wiring, open circuit, short circuit to ground or short circuit.
3. faulty ECU **A-F02**, terminating resistor or software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the terminating resistor inside the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be **120 Ω**. |

   A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is correct, go to **4**.
4. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

   Disconnect the phase 5 engine wiring from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the ON position, use a multimeter to check the voltage on the phase 5 engine wiring side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Chassis ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Chassis ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to **5**.

5. Check the CAN circuit of the ECU **A-F02** to check for a short circuit.

   Disconnect the phase 5 engine wiring from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

   A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Bend the relevant wiring to identify intermittent faults or short circuits in the cables. Operate the machine while you monitor the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 6E0002 110-2 - Coolant temperature sensor : check absolute plausibility with test

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the circuit of the coolant temperature sensor **B-F21**. If the coolant temperature sensor **B-F21** does not detect the minimum required temperature, this fault occurs.

**Cause:**

The coolant temperature sensor **B-F21** detects that the temperature is too high. This can be caused by:

- environment too cold in the cab heater at full power;
- corroded connectors in the additional resistor wiring;
- engine thermostat blocked in the open position.

**Possible failure modes:**

1. Faulty coolant temperature sensor **B-F21**, internal fault.
2. Faulty signal circuit in the coolant temperature sensor **B-F21**.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Before carrying out the required checks, make sure that the engine is not used in extreme environmental conditions.

   Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Check the conditions of the coolant temperature sensor **B-F21**.

   Disconnect the engine wiring from the coolant temperature sensor **B-F21** at connector **X-F21**.

   Use a multimeter to measure the resistance of the coolant temperature sensor **B-F21**:

| From | To | Value |
|---|---|---|
| Coolant temperature sensor **X-F21 pin 1** | Coolant temperature sensor **X-F21 pin 2** | There must be a measurable quantity of resistance according to the effective coolant temperature, between **100 – 50,000 Ω**. |

   A. If an appropriate value of resistance is detected, leave the connector disconnected and go to **3**.

   B. If there is infinite resistance, the coolant temperature sensor **B-F21** has failed internally. Replace sensor.
3. Check the circuit of the coolant temperature sensor **B-F21** for an interruption.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | **X-F21 pin 1** | There should be continuity. |

A. If there is continuity, leave the connectors disconnected and go to **4**.

B. If there is no continuity, it means that there is an open circuit in the engine wiring between the connector **X-F21 pin 1** of the coolant temperature sensor **B-F21** and the connector **X-F02E (Receptacle) pin 100** of the ECU **A-F02**.Locate and repair the conductor interruption.

4. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards another circuit (high voltage source).

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | A | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit (high voltage source) in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. If there is no continuity, leave the connectors disconnected and go to **5**.

5. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards the power supply.

   With the ignition switch set to “ON”, use a multimeter to perform the following voltage check:

| From | A | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | Frame ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards power supply in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. In the absence of voltage, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 B3EEE0 519859-0 - Torque limitation: OBD limitation activated

## Control Module: FPT ECU

**Fault Description:**
This fault path is generated for information purposes only. Torque limitation has been activated due to a high concentration of NOx in the exhaust gas. This fault requires checking for other faults that involve torque limitation and which could be present in the relative memory. If this type of fault is present, follow the relative troubleshooting procedure.

# 295467 6FE8F3 518255-19 - Timeout error of CAN-receive-frame TSC1VE (control bit error)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1VE containing the information regarding torque / speed requested by the vehicle control unit to the ECU **A-F02**. If the ECU **A-F02** detects a checksum error for message TSC1VE, this error occurs. This fault requires no further actions except for checking the presence of other faults in the fault memory which could influence the CAN communication between the vehicle control unit and the ECU **A-F02**. If another fault is present, follow its troubleshooting procedure. If there are no other faults, check the ECU **A-F02** to search the appropriate software and reprogram if necessary.

# 295467 70E8FF 518256-31 - Timeout error of CAN-receive-frame TSC1VE, error condition

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1VE containing the information regarding torque / speed requested by the vehicle control unit to the ECU **A-F02**. If the ECU **A-F02** detects that the TSC1 control request is incorrect and the fault condition occurs constantly, this error occurs. This fault requires no further actions except for checking the presence of other faults in the fault memory which could influence the CAN communication between the vehicle control unit and the ECU **A-F02**. If another fault is present, follow its troubleshooting procedure. If there are no other faults, check the ECU **A-F02** to search the appropriate software and reprogram if necessary.

# 295467 518254-14 6EE8EE - Timeout error of CAN-receive-frame TSC1VE, counter error (lost frame)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1VE containing the information regarding torque / speed requested by the vehicle control unit to the ECU **A-F02**. The rolling counter logics is used to identify any errors due to the intermittent absence of CAN frames. If the ECU **A-F02** detects an error of the rolling counter (missing frame) for message TSC1VE and the fault condition occurs continuously, this error occurs. This fault requires no further actions except for checking the presence of other faults in the fault memory which could influence the CAN communication between the vehicle control unit and the ECU **A-F02**. If another fault is present, follow its troubleshooting procedure. If there are no other faults, check the ECU **A-F02** to search the appropriate software and reprogram if necessary.

# 295467 6FE8E9 518255-9 - Timeout error of CAN-receive-frame TSC1VE from vehicle control unit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1VE containing the information regarding torque/speed requested by the vehicle control unit. If the ECU **A-F02** detects a timeout error for message TSC1VE and the fault condition occurs continuously, this error occurs.

**Cause:**
The ECU **A-F02** has sensed a TSC1VE message timeout.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,.Go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the wiring from the ECU **A-F02** at connector **X-F02V_1**.

With the ignition switch in the ON position, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**. Locate and repair the shorted conductor.

B. In the absence of voltage, go to **7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity on the wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**. Locate and repair the shorted conductor.

B. If no continuity is detected, go to **8**.

8. Check the CAN circuit of the ECU **A-F02** for an open circuit.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | To the pin of CAN H of chassis control module control unit | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | To the pin of CAN L of chassis control module control unit | There should be continuity. |

A. If there is no continuity, there is an open circuit on the CAN network of the ECU **A-F02**. Locate and repair the broken conductor.

B. If continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 70E8E9 518256-9 - Timeout error of CAN-receive-frame TSC1VE from vehicle control unit (active mode)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02**can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1VE CAN message containing the information regarding the torque/speed request from the vehicle control unit.

**Cause:**
The ECU **A-F02** has sensed a TSC1VE message timeout.

**Possible failure modes:**

1. fault in the vehicle system, associated CAN faulty.
2. fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to step **8**.

8. Check the CAN circuit of the ECU **A-F02** for an open circuit.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | To the pin of CAN H of chassis control module control unit | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | To the pin of CAN L of chassis control module control unit | There should be continuity. |

A. If there is no continuity, there is an open circuit on the CAN network of the ECU **A-F02**. Locate and repair the broken conductor.

B. If there is continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 71E8E9 518257-9 - Timeout error of CAN-receive-frame TSC1VE from vehicle control unit (passive mode)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1VE CAN message containing the information regarding the torque/speed request from the vehicle control unit. If the ECU **A-F02** detects a timeout error for the TSC1VE message, and the fault occurs continuously, this fault occurs.

**Cause:**
The ECU **A-F02** has sensed a TSC1VE message timeout.

**Possible failure modes:**

1. fault in the vehicle system, associated CAN faulty.
2. fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase 5 (S5):

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to step **8**.

8. Check the CAN circuit of the ECU **A-F02** for a short circuit.

Disconnect the engine wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 518261-14 75E8EE - Timeout error of CAN-receive-frame VM2EDC, counter error or control bit error

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message VM2EDC which is the proprietary CAN message from the vehicle control unit to the ECU **A-F02** containing the minimum position and intermediate speed parameters. If the ECU **A-F02** detects a checksum error for message VM2EDC and the fault occurs constantly, this fault occurs. This fault requires no further actions except for checking the presence of other faults in the fault memory which could influence the CAN communication between the vehicle control unit and the ECU **A-F02**. If another fault is present, follow its troubleshooting procedure. If there are no other faults, check the ECU **A-F02** to search the appropriate software and reprogram if necessary.

# 295467 518249-9 69E8E9 - CAN communication error between vehicle control unit and engine control unit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN Bus is the main vehicle's interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN Bus inside the ECU **A-F02**. The ECU **A-F02** receives message CAN VM2EDC from the vehicle control unit containing information on the setpoint requested for low minimum, setpoint for high minimum, set of parameters for low minimum, set of parameters for high minimum, set of parameters for intermediate speed, intermediate feedback factor, in braking status.

**Cause:**
The ECU **A-F02** has sensed a VM2EDC message timeout.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN fault or low voltage in vehicle control unit.
2. fault in the power supply voltage or ground, missing.
3. Faulty CAN wiring harness, open or short circuit.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. go to step **7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the CAN circuit of the ECU **A-F02** for a short circuit.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If no continuity is detected, continue with **8**.

6. Check the CAN circuit of the ECU **A-F02** for an open circuit.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | To the pin of CAN H of chassis control module control unit | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | To the pin of CAN L of chassis control module control unit | There should be continuity. |

A. If there is no continuity, there is an open circuit on the CAN network of the ECU **A-F02**. Locate and repair the broken conductor.

B. If continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 9E0010 158-16 - Power stage for diagnostics disengaged due to high battery voltage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the battery voltage using internal interfaces. If the battery voltage is too high, this fault occurs.

**Cause:**
The ECU **A-F02** has detected the battery voltage is too high.

**Possible failure modes:**

1. Faulty wiring of the power supply circuit.
2. Faulty battery and/or recharging system.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Check the battery voltage.

   Motor in operation.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| Battery (+) terminal | Battery (–) terminal | It must be approx. **12 V** |

   A. If there is not approximately **12 V**, go to **4**.

   B. If the reading is approximately **12 V**, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If there is no continuity, Identify and restore power supply to ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**.

5. Check the charging system for proper operation.

   A. If the charging system is not functioning properly, repair the charging system as necessary.

   B. If the charging system is functioning properly, carry out an eddy current absorption test in order to measure the excessive current absorption by the battery. In case of excessive absorption, identify and repair as needed, then recommission the machine..

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 9E0012 158-18 - Power stage for diagnostics disengaged due to low battery voltage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the battery voltage using internal interfaces. If the battery voltage is too low, this fault occurs.

**Cause:**
The ECU **A-F02** has detected that battery voltage is too low.

**Possible failure modes:**

1. Faulty wiring of the power supply circuit.
2. Faulty battery and/or recharging system.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Check the battery voltage.

   Motor in operation.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| Battery (+) terminal | Battery (–) terminal | It must be approx. **12 V** |

   A. If there is not approximately **12 V**, go to **4**.

   B. If the reading is approximately **12 V**, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If there is no continuity, Identify and restore power supply to ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**.

5. Check the charging system for proper operation.

   A. If the charging system is not functioning properly, repair the charging system as necessary.

   B. If the charging system is functioning properly, carry out an eddy current absorption test in order to measure the excessive current absorption by the battery. In case of excessive absorption, identify and repair as needed, then recommission the machine..

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 110-16 6E0010 - Engine coolant temperature has exceeded the pre-warning threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the engine coolant temperature. Two engine temperature thresholds are available to report a high engine temperature.

**Cause:**
The coolant temperature preventive warning threshold has been exceeded.

**Possible failure modes:**

1. Improper use, engine temperature too high (intensive use or high ambient temperature).
2. Faulty engine cooling system, coolant low, thermostat stuck closed, restricted cooling package etc.

# 295467 6E0000 110-0 - Engine coolant temperature has exceeded the warning threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the engine coolant temperature. Two engine temperature thresholds are available to report a high engine temperature. If the alarm threshold is exceeded, this fault occurs.

**Cause:**
The coolant temperature warning threshold has been exceeded.

**Possible failure modes:**

1. Improper use, engine temperature too high (intensive use or high ambient temperature).
2. Faulty engine cooling system, coolant low, thermostat stuck closed, restricted cooling package etc.

# 295467 170E0E 3607-14 - Engine speed limitation via fuel injection cut off is active

## Control Module: FPT ECU

**Fault Description:**
This is only an informative fault and no corrective actions are required; this fault has been generated by another active fault. The engine control unit (ECU) **A-F02** interrupts the fuel injection in order to limit the engine speed at a controllable range. This procedure is activated whenever the engine speed exceeds the limit threshold and if certain faults are found inside the ECU **A-F02** regarding the reliability of the accelerator pedal signal, fuel injection parameters, or engine speed. IF this fault occurs, this fuel injection interruption procedure activates.

# 295467 190-0 BE0000 - Engine overspeed condition identified

## Control Module: FPT ECU

**Fault Description:**
Engine speed is monitored and a fault is reported in the event of overspeed. In the event of an error in the Engine Control Unit (ECU) **A-F02**or in certain operating conditions, for example when driving downhill, the engine could run with a particularly high and unacceptable speed. During downhill driving, the fault does not indicate the presence of an error, but simply informs the operator of "abnormal use" of the engine. If the engine speed exceeds the threshold, this fault is generated. No corrective action is required, except in cases where the fault/information is repeated frequently. In this case, check the driving conditions of the vehicle, the measured values relating to the engine speed and the injection system to check the set point of the quantity and the actual value at the time the fault is reported; also check for other errors associated with the ECU **A-F02**.

# 295467 AB0003 171-3 - Ambient temperature sensor voltage is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the intake air temperature sensor **B-F65**checking for any short circuits towards a high voltage source or an open circuit. If the ECU **A-F02** determines the presence of a short circuit towards a high voltage source or an open circuit in the temperature signal circuit of the intake air temperature sensor **B-F65**, this fault occurs. If this fault occurs, the ambient temperature value is locked by the ECU **A-F02** on the last valid value detected or on a default replacement value once the fault is validated.

**Cause:**
The ECU **A-F02** has detected high voltage in the intake air temperature signal circuit **B-F65**.

**Possible failure modes:**

1. Fault in the temperature signal of the intake air temperature sensor **B-F65**, short circuit towards a high voltage source or open circuit.
2. Fault in the intake air temperature sensor **B-F65**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Check the temperature signal circuit of the intake air temperature sensor **B-F65** for an open circuit.

   Disconnect the engine wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 76** | **X-F65 pin 1** | There should be continuity. |

   A. If continuity is detected, leave the connectors disconnected and go to **3**.

   B. If there is no continuity, this indicates an open circuit in the engine wiring between the connector **X-F02V (Receptacle) pin 76** and the connector **X-F65 pin 1**.Locate and repair the broken conductor.
3. Check the temperature signal circuit of the intake air temperature sensor **B-F65** for a short circuit to another circuit.

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 76** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If continuity is detected, this indicates a short circuit towards another circuit in the temperature signal circuit of the intake air temperature sensor between cable **X-F65 pin 1** and another cable Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connectors disconnected and go to **4**.

4. Check the temperature signal circuit of the intake air temperature sensor **B-F65** for a short circuit to voltage.

   With the ignition switch set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 76** | Chassis ground | There should be no voltage. |

   A. If voltage is detected, this indicates a short circuit towards a voltage source in the temperature signal circuit of the intake air temperature sensor **B-F65** and another wire. Locate and repair the shorted conductors.

   B. In the absence of voltage, Go to **5**.

5. Replace the intake air temperature sensor **B-F65**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 AB0004 171-4 - Ambient temperature sensor voltage is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature signal circuit of the intake air temperature sensor **B-F65**. If the ECU **A-F02** determines that the voltage in the temperature signal circuit of the intake air temperature sensor **B-F65** is below the expected value, this fault occurs. If this fault occurs, the ambient temperature value is blocked by the ECU **A-F02** at the last valid value detected or at a default value, once the fault is validated.

**Cause:**
The ECU **A-F02** has detected low voltage in the temperature signal circuit of the intake air temperature sensor **B-F65**.

**Possible failure modes:**

1. Fault in the temperature signal of the intake air temperature sensor **B-F65**; short circuit to ground.
2. Fault in the intake air temperature sensor **B-F65**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **4**.
2. Check the temperature signal circuit of the intake air temperature sensor **B-F65** for a short circuit to ground.

   Disconnect the engine wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 76** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 76** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If continuity is detected during one of the checks, this indicates a short circuit to ground or a short circuit towards another circuit in the temperature signal circuit of the intake air temperature sensor between cable **X-F65 pin 1** and another.Locate and repair the damaged or shorted conductor towards another conductor.

   B. If there is no continuity in both checks, Go to **3**.
3. Replace the intake air temperature sensor **B-F65**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 636-2 7C0202 - Camshaft speed sensor pattern is not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** assesses the signal received by the camshaft and crankshaft speed sensors. The angle and speed, the quality and plausibility of the signal are determined. If the ECU **A-F02** determines that the camshaft signal does not match the correct model (edge distance, level) or all camshafts edges required during the engine revolutions are not detected for more than six times, this fault occurs. The ECU **A-F02** uses various monitoring strategies during engine start-up and the normal operation of the engine. If the problem is detected at engine start-up, a redundant synchronisation of the angular system is carried out using only the crankshaft increment signal and the test injections to determine the engine phase. If this procedure is not carried out correctly, the injection is interrupted and the system waits for a restart.

**Cause:**
The ECU **A-F02** has detected a camshaft signal implausibility for more than six times.

**Possible failure modes:**

1. Faulty phasing of the camshaft timing gear plate (phonic wheel).
2. Faulty camshaft sensor **B-F19**, internal fault.
3. Fault in the circuit of the camshaft sensor signal **B-F19**, intermittent open circuit, short circuit, or short circuit to ground.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.

2. Check the circuit of the camshaft sensor signal **B-F19** for open circuit, short circuit, or short circuit to ground.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Disconnect the engine wiring from the camshaft sensor **B-F19**, connector **X-F19**.

   With the ignition switch **SW-F215** in the OFF position, use a multimeter to carry out the following continuity checks by moving the wiring. In this way it is easier to locate any intermittent connections:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 51** | **X-F19 pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 52** | **X-F19 pin 2** | There should be continuity. |
| **X-F02E (Receptacle) pin 51** | chassis ground | There should be no continuity. |
| **X-F02E (Receptacle) pin 52** | chassis ground | There should be no continuity. |
| **X-F02E (Receptacle) pin 51** | All other pins in connector **X-F02V_2** | There should be no continuity. |
| **X-F02E (Receptacle) pin 52** | All other pins in connector **X-F02V_2** | There should be no continuity. |

   A. If the values are not correct while moving or shaking the wiring, this indicates an open circuit, a short circuit, or a short circuit to ground in the signal circuit of the camshaft sensor **B-F19**. Locate and repair the damage to the faulty conductor or conductors.

   B. If the values are correct, leave both connectors disconnected and go to **3**.

3. Check the signal circuit of the camshaft sensor **B-F19** for an intermittent short circuit towards a voltage source.

   With the ignition switch **SW-F215** in the ON position, use a multimeter to carry out the following voltage checks by moving the wiring. In this way it is easier to locate any intermittent connections:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 51** | Chassis ground | There should be no voltage. |
| **X-F02E (Receptacle) pin 52** | Chassis ground | There should be no voltage. |

   A. If there is voltage during one or both checks, there is a short circuit towards a voltage source in the signal circuit of the camshaft sensor **B-F19**. Locate and repair the shorted conductors.

   B. If there is no voltage during both checks, go to **4**.

4. Check the integrity of the sensor of the camshaft **B-F19**.

   Make sure that the sensor installed of the camshaft is the correct one and that it is correctly mounted, and that the sensor is not loose or moving.

   Check the alignment of the camshaft timing gear plate (phonic wheel).

   A. In case of assembly or alignment problems, repair or replace as required.

   B. If no issues are found, go to **5**.

5. Replace the camshaft sensor **B-F19**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. if there are no damages and the display indicates only normal readings, delete the fault code.

# 295467 636-9 7C0209 - Camshaft speed sensor values are not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** assesses the signal received by the camshaft and crankshaft speed sensors. The angle and speed, the quality and plausibility of the signal are determined. If the ECU determines that the camshaft **B-F19** signal is not detected for more than four times during engine revolutions, this fault occurs. The ECU **A-F02** uses various monitoring strategies during engine start-up and the normal operation of the engine. If the problem is detected at engine start-up, a redundant synchronisation of the angular system is carried out using only the crankshaft increment signal and the test injections to determine the engine phase. If this procedure is not carried out correctly, the injection is interrupted and the system waits for a restart.

**Cause:**
The ECU **A-F02** has not detected a camshaft signal for more than four times.

**Possible failure modes:**

1. Faulty camshaft sensor **B-F19**, improperly aligned or mounted.
2. Faulty camshaft sensor cable **B-F19**, open circuit.
3. Faulty camshaft sensor **B-F19**, internal fault.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **5**.
2. Check the signal circuit of the camshaft sensor **B-F19** for an interruption.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Disconnect the engine wiring from the camshaft sensor **B-F19**, connector **X-F19**.

   With the ignition switch **SW-F215** in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Reading |
|---|---|---|
| **X-F02E (Receptacle) pin 51** | **X-F19 pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 52** | **X-F19 pin 2** | There should be continuity. |

   A. If there is continuity during one or both checks, there is an open circuit in the signal circuit of the camshaft sensor **B-F19**.Locate and repair the broken conductor.

   B. If there is continuity in both checks, leave both connectors disconnected and go to **3**.
3. Check the integrity of the sensor of the camshaft **B-F19**.

   Make sure that the sensor installed of the camshaft is the correct one and that it is correctly mounted, and that the sensor is not loose or moving.

   Check the alignment of the camshaft timing gear plate (phonic wheel).

   A. In case of assembly or alignment problems, repair or replace as required.

B. If no issues are found, go to step **4**.

4. Replace the camshaft sensor **B-F19**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. if there are no damages and the display indicates only normal readings, erase fault code.

# 295467 636-31 7C021F - Camshaft and crankshaft speed sensor values are not plausible compared to one another

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the camshaft position sensor **B-F19** and the crankshaft sensor **B-F23** characteristics for angle, speed determination, signal plausibility, and quality.

**Cause:**
The ECU **A-F02** has determined that the offset between the crankshaft signal and the first expected camshaft end is lower than or greater than the correct value for more than four consecutive cycles.

**Possible failure modes:**

1. Faulty engine timing, incorrectly timed.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the engine verifying the correct phasing of the camshaft.

   Check the camshaft phasing.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 7D0202 637-2 - Crankshaft speed sensor pattern is not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** evaluates the signals received from the camshaft and crankshaft speed sensors. The angle and speed, the quality and plausibility of the signal are determined. If engine speed exceeds a set value when the engine is running, the ECU **A-F02** determines that the crankshaft signal is not plausible for more than eight times, the crankshaft signal is considered as disturbed and this fault occurs.

**Cause:**
The ECU **A-F02** has determined the presence of a disturbed signal of the crankshaft sensor **B-F23**.

**Possible failure modes:**

1. Faulty crankshaft sensor **B-F23**, incorrectly aligned or mounted.
2. Faulty signal wiring of the crankshaft sensor **B-F23**, intermittent open circuit.
3. Faulty crankshaft sensor **B-F23**, internal fault.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **5**.

2. Check the signal circuit of the crankshaft sensor **B-F23** for an interruption.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Disconnect the engine wiring (EN) from the crankshaft sensor **B-F23**, connector **X-F23**.

   With the ignition switch **SW-F215** in the OFF position, use a multimeter to carry out the following continuity checks by moving the wiring. In this way it is easier to locate any intermittent connections:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 20** | **X-F23 (Receptacle) pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 21** | **X-F23 (Receptacle) pin 2** | There should be continuity. |

   A. If there is a loss of continuity during one or both checks, there is an intermittent open circuit in the signal circuit of the crankshaft sensor **B-F23**.Locate and repair the broken conductor.

   B. If there is no loss of continuity during both checks, leave both connectors disconnected and go to **3**.

3. Check the integrity of the crankshaft sensor **B-F23**.

   Make sure that the sensor installed of the crankshaft is the correct one and that it is correctly mounted, and that the sensor is not loose or moving.

   A. If there are assembly problems, repair or replace as required.

   B. If no issues are found, go to **4**.

4. Replace the crankshaft sensor **B-F23**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. if there are no damages and the display indicates only normal readings, delete the fault code.

# 295467 637-9 7D0209 - Crankshaft speed sensor values are not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** assesses the signals received by the camshaft and crankshaft speed sensors. The angle and speed, the quality and plausibility of the signal are determined. If engine speed exceeds a set value when the engine is running, the ECU **A-F02** determines that the signal of the crankshaft sensor **B-F23** is not plausible for at least two revolutions of the camshaft and that the signal of the camshaft sensor **B-F19** has been tested and is plausible, this fault occurs.

**Cause:**
The ECU **A-F02** has not detected a plausible signal of the crankshaft sensor **B-F23** for at least two camshaft revolutions.

**Possible failure modes:**

1. Faulty crankshaft sensor **B-F23**, assembly related fault.
2. Faulty crankshaft sensor **B-F23**, internal fault.
3. Faulty circuit of the crankshaft sensor signal **B-F23**, intermittent open circuit, short circuit, or short circuit to ground.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Check the circuit of the crankshaft sensor signal **B-F23** for open circuit, short circuit, or short circuit to ground.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Disconnect the engine wiring from the crankshaft sensor **B-F23**, at connector **X-F23**.

   With the ignition switch **SW-F215** in the OFF position, use a multimeter to carry out the following continuity checks by moving the wiring. In this way it is easier to locate any intermittent connections:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 20** | **X-F23 (Receptacle) pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 21** | **X-F23 (Receptacle) pin 2** | There should be continuity. |
| **X-F02E (Receptacle) pin 20** | chassis ground | There should be no continuity. |
| **X-F02E (Receptacle) pin 21** | chassis ground | There should be no continuity. |
| **X-F02E (Receptacle) pin 20** | all other pins in connector **X-F02E** | There should be no continuity. |
| **X-F02E (Receptacle) pin 21** | all other pins in connector **X-F02E** | There should be no continuity. |

   A. If the values are not correct while moving or shaking the wiring, there is an open circuit, a short circuit, or a short circuit towards ground in the signal of the crankshaft sensor **B-F23**. Locate and repair the damage to the faulty conductor or conductors.

   B. If the values are correct, leave both connectors disconnected and go to **3**.
3. Check the signal circuit of the crankshaft sensor **B-F23** for an intermittent short circuit towards a voltage source.

With the ignition switch **SW-F215** in the ON position, use a multimeter to carry out the following voltage checks by moving the wiring. In this way it is easier to locate any intermittent connections:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 20** | Chassis ground | There should be no voltage. |
| **X-F02E (Receptacle) pin 21** | Chassis ground | There should be no voltage. |

A. If there is voltage during one or both checks, there is a short circuit towards a voltage source in the signal circuit of the crankshaft sensor **B-F23**. Locate and repair the shorted conductors.

B. If there is no voltage during both checks, go to **4**.

4. Check the integrity of the sensor of the camshaft **B-F19**.

   Make sure that the sensor installed of the crankshaft is the correct one and that it is correctly mounted, and that the sensor is not loose or moving.

   A. In case of assembly or alignment problems, repair or replace as required.

   B. If no issues are found, go to **5**.

5. Replace the crankshaft sensor **B-F23**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. if there are no damages and the display indicates only normal readings, delete the fault code.

# 295467 BE1400 5310-0 - Hydrocarbon level 1 exceeded

## Control Module: FPT ECU

**Fault Description:**
This fault indicates a warning for component protection caused from excessive Hydrocarbon (HC) levels that have accumulated in the exhaust system.
This may occur even when the engine is left to run at a low load level for a prolonged period of time or idling at low temperatures.
To delete this fault, follow the maintenance instructions for the Selective Catalytic Reduction (SCR) exhaust gas treatment system, or run the engine with a high load to increase the temperature of the engine and exhaust gases. With higher operating temperatures the accumulation of unburnt hydrocarbons will be limited or reduced.

# 295467 BE140E 5310-14 - Hydrocarbon level does not fall far enough after reaching level 1

## Control Module: FPT ECU

**Fault Description:**
This fault indicates a second warning relating to the components protection and is caused by excessive levels of hydrocarbon (HC) accumulated in the exhaust system. This fault occurs after the engine has been restarted and has been left running, and the level of hydrocarbon (HC) has not dropped below the correct value (reset level) of liquid HC in the exhaust system. To delete this fault follow the maintenance instructions for the exhaust treatment of the selective catalytic reduction system (SCR).

# 295467 9D120E 4765-14 - DOC upstream temperature sensor signal drift at cold start

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the signal detected by the exhaust gas temperature sensor upstream of the diesel oxidation catalyst (DOC) **B-F32** and compares its values with those measure by other 3 temperature sensors at the exhaust. If the value measured by the exhaust gas temperature sensor upstream of the DOC **B-F32** differs by more than the maximum permitted limit defined by the ECU **A-F02**, this fault occurs.

**Cause:**
The ECU **A-F02** determines that the signal of the exhaust gas temperature sensor upstream of the DOC **B-F32** has drifted during a cold start.

**Possible failure modes:**

1. Abrupt variations of the ambient temperature surrounding the exhaust gas temperature sensor upstream of the DOC **B-F32**.
2. Faulty exhaust gas temperature sensor upstream of the DOC **B-F32**, internal or wiring fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Use the operator display or the diagnostic instrument to check the status of the following correlated faults.

   **6297-31 4765-3 1899-1F 18991F – Diagnostic fault check for SCR high in oxidation catalyst upstream temperature**

   **4765-4 2999-1F 10649-31 29991F – Diagnostic fault check for SCR low in oxidation catalyst upstream temperature**

   **352C-1F 13612-31 520365-2 352C1F 4766-14 – Upstream oxidation catalyst temperature sensor comparison to a calculated temperature value failure**

   A. If any of the listed faults are active, carry out the diagnostics, then check that the faults have been resolved.

   B. If neither of the listed faults is active, go to **3**.
3. Use the diagnostic instrument to compare the value measured by the exhaust gas temperature sensor upstream of the DOC **B-F32** with the values measured by the exhaust gas temperature sensor upstream of the DPF **B-F33**, by the exhaust gas temperature sensor upstream of the Selective Catalytic Reduction system (RCS) **B-F38**, and by the temperature sensor downstream of the SCR system **B-F39**. Monitor any possible signal drift caused by rapid variations of the ambient temperature. The sensors must have similar characteristics.

   Monitoring must be done after a cold soak condition to avoid any residual heat.

   A. If there are no failures found, Go to **4**.

   B. If any faults are found, check that they are not caused by sudden changes in ambient temperature.
4. Check the integrity of the circuit of the exhaust gas temperature sensor upstream of the DOC **B-F32**.

Disconnect the engine wiring from the exhaust gas temperature sensor upstream of the DOC **B-F32** at connector **X-F32**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

Inspect the relative wiring and connectors checking for damaged, bent, or displaced pins, corroded terminals, or open wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave connector **X-F32** disconnected and go to **5**.

5. Check the correct operation of the exhaust gas temperature sensor upstream of the DOC **B-F32** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to **5**.

6. Replace the exhaust gas temperature sensor upstream of the DOC **B-F32**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   Perform an engine cold start to verify that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 4766-2 9E1202 - SCR upstream temperature sensor signal drift at cold start

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the exhaust gas temperature sensor signal upstream of the DPF **B-F33**. If the ECU **A-F02** determines that this fault has not been deactivated due to another fault – not at high altitudes – and that the last driving cycle was not cold, and the temperature measured by the exhaust gas temperature sensor upstream of the DPF **B-F33** differs from the value measured by the exhaust gas temperature sensor upstream of the DOC **B-F32**, by the exhaust gas temperature sensor upstream of the SCR system **B-F38** and by the exhaust gas temperature sensor downstream of the SCR system **B-F39**, this fault occurs.

**Cause:**
The ECU **A-F02** determines that the signal of the exhaust gas temperature sensor upstream of the DPF **B-F33** has drifted during a cold start.

**Possible failure modes:**

1. Abrupt variations of the ambient temperature surrounding the exhaust gas temperature sensor upstream of the DPF **B-F33**.
2. Fault in the exhaust gas temperature sensor upstream of the DPF **B-F33**, internal fault or fault in the wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **6**.
2. Use the operator display or the diagnostic instrument to check the status of the following correlated faults.

   **4766-3 – High check in signal range**

   **4766-4 – Low check in signal range**

   **3F1C-1F 3F1C1F 3246-2 3242-14 16156-31 – SCR upstream temperature sensor signal drift at cold start**

   A. If any of the listed faults are active, carry out the diagnostics, then check that the faults have been resolved.

   B. If neither of the listed faults is active, Go to **3**.
3. Use the diagnostic instrument to compare the value measured by the exhaust gas temperature sensor upstream of the DPF **B-F33** with the values measured by the exhaust gas temperature sensor upstream of the SCR system **B-F38**, by the exhaust gas temperature sensor upstream of the DOC **B-F32** and by the exhaust gas temperature sensor downstream of the SCR system **B-F39**. Monitor any possible signal drift caused by rapid variations of the ambient temperature. The sensors must have similar characteristics.

   Monitoring must be done after a cold soak condition to avoid any residual heat.

   A. If there are no failures found, Go to **4**.

   B. If any faults are found, check that they are not caused by sudden changes in ambient temperature.
4. Check the integrity of the circuit of the exhaust gas temperature sensor upstream of the DPF **B-F33**.

Disconnect the engine wiring from the exhaust gas temperature sensor upstream of the DPF **B-F33** at connector **X-F113**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

Inspect the relative wiring and connectors checking for damaged, bent, or displaced pins, corroded terminals, or open wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector **X-F33** disconnected and go to **5**.

5. replace the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   Perform an engine cold start to verify that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 4766-14 9E120E - Upstream oxidation catalyst temperature sensor comparison to a calculated temperature value failure

## Control Module: FPT ECU

***NOTE:*** *since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the value detected by the temperature sensor at the exhaust upstream of the diesel oxidation catalyst (DOC) **B-F32**. If the ECU **A-F02** detects that the value detected by the temperature sensor at the exhaust upstream of the DOC **B-F32** is above or below a certain operating limit - which depends on engine rpm, the load, and environmental conditions - established by the ECU **A-F02**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an excessive difference between measured and calculated temperature values.

**Possible failure modes:**

1. Faulty engine operation, incorrect injection pressure or incorrect injection start.
2. Fault in the wiring of the circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32**; insulation damaged, corroded connection, etc.
3. Gas recovery rate from EGR.
4. Fault in the temperature sensor at the exhaust upstream of the DOC **B-F32**, internal fault.
5. Faulty ECU **A-F02**software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **5**.
2. Check the conditions of the temperature sensor at the exhaust upstream of the DOC **B-F32**.

   Disconnect the engine wiring of the vehicle from the temperature sensor at the exhaust upstream of the DOC **B-F32**, connector **X-F32**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the temperature sensor at the exhaust upstream of the DOC **B-F32**.

| From | To | Value |
|---|---|---|
| **X-F32 pin 1** | **X-F32 pin 2** | The value must be between **169.7 – 738.2 Ω** dependant upon the temperature at the exhaust **-40 – 800 °C** (**-40 – 1472 °F**). |

   A. If the measured resistance is not within specification, the temperature sensor at the exhaust upstream of the DOC has failed internally **B-F32**. Replace sensor.

   B. If the measured resistance is within specification, leave the connector disconnected **X-F32** and go to step **3**.
3. Check the integrity of the circuit of the exhaust gas temperature sensor upstream of the DOC **B-F32**.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Inspect the wiring and relative connectors checking for damaged, bent, or displaced pins, corroded terminals, or open or stripped wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector disconnected **X-F32** and go to step **5**.

4. Check the correct operation of the temperature sensor at the exhaust upstream of the DOC **B-F32** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to step **4**.

5. Replace the exhaust gas temperature sensor upstream of the DOC **B-F32**.

   Carry out the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Use the diagnostic tool to check again the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, Check that the ECU software **A-F02** is correct and update, if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 AA0C1F 3242-31 - Upstream SCR temperature sensor comparison to a calculated temperature value failure

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the value measured by the exhaust gas temperature sensor upstream of the DPF **B-F33**. If the ECU **A-F02** determines that the value measured by the exhaust gas temperature sensor upstream of the DPF **B-F33** is higher or lower than a certain operational limit (which depends on the engine speed, on the load, and on ambient conditions) set by the ECU **A-F02**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an excessive difference between measured and calculated temperature values.

**Possible failure modes:**

1. Faulty engine operation, incorrect injection pressure or incorrect injection start.
2. Faulty wiring in the circuit of the exhaust gas temperature sensor upstream of the DPF **B-F33**; damaged insulation, corroded connection, etc.
3. Gas recovery rate from EGR.
4. Fault in the exhaust gas temperature sensor upstream of the DPF **B-F33**, internal fault.
5. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. go to step **5**.
2. Check the conditions of the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   Disconnect the engine wiring from the exhaust gas temperature sensor upstream of the DPF **B-F33** at connector **X-F33**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the exhaust gas temperature sensor upstream of the DPF **B-F33**:

| From | To | Value |
|---|---|---|
| **X-F33 pin 1** | **X-F33 pin 2** | The value must be between **169.7 – 738.2 Ω** dependant upon the temperature at the exhaust **-40 – 800 °C** (**-40 – 1472 °F**). |

   A. If the measured resistance is not within the specified range, this indicates a fault inside the exhaust gas temperature sensor upstream of the DPF **B-F33**. Replace the sensor.

   B. If the measured resistance is within specification, leave the connector **X-F33** disconnected and go to step **3**.
3. Check the integrity of the circuit of the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Inspect the wiring and relative connectors checking for damaged, bent, or displaced pins, corroded terminals, or open or stripped wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector **X-F33** disconnected and go to step **4**.

4. replace the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   Then use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration.

   Carry out the SCR fault verification.

   Use the diagnostic tool to check again the status of this fault.

   A. If the fault has been corrected, return the machine to service.

   B. If the fault has not been corrected, check that the software of ECU **A-F02** is correct and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 61001F 97-31 - Water In Fuel Level Sensor Defect Detection

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the voltage output from the water sensor in the fuel **B-F217** in order to determine the presence of any water in the fuel supply. If water is detected in the fuel, warnings will be displayed to the operator about the risk of damaging the engine if continuing to use the unit. A ground signal from the water sensor in the fuel **B-F217** indicates the presence of water.

**Cause:**
This fault code is displayed to warn the operator that the ECU **A-F02** has detected excess water in the fuel system or a fault in the water in fuel sensor circuit.

**Possible failure modes:**

1. Excess water in the fuel supply.
2. Faulty water in fuel sensor **B-F217**, wiring or internal (mechanical and/or electrical) fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is still present and remains active, continue with step **2**.

   B. If the fault is no longer present or is in an inactive state, continue with **7**.
2. Check fuel for water contamination.

   A. If there is water contamination, continue with step **3**.

   B. If there is no water contamination, continue with **4**.
3. Check the correct operation of the water in fuel sensor **B-F217**.

   Purge fuel supply system, replace fuel filter(s) and refill with fuel that is free of water contamination.

   Start and run the engine for 5 minutes.

   Check for code to return to active status.

   A. If code returns in an active status, replace water in fuel sensor **B-F217**.

   B. If code remains inactive, return the machine to service.
4. Check for open, short, and grounded circuit conditions in the water in fuel sensor **B-F217** circuit.

   Disconnect the water in fuel sensor **B-F217** at connector **X-F217**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Reading |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | **X-F02V (Receptacle) pin 70** | There should be continuity. |
| **X-F217 (Receptacle) pin 2** | **X-F02V (Receptacle) pin 88** | There should be continuity. |
| **X-F217 (Receptacle) pin 3** | **X-F02V (Receptacle) pin 75** | There should be continuity. |

Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 70** | **X-F02V** all other pins | There should be no continuity |
| **X-F02V (Receptacle) pin 88** | **X-F02V** all other pins | There should be no continuity |
| **X-F02V (Receptacle) pin 75** | **X-F02V** all other pins | There should be no continuity |

Then use a multimeter to perform the following tests on the engine wiring phase 5 (S5):

| From | A | Value |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | Ground | There should be no continuity |
| **X-F217 (Receptacle) pin 2** | Ground | There should be no continuity |
| **X-F217 (Receptacle) pin 3** | Ground | There should be no continuity |

A. If the results are not as expected for any of the wiring tests listed above, there is an open, short or grounded circuit condition in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

B. If the results are as expected in all of the wiring tests listed above, the wiring is okay. Leave the connectors disconnected and go to **5**.

5. Check the power supply voltage of the water in fuel sensor **B-F217**.

   With the ignition switch in the ON position, use a multimeter to perform the following test on the wiring side of the water in fuel sensor:

| From | To | Reading |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | Grounding | There should be ignition switch voltage. |

   A. If there is ignition switch voltage present, continue with step **6**.

   B. If no voltage is detected in the ignition switch, there is an open circuit or a short circuit to ground between **X-F217 (Receptacle) pin 1** and **X-F02V (Receptacle) pin 70**. Locate and repair the open circuit or the short circuit in the wiring.

6. Replace the water in fuel sensor **B-F217**, then check to see if this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damages are found and the display shows normal values, erase fault code.

# 295467 174-3 AE0003 - Fuel Temperature Sensor voltage is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the fuel temperature sensor **B-F290** to check for a short circuit towards a high voltage source or an open circuit. If the ECU **A-F02** determines the presence of a short circuit towards a high voltage source or an interruption in the temperature signal circuit of the fuel temperature sensor **B-F290**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a too high voltage in the temperature signal circuit of the fuel temperature sensor **B-F290**.

**Possible failure modes:**

1. Faulty temperature signal wire of the fuel temperature sensor **B-F290**, short circuit towards a high voltage source or open circuit.
2. Faulty fuel temperature sensor **B-F290**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **6**.

2. Check the temperature signal circuit of the fuel temperature sensor **B-F290** for an interruption.

   Disconnect the engine wiring from the fuel temperature sensor **B-F290** at connector **X-F290**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 36** | **X-F290 pin 1** | There should be continuity. |

   A. If there is continuity, leave connectors **X-F290** and **X-F02E** disconnected and go to **3**.

   B. If there is no continuity, this indicates an open circuit condition in the engine wiring between the connector **X-F02E (Receptacle) pin 36** and the connector **X-F290 pin 1**.Locate and repair the broken conductor.

3. Check the temperature signal circuit of the fuel temperature sensor **B-F290** for a short circuit towards another circuit.

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 36** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit of the temperature signal circuit of the fuel temperature sensor **B-F290**. Locate and repair the shorted conductors.

   B. If there is no continuity, leave the connectors disconnected and go to **4**.

4. Check the temperature signal circuit of the fuel temperature sensor **B-F290** for a short circuit towards a voltage source.

   With the ignition switch set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 36** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards a voltage source in the temperature signal circuit of the fuel temperature sensor **X-F02E (Receptacle) pin 36**.Locate and repair the shorted conductors.

   B. In the absence of voltage, go to step **5**.

5. Replace the fuel temperature sensor **B-F290**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is found and the display shows normal values, erase fault code.

# 295467 174-4 AE0004 - Fuel Temperature Sensor voltage is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature signal circuit of the fuel temperature sensor **B-F290**. If the ECU **A-F02** senses that the voltage in the temperature signal circuit of the fuel temperature sensor **B-F290** is below the expected value, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a too low voltage in the temperature signal circuit of the fuel temperature sensor **B-F290**.

**Possible failure modes:**

1. Faulty temperature signal wire of the fuel temperature sensor **B-F290**, short circuit to ground.
2. Faulty fuel temperature sensor **B-F290**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **4**.
2. Check the temperature signal circuit of the fuel temperature sensor **B-F290** for a short circuit to ground.

   Disconnect the engine wiring from the fuel temperature sensor **B-F290** at connector **X-F290**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 36** | Frame ground | There should be no continuity. |
| **X-F02E (Receptacle) pin 36** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity during one of the checks, there is a short circuit to ground or towards another circuit of the temperature signal circuit of the fuel temperature sensor **B-F290**.Locate and repair the broken or shorted conductor.

   B. If there is no continuity in both checks, go to **3**.
3. Replace the fuel temperature sensor **B-F290**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is found and the display shows normal values, erase fault code.

# 295467 ED0A01 2797-1 - Injector: voltage too low

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the injectors for various electric problems.

**Cause:**
The supercharging voltage diagnostics threshold has not been reached

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **3**age.

2. Check the correct operation of the ECU **A-F02**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the ECU **A-F02**.

   B. If code remains inactive, return the machine to service.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 8B0205 651-5 - Injector: open circuit of injector 1 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During evaluation of the cylinder 1 injector **Y-F11_1**, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 1 injection nozzle **Y-F11_1** solenoid windings, open circuit.
2. Faulty wiring of cylinder 1 injector circuit **Y-F11_1**, broken or interrupted conductor, high voltage or low voltage side (damaged wiring).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the open circuit condition.

   Disconnect the connector **X-F02E** on the wiring of the control unit of the ECU **A-F02**.

   Disconnect the connector of the wiring **X-F3YZ** from the connector of the injector cover (valves) **X-F3YZ-1**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 64** | **X-F3YZ (Plug) pin A** | There should be continuity |
| **X-F02E (Receptacle) pin 85** | **X-F3YZ (Plug) pin B** | There should be continuity |

   A. If continuity is detected, leave connectors **X-F02E** and **X-F3YZ** disconnected and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 1 injector **Y-F11_1**, high side terminal, at connector **X-F11_1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_1 pin 1**(high voltage side terminal) | **X-F3YZ-1 (Plug) pin A** | There should be continuity |

   A. If continuity is detected, leave the injector wiring connector **X-F11_1** disconnected from the injector of cylinder 1 **Y-F11_1** and go to step **6**.

B. If there is no continuity, there is an open circuit, Locate and repair the broken conductor.

4. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 1 injector **Y-F11_1**, low side terminal, at connector **X-F11_1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_1 pin 2**(low side terminal) | **X-F3YZ-1 (Plug) pin B** | There should be continuity |

   A. If continuity is detected, Locate and repair the broken conductor.

   B. If there is no continuity, there is an open circuit, repair or replace, as required; if the fault code persists contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8D0205 653-5 - Injector: open circuit of injector 2 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 3 injector **Y-F11_3** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 3 injection nozzle **Y-F11_3** solenoid windings, open circuit.
2. Faulty wiring of cylinder 3 injector circuit **Y-F11_3**, broken or interrupted conductor, high voltage or low voltage side (damaged wiring).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the open circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Disconnect the connector of the wiring **X-F3YZ** from the connector of the injector cover (valves) **X-F3YZ-1**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 45** | **X-F3YZ (Plug) pin C** | There should be continuity |
| **X-F02E (Receptacle) pin 24** | **X-F3YZ (Plug) pin D** | There should be continuity |

   A. If continuity is detected, leave connectors **X-F02E** and **X-F3YZ** disconnected and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 3 injector **Y-F11_3**, high side terminal, at connector **X-F11_3**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_3 pin 1**(high voltage side terminal) | **X-F3YZ-1 (Plug) pin D** | There should be continuity |

   A. If continuity is detected, leave the injector wiring connector **X-F11_3** disconnected from the injector of cylinder 3 **Y-F11_3** and go to step **6**.

B. If there is no continuity, there is an open circuit, Locate and repair the broken conductor.

4. Determine the location of the open circuit condition.

   Remove the injector cover (valve) and disconnect the injector wiring from the cylinder 3 injector **Y-F11_3**, low side terminal, at connector **X-F11_3**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_3 pin 2**(low side terminal) | **X-F3YZ-1 (Plug) pin C** | There should be continuity |

   A. If continuity is detected, Locate and repair the broken conductor.

   B. If there is no continuity, there is an open circuit, repair or replace, as required; if the fault persist contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8E0205 654-5 - Injector: open circuit of injector 3 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 4 injection nozzle **Y-F11_4** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 4 injection nozzle **Y-F11_4** solenoid windings, open circuit.
2. Faulty wiring of cylinder 4 injector circuit **Y-F11_4**, broken or interrupted conductor, high voltage or low voltage side (damaged wiring).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the open circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Disconnect the connector of the wiring **X-F3YZ** from the connector of the injector cover (valves) **X-F3YZ-1**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 66** | **X-F3YZ (Plug) pin E** | There should be continuity |
| **X-F02E (Receptacle) pin 87** | **X-F3YZ (Plug) pin F** | There should be continuity |

   A. If continuity is detected, leave connectors **X-F02E** and **X-F3YZ** disconnected and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 4 injector **Y-F11_4**, high side terminal, at connector **X-F11_4**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_4 pin 1**(high voltage side terminal) | **X-F3YZ-1 (Plug) pin E** | There should be continuity |

   A. If continuity is detected, leave the injector wiring connector **X-F11_4** disconnected from the injector of cylinder 4 **Y-F11_4** and go to step **6**.

B. If there is no continuity, there is an open circuit, Locate and repair the broken conductor.

4. Determine the location of the open circuit condition.

   Remove the injector cover (valve) and disconnect the injector wiring from the cylinder 4 injector **Y-F11_4**, low side terminal, at connector **X-F11_4**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_4 pin 2**(low side terminal) | **X-F3YZ-1 (Plug) pin F** | There should be continuity |

   A. If continuity is detected, Locate and repair the broken conductor.

   B. If there is no continuity, there is an open circuit, repair or replace, as required; if the fault persist contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8C0205 652-5 - Injector: open circuit of injector 4 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 2 injector **Y-F11_2** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Fault in cylinder 2 injector **Y-F11_2** solenoid windings, open circuit.
2. Faulty wiring of cylinder 2 injector circuit **Y-F11_2**, broken or interrupted conductor, high voltage or low voltage side (damaged wiring).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the open circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Disconnect the connector of the wiring **X-F3YZ** from the connector of the injector cover (valves) **X-F3YZ-1**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 43** | **X- F3YZ (Plug) pin G** | There should be continuity |
| **X-F02E (Receptacle) pin 22** | **X-F3YZ (Plug) pin H** | There should be continuity |

   A. If continuity is detected, leave connectors **X-F02E** and **X-F3YZ** disconnected and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 2 injector **Y-F11_2**, high side terminal, at connector **X-F11_2**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_2 pin 1**(high voltage side terminal) | **X-F3YZ-1 (Plug) pin H** | There should be continuity |

   A. If continuity is detected, leave the injector wiring connector **X-F11_2** disconnected from the injector of cylinder 2 **Y-F11_2** and go to step **6**.

B. If there is no continuity, there is an open circuit, Locate and repair the broken conductor.

4. Determine the location of the open circuit condition.

   Remove the injector cover (valve) and disconnect the injector wiring from the cylinder 2 injector **Y-F11_2**, low side terminal, at connector **X-F11_2**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_1 pin 2**(low side terminal) | **X- F3YZ (Plug) pin G** | There should be continuity |

   A. If continuity is detected, Locate and repair the broken conductor.

   B. If there is no continuity, there is an open circuit, repair or replace, as required; if the fault persist contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 2797-4 ED0A04 - Injector: short circuit of the HDEV power stage (first bank)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors in the bank 1 cylinder (cylinder 1 and 3). When the specific combination of errors is detected, this fault occurs.

**Cause:**
During cylinder bank 1 evaluation, the pattern for a short circuit condition was detected.

**Possible failure modes:**

1. Fault in the windings of the bank 1 injector solenoid ( **Y-F11_1** or **Y-F11_3**), short circuit to ground.
2. Fault in the wiring of the bank 1 injector ( **Y-F11_1** or **Y-F11_3**), short circuit to ground (wiring damaged).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **8**.
2. Check the wiring of the cylinder 1 injector **Y-F11_1** control circuit to check for a short circuit to ground.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 64** | Chassis ground | There should be no continuity |

   A. If there is no continuity, leave connector **X-F02E** disconnected and go to step **8**.

   B. If there is continuity, go to **3** .
3. Determine location of the short circuit to ground condition.

   Disconnect the connector of the engine wiring **X-F3YZ** from the connector of the cover (valves).

   Use a multimeter to measure the continuity on the injector cover side (valve):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Receptacle) pin A** | Chassis ground | There should be no continuity |

   A. If continuity to chassis ground is not detected, leave connector **X-F3YZ** disconnected and go to **4**.

   B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.
4. Determine location of the short circuit to ground condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 1 injector **Y-F11_1**, high side terminal, at connector **X-F11_1**.

   Use a multimeter to measure the continuity on the injector:

| From | To | Value |
|---|---|---|
| **X-F11_1 pin 1** (high voltage side terminal) | Chassis ground | There should be no continuity |

A. If there is no continuity, this indicates that the cylinder 1 injector solenoid coil is faulty, replace the injector.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

5. Check the wiring of the cylinder 3 injector **Y-F11_3** control circuit to check for a short circuit to ground.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 24** | Chassis ground | There should be no continuity |

A. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If there is continuity, go to **9**.

6. Determine location of the short circuit to ground condition.

   Disconnect the connector of the engine wiring **X-F3YZ** from the connector of the cover (valves).

   Use a multimeter to measure the continuity on the injector cover side (valve):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Receptacle) pin D** | Chassis ground | There should be no continuity |

A. If continuity to chassis ground is not detected, leave the connector **X-F3YZ** disconnected and go to **7**.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

7. Determine location of the short circuit to ground condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 3 injector **Y-F11_3**, high side terminal, at connector **X-F11_3**.

   Use a multimeter to measure the continuity on the injector:

| From | To | Value |
|---|---|---|
| **X-F11_3 pin 1** (high voltage side terminal) | Chassis ground | There should be no continuity |

A. If there is no continuity, this indicates that the cylinder 3 injector solenoid coil is faulty, replace the injector.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

8. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 EE0A04 2798-4 - Injector: short circuit of the HDEV power stage (second bank)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors in the bank 2 cylinder (cylinder 2 and 4). When the specific combination of errors is detected, this fault occurs.

**Cause:**
During cylinder bank 2 evaluation, the pattern for a short circuit condition was detected.

**Possible failure modes:**

1. Fault in the windings of the bank 2 injector solenoid ( **Y-F11_4** or **Y-F11_2**), short circuit to ground.
2. Fault in the wiring of the bank 2 injector ( **Y-F11_4** or **Y-F11_2**), short circuit to ground (wiring damaged).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **8**.
2. Check the wiring of the cylinder 4 injector **Y-F11_4** control circuit to check for a short circuit to ground.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 66** | Chassis ground | There should be no continuity |

   A. If there is no continuity, leave connector **X-F02E** disconnected and go to step **8**.

   B. If there is continuity, go to **3** .
3. Determine location of the short circuit to ground condition.

   Disconnect the connector of the engine wiring **X-F3YZ** from the injector cover (valves).

   Use a multimeter to measure the continuity on the injector cover side (valve):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Receptacle) pin E** | Chassis ground | There should be no continuity |

   A. If continuity to chassis ground is not detected, leave connector **X-F3YZ** disconnected and go to **4**.

   B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.
4. Determine location of the short circuit to ground condition.

   Remove the injector cover (valve) and disconnect the injector wiring (IN4) from the cylinder 4 injector **Y-F11_4**, high side terminal, connector **X-F11_4**.

   Use a multimeter to measure the continuity on the injector:

| From | To | Value |
|---|---|---|
| **X-F11_4 pin 1** (high voltage side terminal) | Chassis ground | There should be no continuity |

A. If there is no continuity, this indicates that the cylinder 4 injector solenoid coil is faulty, replace the injector.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

5. Check the wiring of the cylinder 2 injector **Y-F11_2** control circuit to check for a short circuit to ground.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 22** | Chassis ground | There should be no continuity |

A. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If there is continuity, go to **9**.

6. Determine location of the short circuit to ground condition.

   Disconnect the connector of the engine wiring **X-F3YZ** from the injector cover (valves).

   Use a multimeter to measure the continuity on the injector cover side (valve):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Receptacle) pin H** | Chassis ground | There should be no continuity |

A. If continuity to chassis ground is not detected, leave the connector **X-F3YZ** disconnected and go to **7**.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

7. Determine location of the short circuit to ground condition.

   Remove the injector cover (valve) and disconnect the injector wiring (IN2) from the cylinder 2 injector **Y-F11_2**, high side terminal, connector **X-F11_2**.

   Use a multimeter to measure the continuity on the injector:

| From | To | Value |
|---|---|---|
| **X-F11_2 pin 1** (high voltage side terminal) | Chassis ground | There should be no continuity |

A. If there is no continuity, this indicates that the cylinder 2 injector solenoid coil is faulty, replace the injector.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

8. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 651-4 8B0204 - Injector: short circuit on the low level check in injector 1 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 1 injector **Y-F11_1** evaluation, the pattern for a low side short circuit was detected.

**Possible failure modes:**

1. Faulty wiring of cylinder 1 injector **Y-F11_1**, low side circuit in short circuit towards a high voltage source (wiring damaged).
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active, go to **3**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **8**.
2. Check the low side control circuit of cylinder 1 injector **Y-F11_1** for a short circuit towards a high voltage source.

   Disconnect the ECU **A-F02** from the engine wiring, connector **X-F02E**.

   Use a multimeter to check the continuity on the wiring side (EN):

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 64** | All other pins in **X-F02E** | There should be no continuity |
| ***NOTE:*** *the resistance measured in the injector coil is a very small value, typically between* ***0.2 – 0.5 Ω****, present between* ***X-F02E (Receptacle) pin 64*** *and* ***X-F02E (Receptacle) pin 85****.* | | |

   A. If continuity is detected, this indicates a short circuit to a high voltage source, locate and repair the shorted conductors.

   B. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 8D0204 653-4 - Injector: short circuit on the low level check in injector 2 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 3 injector **Y-F11_3** evaluation, the pattern for a low side short circuit was detected.

**Possible failure modes:**

1. Faulty wiring of cylinder 3 injector **Y-F11_3**, low side circuit in short circuit towards a high voltage source (wiring damaged).
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active, pass on to point **3**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **8**.
2. Check the low side control circuit of cylinder 3 injector **Y-F11_3** for a short circuit towards a high voltage source.

   Disconnect the ECU **A-F02** from the engine wiring, connector **X-F02E**.

   Use a multimeter to check for continuity on the EN harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 45** | All other pins in **X-F02E** | There should be no continuity |
| ***NOTE:*** *the resistance measured in the injector coil is a very small value, typically between* ***0.2 – 0.5 Ω****, present between* ***X-F02E (Receptacle) pin 45*** *and* ***X-F02E (Receptacle) pin 24****.* | | |

   A. If continuity is detected, this indicates a short circuit to a high voltage source, Locate and repair the shorted conductors.

   B. If no continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 654-4 8E0204 - Injector: short circuit on the low level check in injector 3 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 4 injector **Y-F11_4** evaluation, the pattern for a low side short circuit was detected.

**Possible failure modes:**

1. Faulty wiring of cylinder 4 injector **Y-F11_4**, low side circuit in short circuit towards a high voltage source (wiring damaged).
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active, pass on to point **3**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **8**.
2. Check the low side control circuit of cylinder 4 injector **Y-F11_4** for a short circuit towards a high voltage source.

   Disconnect the ECU **A-F02** from the engine wiring, connector **X-F02E**.

   Use a multimeter to check for continuity on the EN harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 87** | All other pins in **X-F02E** | There should be no continuity |
| ***NOTE:** the resistance measured in the injector coil is a very small value, typically between **0.2 – 0.5 Ω**, present between **X-F02E (Receptacle) pin 87** and **X-F02E (Receptacle) pin 66**.* | | |

   A. If continuity is detected, this indicates a short circuit to a high voltage source, Locate and repair the shorted conductors.

   B. If no continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8C0204 652-4 - Injector: short circuit on the low level check in injector 4 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 2 injector **Y-F11_2** evaluation, the pattern for a low side short circuit was detected.

**Possible failure modes:**

1. Faulty wiring of cylinder 2 injector **Y-F11_2**, low side circuit in short circuit towards a high voltage source (wiring damaged).
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,pass on to point **3**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **8**.
2. Check the cylinder 2 injector **Y-F11_2** high side control circuit for a short circuit to ground condition.

   Disconnect the ECU **A-F02** from the engine wiring, connector **X-F02E**.

   Use a multimeter to check for continuity on the EN harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 43** | All other pins in **X-F02E** | There should be no continuity |
| ***NOTE:*** *the resistance measured in the injector coil is a very small value, typically between* ***0.2 – 0.5 Ω****, present between* ***X-F02E (Receptacle) pin 22*** *and* ***X-F02E (Receptacle) pin 43****.* | | |

   A. If continuity is detected, this indicates a short circuit to a high voltage source, Locate and repair the shorted conductors.

   B. If no continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 651-3 8B0203 - Injector: short circuit between the low level check and the high level check in injector 1 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During evaluation of the cylinder 1 injector **Y-F11_1**, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 1 injector **Y-F11_1** solenoid windings, short circuit.
2. Faulty wiring of cylinder 1 injector **Y-F11_1** circuit, broken or disconnected conductor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the short circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 64** | **X-F02E (Receptacle) pin 85** | There should be no continuity |

   A. If there is no continuity, leave the connector **X-F02E** disconnected and go to step **3**.

   B. If continuity is detected, Locate and repair the broken conductor.
3. Determine the location of the short circuit condition.

   Disconnect **X-F3YZ** and **X-F3YZ-1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Plug) pin A** | **X-F3YZ (Plug) pin B** | There should be no continuity |
| **X-F3YZ-1 (Plug) pin A** | **X-F3YZ-1 (Plug) pin B** | There should be no continuity |

   A. If there is no continuity, leave connectors **X-F3YZ** and **X-F3YZ-1** disconnected and go to step **6**.

   B. If there is continuity, there is a short circuit, Locate and repair the broken conductor.
4. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 1 **Y-F11_1** injector, connector **X-F11_1**.

Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_1 pin 1**(high side terminal) | **X-F11_1 pin 2** (low side terminal) | There should be no continuity |

A. If continuity is detected, Locate and repair the broken conductor.

B. If there is no continuity, contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 653-3 8D0203 - Injector: short circuit between the low level check and the high level check in injector 2 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 3 injector **Y-F11_3** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 3 injector **Y-F11_3** solenoid windings, short circuit.
2. Faulty wiring of cylinder 3 injector **Y-F11_3** circuit, broken or disconnected conductor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the short circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 45** | **X-F02E (Receptacle) pin 24** | There should be no continuity |

   A. If there is no continuity, leave the connector **X-F02E** disconnected and go to step **3**.

   B. If continuity is detected, Locate and repair the broken conductor.
3. Determine the location of the short circuit condition.

   Disconnect **X-F3YZ** and **X-F3YZ-1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Plug) pin C** | **X-F3YZ (Plug) pin D** | There should be no continuity |
| **X-F3YZ-1 (Plug) pin C** | **X-F3YZ-1 (Plug) pin D** | There should be no continuity |

   A. If there is no continuity, leave connectors **X-F3YZ** and **X-F3YZ-1** disconnected and go to step **6**.

   B. If there is continuity, there is a short circuit, Locate and repair the broken conductor.
4. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 3 **Y-F11_3** injector, connector **X-F11_3**.

Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_3 pin 1**(high side terminal) | **X-F11_3 pin 2** (low side terminal) | There should be no continuity |

A. If continuity is detected, Locate and repair the broken conductor.

B. If there is no continuity, contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 654-3 8E0203 - Injector: short circuit between the low level check and the high level check in injector 3 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 4 injection nozzle **Y-F11_4** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 4 injector **Y-F11_4** solenoid windings, short circuit.
2. Faulty wiring of cylinder 4 injector **Y-F11_4** circuit, broken or disconnected conductor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the short circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 66** | **X-F02E (Receptacle) pin 87** | There should be no continuity |

   A. If there is no continuity, leave the connector **X-F02E** disconnected and go to step **3**.

   B. If continuity is detected, Locate and repair the broken conductor.
3. Determine the location of the short circuit condition.

   Disconnect **X-F3YZ** and **X-F3YZ-1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Plug) pin E** | **X-F3YZ (Plug) pin F** | There should be no continuity |
| **X-F3YZ-1 (Plug) pin E** | **X-F3YZ-1 (Plug) pin F** | There should be no continuity |

   A. If there is no continuity, leave connectors **X-F3YZ** and **X-F3YZ-1** disconnected and go to step **6**.

   B. If there is continuity, there is a short circuit, Locate and repair the broken conductor.
4. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 4 **Y-F11_4** injector, connector **X-F11_4**.

Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_4 pin 1**(high side terminal) | **X-F11_4 pin 2** (low side terminal) | There should be no continuity |

A. If continuity is detected, Locate and repair the broken conductor.

B. If there is no continuity, contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8C0203 652-3 - Injector: short circuit between the low level check and the high level check in injector 4 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 2 injector **Y-F11_2** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 2 injector **Y-F11_2** solenoid windings, short circuit.
2. Faulty wiring of cylinder 2 injector **Y-F11_2** circuit, broken or disconnected conductor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the short circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 43** | **X-F02E (Receptacle) pin 22** | There should be no continuity |

   A. If there is no continuity, leave the connector **X-F02E** disconnected and go to step **3**.

   B. If continuity is detected, Locate and repair the broken conductor.
3. Determine the location of the short circuit condition.

   Disconnect **X-F3YZ** and **X-F3YZ-1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Plug) pin G** | **X-F3YZ-1 (Plug) pin G** | There should be no continuity |
| **X-F3YZ-1 (Plug) pin G** | **X-F3YZ-1 (Plug) pin H** | There should be no continuity |

   A. If there is no continuity, leave connectors **X-F3YZ** and **X-F3YZ-1** disconnected and go to step **6**.

   B. If there is continuity, there is a short circuit, Locate and repair the broken conductor.
4. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 2 **Y-F11_2** injector, connector **X-F11_2**.

Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_2 pin 1**(high side terminal) | **X-F11_2 pin 2** (low side terminal) | There should be no continuity |

A. If continuity is detected, Locate and repair the broken conductor.

B. If there is no continuity, contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 C4150E 5572-14 - ECU internal failure - NTP error in ADC monitoring

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** uses a No-load Test Pulse (NTP) operation to check the efficiency of the Analog to Digital Converter (ADC). If an error is detected during this test, this fault will occur.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 C4151F 5572-31 - ECU internal failure - ADC test

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the efficiency of the Analog to Digital Converter (ADC). A fixed incoming test voltage is sent to the ADC and converted. The ECU **A-F02** monitors this test and counts the number of times that the value is not in the specified range. If the counter exceeds 15 times, this fault occurs.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 518203-31 3BE8FF - ECU internal failure - Injection cut off requested by test path

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** includes the so-called redundant stop paths which deactivate all injection supply phases in case some errors inside the ECU **A-F02** are found. In order to check the correct operation of the stop procedure, each path is activate for a short time during the ECU boot, then the fuel injection supply phase is activated. However, since the stop procedure is active, there is no injection if the procedure operates correctly.

**Cause:**
The ECU **A-F02** has failed internally.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 32041F 1074-31 - Position sensor rationality failure

## Control Module: FPT ECU

**Fault Description:**
This function calculates the activation status of the engine brake actuators based on the activation status of the low and high side power supply phases. It also provides information regarding the diagnostic error relating to the engine brake power supply phases. The supply phases of the exhaust baffle are monitored and a plausibility error is detected relative to the release of the exhaust baffle between level 1 and level 2.

**Cause:**
The ECU **A-F02** has failed internally.

**Solution:**

1. Check that the ECU software **A-F02** is correct and re-flash.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 00E8EE 518144-14 - Diagnostic fault check to report the engine speed error

## Control Module: FPT ECU

**Fault Description:**
A redundant check of the engine speed is carried out to monitor functionality at software level 2. The monitoring inside the engine control unit (ECU) **A-F02** takes place on 3 levels: level 1 is the functions level (component monitoring, engine control), level 2 is the function monitoring level (detects the faulty processes of the level 1 functions) and level 3 is the monitoring level of the control unit (checks the correctness of the processing of ECU **A-F02** programme commands). The difference between the engine speed calculated by level 1 and the engine speed calculated by level 2 is higher than the correct threshold or there is an error in the debounce signal.

**Cause:**
The ECU **A-F02** has failed internally.

**Solution:**

1. Check that the ECU software **A-F02** is correct and re-flash.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 5441-2 411502 - Fuel injection energizing time is not plausible

## Control Module: FPT ECU

**Fault Description:**
The plausibility of the injector energising time request is monitored by the monitoring software (level 2) of the engine control unit (ECU). Level 2 of the ECU **A-F02** monitors the level 1 software of the ECU (functional software).

**Cause:**
The ECU **A-F02** has failed internally.

**Solution:**

1. Check that the ECU software **A-F02** is correct and re-flash.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 5441-31 41151F - Fuel injection energizing phase not plausible

## Control Module: FPT ECU

**Fault Description:**
The plausibility of the injector excitation time start is monitored by the monitoring software (level 2) of the engine control unit (ECU). The level 2 of the ECU monitors the software of level 1 of the ECU (functional software). If the system detects a non-plausible excitation start up of the main injection, of the pilot injection, or of the post-injection and the detection is not inhibited by another fault, this fault occurs.

**Cause:**
The ECU **A-F02** has failed internally.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 156-14 9C000E - Fuel injection energizing phase is not plausible (ZFC calibration)

## Control Module: FPT ECU

**Fault Description:**
The plausibility of the excitation start time of the injectors is monitored by the monitoring software (level 2) of the Engine Control Unit (ECU) **A-F02**. The ECU level 2 monitors the software of the ECU level 1 (functional software). If there is an implausible calibration of the quantity of fuel at zero, this fault occurs. Replace the ECU **A-F02**.

# 295467 06E8FF 518150-31 - Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI2 shut-off

## Control Module: FPT ECU

**Fault Description:**
Engine performance is supported by the addition of the pilot injections, main injections and three post-injections. The engine control unit (ECU) **A-F02** monitors the amount of fuel not supplied (shut off) during the post-injection 2 phase in normal mode. Replace the ECU **A-F02** if necessary.

# 295467 518151-31 07E8FF - Diagnostic fault check to report the plausibility error in PoI3 efficiency factor

## Control Module: FPT ECU

**Fault Description:**
The engine performance is supported by the addition of pilot injections, main injections, and post-injections. The engine control unit (ECU) **A-F02** monitors these injections and compares their values against a model. If the post-injection 3 efficiency is not within the relative range of plausible values, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 518219-31 4BE8FF - Internal error: Error in the total injection quantity at level 1

## Control Module: FPT ECU

**Fault Description:**
The engine performance (torque generation) is supported by the addition of pilot injections, main injections, and post-injections. The engine control unit (ECU) **A-F02** monitors these injections and compares their values against a model. If the injection (level 1) is not within the relative range of plausible values, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 4CE8FF 518220-31 - Internal error: Error in the total injection quantity at level 2

## Control Module: FPT ECU

**Fault Description:**
Engine performance (torque generation) is supported by the addition of pilot injections, main injections and post-injections. The Engine Control Unit (ECU) **A-F02** monitors these injections and compares their values against a model. If the injection (level 2) does not fall within the range of plausible values, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 1116-31 5C041F - Diagnostic fault check to report the error due to injection quantity correction

## Control Module: FPT ECU

**Fault Description:**
Engine performance is supported by the addition of pilot injections, main injections and three post-injections. The Engine Control Unit (ECU) **A-F02** monitors the efficiency of these injections and corrects the amount injected if necessary. If the ECU **A-F02** detects that the corrections of the injection quantity is excessive, there is a calibration error and this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 C11402 5313-2 - Diagnostic fault check to report the plausibility error in rail pressure monitoring

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the fuel line pressure to ensure that the engine performances are correct and that there are no safety problems. The pressure in the fuel line is monitored by the ECU **A-F02** to check that the ECU **A-F02** operates correctly. If the ECU **A-F02** detects a non-plausible line pressure during the monitoring phase, the ECU **A-F02** is not operating correctly and this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 49E8FF 518217-31 - ECU internal error - Error detected by the start monitoring system

## Control Module: FPT ECU

**Fault Description:**
The start-up behaviour of the engine is a fundamental safety function. Therefore, an additional monitoring check (level 2) is performed to see if the Engine Control Unit (ECU) **A-F02** is working properly. If level 2 detects an implausible behaviour of the start request while level 1 monitoring does not detect any problems, the ECU **A-F02** is not working properly and this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 518162-31 12E8FF - ECU internal fault - Injector activation time too long

## Control Module: FPT ECU

**Fault Description:**
The torque request of the engine control unit (ECU) **A-F02** can be influenced by many vehicle functions which, in some cases, are incremental, sometimes as a maximum limit, sometimes as a minimum limit. This complex structure can lead to a torque request above the acceptable value for the engine, therefore the total engine torque requested is compared to a maximum engine torque permitted, calculated using a redundant procedure.

**Cause:**
Fault inside the ECU **A-F02** or calibration error.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, Contact the THD.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **2**age.

2. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 518161-31 11E8FF - ECU internal fault - Plausibility error in the torque values

## Control Module: FPT ECU

**Fault Description:**
The torque request of the engine control unit (ECU) **A-F02** can be influenced by various functions of the vehicle which, in some cases, are incremental, sometimes as maximum limit, sometimes as minimum limit. This complex structure may lead to a torque request above the acceptable value for the engine, therefore the total requested engine torque is compared against the maximum permitted engine torque calculated through a redundant procedure. The difference between the effective torque and the permitted torque composes the torque integral. If the integral value accumulated exceeds the maximum threshold determined by the ECU **A-F02**, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 3CE8FF 518204-31 - Internal error ECU- selective monitoring

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the circuit to check for internal faults during the driving cycle. The ECU **A-F02** can select specific components to be monitored with determined parameters of the driving cycle. If an excessive number of monitored parameters are not within specifications, this code occurs. If necessary replace the ECU **A-F02**.

# 295467 B30C02 3251-2 - DPF pressure sensor - Pressure plausibility error

## Control Module: FPT ECU

**Fault Description:**
The Engine control unit (ECU) **A-F02** monitors operation of the diesel particulate filter (DPF) delta pressure sensor **B-F34**. If during the after-run of the ECU **A-F02**, after turning off, the monitoring is not disabled by another fault and the signal of the delta pressure sensor of the DPF **B-F34** is below the correct value, this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the signal of the delta pressure sensor of the DPF **B-F34** is below the permitted tolerance value.

**Possible failure modes:**

1. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Use the diagnostic instrument to check for other faults relating to the DPF delta pressure sensor **B-F34**.

   A. If another fault is present, resolve it. Then determine if this fault is also resolved.

   B. If there are no other faults present, continue with step **2**.
2. Replace the DPF delta pressure sensor **B-F34**.

   Use the diagnostic instrument to check that this fault has been resolved .

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 61E8FF 518241-31 - ECU internal failure - "ABE active" signalled

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the communication, inside the ECU **A-F02**, between the supply stages and the voltage power supply of the supply stage. Replace the ECU **A-F02** if necessary.

# 295467 1648-12 70060C - ECU has an internal fault: "WDA active" reported due to errors in query/response communication

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors communication inside the ECU **A-F02** between the power supply phases and the power unit of the power supply phase. If unexpected communication is detected during monitoring (a wire is active when it should not be), this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 62E8FF 518242-31 - ECU internal failure - "Errorpin active" signalled

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the communication, inside the ECU **A-F02**, between the supply stages and the voltage power supply of the supply stage. If the supply stages are interrupted due to an active pin error, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 700603 1648-3 - ECU internal failure - 'ABE active' reported due to overvoltage detection

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the communication, inside the ECU **A-F02**, between the power supply phases and the voltage power supply of the supply phase. If the ECU **A-F02** detects high voltage while the stop circuit test is not active, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 9D121F 4765-31 - Temperature monitoring on OxiCat catalyst: incorrect assembly of temperature sensor

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the Diesel Oxidation Catalyst (DOC) **B-F32** upstream exhaust temperature sensor and the DOC **B-F33** downstream exhaust temperature sensor and reports that the sensor positions have been inverted.

**Cause:**
The ECU **A-F02** has determined that the position of the DOC **B-F32** upstream exhaust temperature sensor and the DOC **B-F33** downstream exhaust temperature have been inverted.

**Possible failure modes:**

1. Fault due to incorrect position of the DOC upstream exhaust temperature sensor **B-F32** and the DOC downstream exhaust temperature sensor **B-F33**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the position of the DOC upstream exhaust temperature sensor **B-F32**.

   Disconnect the phase 5 engine wiring (S5) from the exhaust gas temperature sensor upstream of the DOC **B-F32** at connector **X-F32**.

   Inspect the connector and the respective wiring to verify the correct positioning of the DOC upstream exhaust temperature sensor **B-F32**.

   A. If the position is not correct, switch over the sensors.

   B. If the position is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 6C0010 108-16 - Boost pressure: high physical value

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** analyses the signal of the ambient air pressure sensor to identify any implausible values using different criteria. If any faults are present, the signals are set as invalid and the fault is generated. The measured pressure is checked to see if it is plausible. The ambient air pressure sensor is located inside the ECU **A-F02**. If the ECU **A-F02** detects an ambient pressure higher than the correct value, this fault occurs. If the ECU **A-F02** is not at an extremely low altitude (below sea level), as this fault is caused by an internal fault, replace the ECU **A-F02**.

# 295467 6C0012 108-18 - Boost pressure: low physical value

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** analyses the signal of the ambient air pressure sensor to identify any implausible values using different criteria. If any faults are present, the signals are set as invalid and the fault is generated. The measured pressure is checked to see if it is plausible. The ambient air pressure sensor is located inside the ECU **A-F02**. If the ECU **A-F02** detects an ambient pressure lower than the correct pressure, this fault occurs. If the ECU **A-F02** is not at an extremely high altitude, as this fault is caused by an internal fault, replace the ECU **A-F02**.

# 295467 6C0003 108-3 - Turbocharger boost pressure is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** analyses the signal of the ambient air pressure sensor to identify any implausible values using different criteria. If any faults are present, the signals are set as invalid and the fault is generated. The measured pressure is checked to see if it is plausible. The ambient air pressure sensor is located inside the ECU **A-F02**. If the diagnostic information of the serial processor interface ECU **A-F02** report a continuous status of "value too high", this fault occurs. As this fault is caused by an internal fault, the ECU must be replaced **A-F02**.

# 295467 6C0004 108-4 - Turbocharger boost pressure is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** analyses the signal of the ambient air pressure sensor to identify any implausible values using different criteria. If any faults are present, the signals are set as invalid and the fault is generated. The measured pressure is checked to see if it is plausible. The ambient air pressure sensor is located inside the ECU **A-F02**. If the diagnostic information of the ECU **A-F02** of the serial processor interface (SPI) report a continuous status of "value too low", this fault occurs. As this fault is caused by an internal fault, the ECU must be replaced **A-F02**.

# 295467 108-2 6C0002 - Turbocharger boost pressure: value not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** analyses the signal of the ambient air pressure sensor to identify any implausible values using different criteria. If any faults are present, the signals are set as invalid and the fault is generated. The measured pressure is checked to see if it is plausible. The ambient air pressure sensor is located inside the ECU **A-F02**. If the ambient air pressure sensor inside the ECU **A-F02** reports an implausible status consistently for a set time, this fault occurs. As this fault is caused by an internal fault, the ECU must be replaced **A-F02**.

# 295467 3251-15 B30C0F - DPF pressure sensor: Pressure value on the DPF higher than expected

## Control Module: FPT ECU

**Fault Description:**
If the exhaust gas return pressure reaches values which are too high due to a high level of soot, the system switches to an "alarm status" and the fault is activated. This can reduce engine power to protect the diesel particulate filter (DPF) from damage. The engine control unit **A-F02** monitors exhaust operation until battery voltage exceeds **10 V**, engine speed and the surface temperature of the particulate filter are in standard conditions, there are no suspended regenerations, monitoring is inhibited by another fault and the volume of the exhaust flow is higher than the minimum permitted value established by the ECU. A pressure drop on the filter greater than the exhaust flow, based on limits established by the ECU **A-F02**, in continuous mode equal to a high level of soot which indicates the presence of a severely obstructed DPF means this fault occurs. The vehicle switches to 'emergency mode' and must be subject to maintenance to replace the Selective Catalytic Reduction on the filter (RCSsF).

**Cause:**
The ECU **A-F02** has determined that the DPF delta pressure sensor signal level **B-F34** is too high.

**Possible failure modes:**

1. Fault in the DPF delta pressure sensor signal wire **B-F34**, short circuit to high voltage source.
2. Fault in the DPF differential pressure sensor **B-F34**, internal fault.
3. Faulty ECU **A-F02**software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **5**.
2. Check the DPF delta pressure sensor signal circuit **B-F34** to check for a short circuit to ground or to another circuit.

   Disconnect the DPF delta pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the phase 5 engine wiring (S5) from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks :

| From | To | Value |
|---|---|---|
| **X-F02V pin 15** | Battery positive | There should be no continuity. |
| **X-F02V pin 15** | All other pins in connector **X-F02V_2** | There should be no continuity. |

   A. If there is continuity, there is a short circuit to battery in the DPF delta pressure sensor signal circuit **B-F34**.Locate and repair the shorted conductor.

   B. If no continuity is detected, go to step **4**.
3. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, Check that the ECU software **A-F02** is correct and update, if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 519697-0 11EEE0 - DPF pressure sensor: the differential pressure measured on the DPF exceeds the limit

## Control Module: FPT ECU

**Fault Description:**
If the exhaust gas return pressure reaches values which are too high due to a high level of soot, the system switches to an "alarm status" and the fault is activated. This can reduce engine power to protect the diesel particulate filter (DPF) from damage. The engine control unit (ECU) **A-F02** monitors operation of the exhaust until the battery voltage is above **10 V** and the engine rpm is in standard conditions. A pressure drop on the filter greater than the exhaust flow, based on limits established by the ECU **A-F02**, in continuous mode equal to a high level of soot which indicates an obstructed DPF means this fault occurs. Regeneration of the filter is not correctly completed or is not possible, we recommend managing the manual catalyst (MCM) to return the DPF to the correct condition.

**Cause:**
The ECU **A-F02** has determined that the DPF delta pressure sensor signal level **B-F34** exceeds the limit.

**Possible failure modes:**

1. Fault in the DPF delta pressure sensor signal wire **B-F34**, short circuit to high voltage source.
2. Fault in the DPF differential pressure sensor **B-F34**, internal fault.
3. Faulty ECU **A-F02**software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **5**.
2. Check the DPF delta pressure sensor signal circuit **B-F34** to check for a short circuit to ground or to another circuit.

   Disconnect the DPF delta pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the phase 5 engine wiring (S5) from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks :

| From | To | Value |
|---|---|---|
| **X-F02V pin 15** | Battery positive | There should be no continuity. |
| **X-F02V pin 15** | All other pins in connector **X-F02V_2** | There should be no continuity. |

   A. If there is continuity, there is a short circuit to battery in the DPF delta pressure sensor signal circuit **B-F34**.Locate and repair the shorted conductor.

   B. If no continuity is detected, go to step **4**.
3. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, Check that the ECU software **A-F02** is correct and update, if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 C50D00 3525-0 - Regeneration ends due to time exceeded

## Control Module: FPT ECU

**Fault Description:**
To avoid permanent regeneration of the diesel particulate filter (DPF) due to particular conditions and/or faulty sensors, the maximum duration of each regeneration level, based on the amount of soot detected, is limited with regeneration blocked and is recorded by a counter. The fault recorded is the result of the temperature being too low, therefore the system does not detect a real regeneration. If there are more than two blocked regenerations, this indicates that the system is in a critical situation and this fault is stored in the Engine Control Unit (ECU) **A-F02**. This fault could result in high fuel consumption, a dilution of the engine oil and an overload of the DPF with probable damage caused by the prolonged regeneration period. This fault is probably due to particular conditions of use of the vehicle, for example engine running at idle or low load for a prolonged period of time.

**Cause:**
The ECU **A-F02** has detected regeneration completed due to time expired.

**Possible failure modes:**

1. Fault in the exhaust temperature sensor upstream of the DOC **B-F32**, not efficient, too old, internal fault.
2. Fault in the upstream particulate filter.
3. Fault in the injectors, they do not operate after injection.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive, continue to step **9**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38** for a short circuit.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 29** | All other pins in connector **X-F02V** | There should be no continuity. |
| ***NOTE:*** *The connector **X-F02V (Plug) pin 7** is the ground return side of the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**. The value must be between **169.7 – 738.2 Ω** according to the exhaust temperature **-40 – 800 °C** (**-40 – 1472 °F**).* | | |

   A. If continuity is detected, there is a short circuit, in the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**, locate and repair the conductors in a short circuit condition.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.
3. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38** for a short circuit towards a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 29** | Chassis ground | There must be no voltage. |

   A. If voltage is detected, this indicates a short circuit towards a voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F38**, locate and repair the conductors in a short circuit condition.

B. If there is no voltage, continue to step **4**.

4. Check the correct operation of the temperature sensor at the exhaust upstream of the SCR system **B-F38** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, continue to step **6**.

   B. If the sensor is not working correctly, continue to step **5**.

5. Replace the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.

6. Check the correct operation of the differential pressure sensor on the DPF **B-F34** following the procedure indicated **PRESSURE SENSOR - Test (50.71)**.

   A. If the sensor is okay, continue to step **7**.

   B. If the sensor is not working correctly, replace the sensor.

7. Check the correct operation of all the injectors.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If they operate correctly, continue to step **8**.

   B. If they are not working correctly, repair or replace as appropriate.

8. Check correct operation of catalytic converter.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If they operate correctly, return the machine to service.

   B. If they are not working correctly, repair or replace as appropriate.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 5A1510 5466-16 - Particulate filter overloaded (level 2)

## Control Module: FPT ECU

**Fault Description:**
When the regeneration of the filter is insufficient due to low exhaust temperatures for a prolonged period of time (engine running at idle or low load for a prolonged period), or in the presence of a damaged diesel oxidation catalyst (DOC) (not producing supply gas), the flow resistance of the filter can increase to values which are higher than the critical values. The engine control unit (ECU) **A-F02** monitors the soot load levels until battery voltage reaches a value exceeding **10 V** and engine reaches a standard speed. If the soot load level is high or the pressure differential in the diesel particulate filter (DPF) exceeds the limits defined by the ECU **A-F02** based on the exhaust flow, the filter is overloaded (the flow resistance is too high) and this fault occurs. Manual catalytic converter management (MCM) with possible forced thermal treatment at the inlet of the selective catalytic reduction on filter (SCR on F) must be carried out, or the filter must be cleaned.

**Cause:**
The particulate filter regeneration switch is overloaded (second level).

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration , wiring or switch.
2. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check the correct operation of the connector of the particulate filter regeneration switch and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, continue to step **3**.
3. Check the correct operation of the particulate filter regeneration switch by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch . After having carried out the regeneration reset the switch use counter.

   A. If the switch is working correctly, contact the Technical Help Desk.

   B. If the switch is not working correctly, continue to step**4**.
4. Replace the particulate filter regeneration switch.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, continue to step**5**.

5. Check the correct operation of the connector **X-F34** of the DPF differential pressure sensor **B-F34** and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, continue to step **5**.

6. Replace the DPF differential pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 5A1500 5466-0 - Particulate filter overloaded (level 3)

## Control Module: FPT ECU

**Fault Description:**
When the regeneration of the filter is insufficient due to low exhaust temperatures for a prolonged period of time (engine running at idle or low load for a prolonged period), or in the presence of a damaged diesel oxidation catalyst (DOC) (not producing supply gas), the flow resistance of the filter can increase to values which are higher than the critical values. The engine control unit (ECU) **A-F02** monitors the soot load levels until battery voltage reaches a value exceeding **10 V** and engine reaches a standard speed. If the soot load level is high or the pressure differential in the diesel particulate filter (DPF) exceeds the limits defined by the ECU **A-F02** based on the exhaust flow, the filter is overloaded (the flow resistance is too high) and this fault occurs. Manual catalytic converter management (MCM) with possible forced thermal treatment at the inlet of the selective catalytic reduction on filter (SCR on F) must be carried out, or the filter must be cleaned.

**Cause:**
The particulate filter regeneration switch is overloaded (second level).

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration , wiring or switch.
2. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Go to step **7**.
2. Check the correct operation of the connector of the particulate filter regeneration switch and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to step **3**.
3. Check the correct operation of the particulate filter regeneration switch by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch . After having carried out the regeneration reset the switch use counter.

   A. If the switch is working correctly, contact the Technical Help Desk.

   B. If the switch is not working correctly, go to step**4**.
4. Replace the particulate filter regeneration switch.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, go to step**5**.
5. Check the correct operation of the connector **X-F34** of the DPF differential pressure sensor **B-F34** and the wiring to which it is connected.

Check the correct insulation and check there are no problems with the contacts.

A. If a fault is detected, intervene and repair if necessary.

B. If no fault is detected, go to step **5**.

6. Replace the DPF differential pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 102-15 66000F - Plausibility check for high air pressure upstream of intake valve sensor

## Control Module: FPT ECU

**Fault Description:**
The plausibility of the intake manifold pressure measured under low load and low speed conditions is monitored by the engine control unit (ECU) **A-F02**. The intake manifold pressure is compared with the ambient pressure after the ECU **A-F02** initialisation and before the engine starts, until the value detected by the intake manifold temperature and pressure sensor **B-F48** is considered reliable.

**Cause:**
The ECU **A-F02** has determined that the pressure signal of the intake manifold pressure and temperature sensor **B-F48** is out of the high range.

**Possible failure modes:**

1. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
2. Fault ECU **A-F02**, software.

**Solution:**

1. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 660011 102-17 - Plausibility check for low air pressure upstream of intake valve sensor

## Control Module: FPT ECU

**Fault Description:**
The plausibility of the intake manifold pressure measured under low load and low speed conditions is monitored by the engine control unit (ECU) **A-F02**. The intake manifold pressure is compared with the ambient pressure after the ECU **A-F02** initialisation and before the engine starts, until the value detected by the intake manifold temperature and pressure sensor **B-F48** is considered reliable.

**Cause:**
The ECU **A-F02** has determined that the pressure signal of the intake manifold pressure and temperature sensor **B-F48** is out of the low range.

**Possible failure modes:**

1. Fault in the wire of the pressure signal of the intake manifold pressure and temperature sensor **B-F48**, poor connection.
2. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken wires. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions.

   A. If damage is found Repair the damage found during the inspection and then check that the error has been corrected.

   B. If no damage is present, continue with step **2**.
2. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 102-3 660003 - Engine Intake Air Pressure Sensor voltage is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the intake manifold temperature and pressure sensor **B-F48** to check for a short circuit to a high voltage source or an open circuit. If the ECU **A-F02** determines the presence of a short circuit to a high voltage source or an interruption in the pressure signal circuit of the intake manifold temperature and pressure sensor **B-F48**, this fault occurs. If this fault occurs, the pressure is set to the last valid value detected following the preliminary fault report and switches to a default value once the fault has been validated.

**Cause:**
The ECU **A-F02** has sensed a voltage greater than expected in the pressure signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**.

**Possible failure modes:**

1. Fault in the pressure signal wire of the intake manifold temperature and pressure sensor **B-F48**, short circuit to a high voltage source or open circuit.
2. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to step **6**.

2. Check the pressure signal circuit of the intake manifold pressure and temperature sensor **B-F48** to check for an interruption.

   Disconnect the engine wiring (EN) from the intake manifold pressure and temperature sensor **B-F48** connector **X-F48**.

   Disconnect the engine harness (EN) from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E pin 96** | **X-F48 (Plug) pin 4** | There should be continuity. |
| **X-F02E pin 38** | **X-F48 (Plug) pin 3** | There should be continuity. |
| **X-F02E pin 95** | **X-F48 (Plug) pin 1** | There should be continuity. |

   A. If continuity is detected, leave connectors **X-F48** and **X-F02E** disconnected and go to **3**.

   B. If there is no continuity, there is an open circuit,Locate and repair the broken conductor.

3. Check the pressure signal circuit of the intake manifold pressure and temperature sensor **B-F48** to check for a short circuit to another circuit.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E pin 96** | All other pins in connector **X-F02E_6** | There should be no continuity. |

A. If there is continuity, there is a short circuit to another circuit in the pressure signal circuit of the intake manifold temperature and pressure sensor **B-F48**. Locate and repair the shorted conductor.

B. If no continuity is detected, leave the connectors disconnected and go to **4**.

4. Check the pressure signal circuit of the intake manifold pressure and temperature sensor **B-F48** to check for a short circuit to voltage.

   With the ignition switch **S-F200** set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E pin 96** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit to a voltage source in the pressure signal circuit of the intake manifold temperature and pressure sensor **B-F48**. Locate and repair the shorted conductors.

   B. In the absence of voltage, go to step **5**.

5. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-9300** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 660004 102-4 - Engine intake air pressure sensor voltage is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the pressure signal circuit of the intake manifold temperature and pressure sensor **B-F48**. If the ECU **A-F02** determines that the voltage in the pressure sensor circuit of the intake manifold temperature and pressure signal **B-F48** is lower than the expected value, this fault occurs. If this fault occurs, the pressure is set to the last valid value detected following the preliminary reporting of the fault and switches to a default value once the fault has been validated.

**Cause:**
The ECU **A-F02** has sensed a voltage lower than expected in the pressure signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**.

**Possible failure modes:**

1. Fault in the wire of the pressure signal of the intake manifold pressure and temperature sensor **B-F48**, short circuit to ground.
2. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **4**.
2. Check the pressure signal circuit of the intake manifold pressure and temperature sensor **B-F48** to check for a short circuit to ground condition.

   Disconnect the engine wiring (EN) from the intake manifold pressure and temperature sensor **B-F48** connector **X-F48**.

   Disconnect the engine wiring (EN) from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to carry out the following continuity checks:

| From | A | Value |
|---|---|---|
| **X-F02E pin 38** | Frame ground | There should be no continuity. |
| **X-F02E pin 96** | Frame ground | There should be no continuity. |

   A. If there is continuity during one of the checks, there is a short circuit to ground or towards another circuit in the pressure signal circuit of the intake manifold temperature and pressure sensor **B-F48**.Locate and repair the damaged or shorted conductors.

   B. If there is no continuity in both checks, go to **3**.
3. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 519694-7 0EEEE7 - DPF differential pressure sensor: error on pipe sensor

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the diesel particulate filter (DPF) delta pressure sensor **B-F34** and evaluates the filter differential pressure and the change in filter volume flow over time. By monitoring the flexible hoses it is possible to detect drops, obstructions, or blockages in the hose connections of the particulate filter pressure sensor system. If the filter differential pressure signal is lower than the minimum value, this fault occurs. With atmospheric pressure constantly present on the pressure connection upstream of the particulate filter, this fault indicates the presence of a hose connection upstream of the particulate filter disconnected or completely blocked.

**Cause:**
Filter differential pressure sensor **B-F34** error on sensor pipes.

**Possible failure modes:**

1. Fault in the DPF delta pressure sensor **B-F34**, fault in the pipes.
2. Fault in the DPF differential pressure sensor **B-F34**, internal fault.
3. Faulty ECU **A-F02**software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check that the pipes for the DPF delta pressure sensor **B-F34** are correctly fitted and are not faulty.

   A. If a fault is detected, locate it and repair.

   B. If there are no faults on the pipes, go to step **4**.
3. Check that the DPF delta pressure sensor is correctly installed **B-F34**.

   A. If the DPF delta pressure sensor **B-F34** is correctly fitted, go to step **6**.

   B. If there is an error in the assembly, correct the error and install the sensor correctly.
4. Restore the offset drift compensation for the differential pressure sensor **B-F34** using the dedicated UDS routine control service (ID $0253).

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, go to step **5**.
5. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, Check that the ECU software **A-F02** is correct and update, if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 0FEEE7 519695-7 - DPF differential pressure sensor: plausibility error in the pipe

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the operation of the diesel particulate filter (DPF) delta pressure sensor **B-F34** and evaluates the filter differential pressure and the change in filter volume flow over time. By monitoring the flexible hoses, it is possible to detect drops, obstructions, or blockages in the hose connections of the particulate filter pressure sensor system. This error is generated when implausible behaviour of the volume flow signal and the pressure of the differential is detected. This means that the change in the differential pressure is lower than the minimum positive value or higher than the minimum negative value. If this condition is present at low temperatures, this fault occurs. With atmospheric pressure constantly present on the pressure connection upstream of the particulate filter, this fault indicates the presence of a hose connection upstream of the particulate filter disconnected or completely blocked.

**Cause:**
Differential pressure sensor of the filter **B-F34** plausibility error in the pipe.

**Possible failure modes:**

1. Faulty delta pressure sensor of the DPF **B-F34**, pipe fault.
2. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check that the delta pressure sensor pipes of the DPF **B-F34** are correctly installed and are not faulty.

   A. If a fault is detected, locate it and repair.

   B. If there are no faults on the pipes, go to step **4**.
3. Check that the delta pressure sensor of the DPF **B-F34** is correctly installed.

   A. If the delta pressure sensor of the DPF **B-F34** is correctly installed, go to step **5**.

   B. If there is an error in the assembly, correct the error and install the sensor correctly.
4. Check the integrity of the DPF delta pressure sensor control circuit **B-F34**. Check for an open circuit.

   Disconnect the connector **X-F34** at the DPF delta pressure sensor **B-F34**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F34 (Plug) pin 1** | **X-F02V (Plug) pin 42** | There should be continuity |
| **X-F34 (Plug) pin 2** | **X-F02V (Plug) pin 15** | There should be continuity |
| **X-F34 (Plug) pin 3** | **X-F02V (Plug) pin 16** | There should be continuity |

   A. If there is no continuity, repair or replace as required.

   B. If continuity is detected, go to step **6**

5. Reset the offset drift compensation for the differential pressure sensor **B-F34** using the dedicated UDS routine control service (ID $0253).

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, go to step **5**.

6. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3251-3 B30C03 - DPF differential pressure sensor: pressure difference too great

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the diesel particulate filter (DPF) delta pressure sensor **B-F34**. The DPF delta pressure sensor **B-F34** is an advanced sensor that uses SENT (Single Edge Nibble Transmission) technology. SENT technology is intended for use in applications where it high-resolution sensor data has to be transmitted from a sensor to an ECU unit. The DPF delta pressure sensor **B-F34** supplies information to the ECU **A-F02** using 2 fast channels and a slow channel. Fast channel 1 contains the value of the differential pressure, fast channel 2 contains known values for the validation of sensor information, while the slow channel contains warning messages and the configuration and manufacturer codes. The DPF delta pressure sensor **B-F34** contains an integrated circuit for specific applications (ASIC) and a digital signal processor (DSP) based on a microprocessor and monitors the presence of internal faults. If the signal circuit of the DPF delta pressure sensor **B-F34** is above the expected value, the DPF differential pressure is blocked to the last valid value during the preliminary fault signalisation or switches to default value if the fault is validated, and this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the signal level of the DPF delta pressure sensor **B-F34** is too high.

**Possible failure modes:**

1. Fault in the signal wire of the DPF delta pressure sensor **B-F34**, short circuit to a high voltage source.
2. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check the signal circuit of the delta pressure sensor of the DPF **B-F34** for a short circuit to another circuit.

   Disconnect the DPF delta pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the phase 5 engine wiring (S5) from the ECU **A-F02** at the connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V pin 15** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit to another circuit of the delta pressure sensor signal of the DPF **B-F34** Locate and repair the shorted connectors.

   B. If no continuity is detected, leave the connectors disconnected and go to **4**.
3. Check the signal circuit of the delta pressure sensor of the DPF **B-F34** for a short circuit to a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 15** | Chassis ground | There should be no voltage. |

A. If there is voltage, there is a short circuit to a voltage source in the signal circuit of the delta pressure sensor of the DPF **B-F34** Locate and repair the damaged connectors.

B. If there is no voltage, go to step **6**.

4. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 B30C04 3251-4 - DPF differential pressure sensor: pressure difference too low

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the diesel particulate filter (DPF) delta pressure sensor **B-F34**. The DPF delta pressure sensor **B-F34** is an advanced sensor that uses SENT (Single Edge Nibble Transmission) technology. SENT technology is intended for use in applications where it high-resolution sensor data has to be transmitted from a sensor to an ECU unit. The DPF delta pressure sensor **B-F34** supplies information to the ECU **A-F02** using 2 fast channels and a slow channel. Fast channel 1 contains the value of the differential pressure, fast channel 2 contains known values for the validation of sensor information, while the slow channel contains warning messages and the configuration and manufacturer codes. The DPF delta pressure sensor **B-F34** contains an integrated circuit for specific applications (ASIC) and a digital signal processor (DSP) based on a microprocessor and monitors the presence of internal faults. If the signal circuit of the DPF delta pressure sensor **B-F34** is below the expected value, the DPF differential pressure is blocked to the last valid value during the preliminary fault signalisation or switches to default value if the fault is validated, and this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the signal level of the DPF delta pressure sensor **B-F34** is too low.

**Possible failure modes:**

1. Fault in the signal wire of the DPF delta pressure sensor **B-F34**, short circuit to a low voltage source (ground).
2. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **5**.

2. Check the signal circuit of the DPF delta pressure sensor **B-F34** to check for a short circuit to ground or towards another circuit.

   Disconnect the DPF delta pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the phase 5 engine wiring (S5) from the ECU **A-F02** at the connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V pin 15** | Frame ground | There should be no continuity. |
| **X-F02V pin 15** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit to ground or towards another circuit in the signal circuit of the DPF delta pressure sensor **B-F34**.Locate and repair the conductor connected to ground or the shorted conductors.

   B. If no continuity is detected, go to step **4**.

3. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 C3150F 5571-15 - Fuel pressure relief valve reached maximum allowed opening count

## Control Module: FPT ECU

**Fault Description:**
A mechanical pressure relief valve (PRV), integrated in the fuel supply rail, opens if excessive pressure is present in the rail. The engine control unit (ECU) **A-F02** detects and counts the sudden pressure drops in the rail due to the opening of the PRV valve. If more openings than the maximum limit are detected, this fault occurs.

**Cause:**
The PRV opening counter inside the ECU **A-F02**, has exceeded the maximum limit.

**Possible failure modes:**

1. Faulty PRV, check tightness and opening pressure.
2. Faulty fuel metering unit **Y-F07**, wiring.
3. Faulty fuel metering unit **Y-F07**, internal failure.

**Solution:**

1. Check the status of the following related faults:

   **44651F 17509-31 4465-1F 1240-31 1239-0 – Fuel pump pressure has exceeded desired pressure limits**

   **6245-31 18651F 520502-0 1865-1F 1442-0 – Fuel Rail Pressure has exceeded maximum limit**

   **5380-5 – Fuel measuring unit: open circuit**

   **1442-2 – Fuel measuring unit: contact lost between the measuring unit and the control unit**

   **519744-18 22651F 2265-1F 8805-31 520500-18 – Fuel rail pressure has exceeded maximum positive deviation limits**

   **520500-16 519744-15 5477-31 1565-1F 15651F – Fuel Rail Pressure has exceeded maximum negative deviation limits**

   A. If either of the faults are active, diagnose them first and then return to this fault.

   B. If neither of the listed faults is active, go to **2**.
2. Replace the PRV.

   Use the diagnostic tool to verify the status of the **17451F 520400-16 5571-16 5957-31 1745-1F – Pressure relief valve reached maximum allowed open time**.

   A. If the fault has been resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 5571-14 C3150E - Fuel pressure relief valve is forced to open, perform pressure increase

## Control Module: FPT ECU

**Fault Description:**
To determine the wear of the mechanical components or to make the system pass into emergency mode, the electronic control unit (ECU) **A-F02**can force the fuel pressure relief valve open. This action consists of two phases, waiting for the pressure in the rail to increase and then performing the pressure peak. If this operation is controlled by the ECU **A-F02**, this fault occurs. This fault, when it occurs, can generate other related faults due to the increase in fuel pressure. In this case, diagnose these codes as required.

# 295467 5571-10 C3150A - Fuel pressure relief valve is forced to open, perform pressure spike

## Control Module: FPT ECU

**Fault Description:**
To determine the wear of the mechanical components or to make the system pass into emergency mode, the electronic control unit (ECU) **A-F02**can force the fuel pressure relief valve open. This action consists of two phases, waiting for the pressure in the rail to increase and then performing the pressure peak. If this operation is controlled by the ECU **A-F02**, this fault occurs. This fault, when it occurs, can generate other related faults due to the increase in fuel pressure. In this case, diagnose these codes as required.

# 295467 5571-11 C3150B - Fuel pressure relief valve is open

## Control Module: FPT ECU

**Fault Description:**
A mechanical pressure relief valve (PRV), integrated in the fuel supply rail, opens if excessive pressure is present in the rail. The Engine Control Unit (ECU) **A-F02** detects and counts the radical pressure drops in the rail. If opening of the valve is detected, this fault occurs.

**Cause:**
The ECU **A-F02** has detected that the PRV is open.

**Possible failure modes:**

1. The ECU **A-F02** has commanded the PRV open by a pressure shock.
2. Faulty PRV, mechanical fault
3. Faulty mechanical component of the injection system, leak
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **5**.
2. Check the operating condition of the mechanical system of the engine injection system.

   Check that there are no leaks in the system or any other conditions which could cause fuel pressure surges.

   A. If a mechanical condition is present which could cause a pressure surge or fuel leak, repair or replace the component as required.

   B. If there is no mechanical condition present which could cause a pressure surge or fuel leak, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 5571-16 C31510 - Pressure relief valve reached maximum allowed open time

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The pressure relief valve (PRV), integrated in the fuel line, opens if excessive pressure is present in the rail. The engine control unit (ECU) **A-F02** detects, counts and records the number and duration of PRV openings. If the ECU **A-F02** determines that the PRV has remained open for too long, this fault occurs.

**Cause:**
The ECU **A-F02** has recorded a PRV opening for too long.

**Possible failure modes:**

1. Faulty fuel injection system, causing the PRV to open for an extended period of time.
2. Faulty low pressure fuel lines, clogged fuel filter, faulty charge gear pump, faulty lift pump (if equipped).
3. Faulty fuel metering unit **Y-F07**, internal failure or wiring.
4. Faulty PRV, mechanical failure.
5. Fault in the rail pressure sensor **B-F09**, implausible value.
6. Faulty ECU **A-F02**, software.

**Solution:**

1. Use the diagnostic tool to check if other faults relating to the fuel system, rail pressure or pressure relief valve are active.

   A. If other faults relating to the fuel system, rail pressure or pressure relief valve are active, diagnose them first and then return to this fault.

   B. If other faults relating to the fuel system, rail pressure or pressure relief valve are not active, go to **2**.
2. Check that there are no leaks, obstructions or damage that could allow air to enter the low pressure side of the fuel system. Visually check and inspect the low pressure side of the supply system to check that there are no leaks, obstructions or damage due to air entry. Inspect the gear pump to verify that the pressure is correct.

   A. If leakage, clogging, air entry, damage or low gear pump pressure is found, repair of replace fittings, filters, lines, etc., as required.

   B. If no leakage, clogging, air entry, damage or low gear pump pressure is found, continue with step **3**.
3. Replace the fuel metering unit **Y-F07**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, go to step **4**.
4. Replace the PRV.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, go to step **5**.

5. Replace the rail pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If fault has not been resolved, Check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 519744-18 40EEF2 - Fuel rail pressure has exceeded maximum positive deviation limits

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the fuel pressure control. Fuel pressure is controlled by the fuel metering unit (FMU) . If the ECU **A-F02** determines that the rail pressure is lower than the expected value for the engine speed based on the threshold value, this indicates that fuel pressure in the rail has exceeded the maximum positive deviation limits and this fault occurs.

**Cause:**
Leaks in the high pressure valve: Injection nozzle blocked in the open position, low efficiency of the high pressure valve, internal leaks in the injectors, leaks in the pressure control valve. Low pressure in the high pressure valve due to clogged filter, leaks in the low pressure pipe, faulty pre-pressure pump, faulty gear pump.

**Possible failure modes:**

1. Fault in the low pressure system, clogging
2. Fault in the fuel filter controlled by the relay **K-F230**.
3. Fault in the pipes
4. Fault in the high pressure valve
5. Fault in the injector seal
6. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check that the low pressure system (and the fuel filter controlled by the relay **K-F230**) are not clogged

   A. If the system is clogged, Bleed the system

   B. If the system is not clogged, Continue to step **3**.
3. Check that the pipes between the pre-supply and the fuel metering unit **Y-F07** do not show any sign of malfunctions

   A. If any malfunctions are present, repair or replace as required.

   B. If no malfunctions are present, Continue to step **3**.
4. Check the supply (this may be low due to clogging of the pipes ate the tank outlet) of the pre-supply pump

   A. If the supply is too low, repair or replace as required.

   B. If the supply is not too low, Continue to step **4**.
5. Check the high pressure system to check for leaks

   A. If the system has leaks, repair or replace as required.

   B. If the system does not have any leaks, Continue to step **5**.
6. Check the correct operation of the high pressure pump

A. If the pump is not working correctly, repair or replace the high pressure pump.

B. If the pump is working correctly, Continue to step **6**.

7. Check none of the injectors are tightened more than normal

   A. If one or more of the injectors are too tight, repair or replace one or more injectors.

   B. If one or more of the injectors are not too tight, send a request to the Technical Help Desk

8. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 1240-31 D8041F - Fuel pump pressure has exceeded desired pressure limits

## Control Module: FPT ECU

**Fault Description:**
The fuel metering unit (FMU) **Y-F07** controls the required fuel flow on the common rail. The unit is regulated via feedback control from the Engine Control Unit (ECU) **A-F02**. If the ECU **A-F02** determines that the required fuel pressure cannot be obtained, this indicates the probable presence of a leak and this fault occurs.

**Cause:**
Fuel pressure is unable to reach the desired pressure.

**Possible failure modes:**

1. Operating in higher than normal ambient pressure conditions.
2. Faulty fuel injectors, excessive return leakage or stuck open.
3. Fault in the fuel filter, clogged.
4. Faulty low pressure fuel system, leakage or blockage.
5. Faulty charge gear pump, low efficiency.
6. Rail pressure sensor (RPS) **B-F09**, internal fault or fault in the wiring.
7. Fault in the FMU **Y-F07**, internal fault or in the wiring.
8. Faulty high pressure pump, feeding efficiency low.
9. Faulty ECU **A-F02**, software.

**Solution:**

1. Use the diagnostic instrument to check for the following related faults that may have caused this fault to occur. If any of the listed faults are active, diagnose them first and then return to the current fault.

   **5447-3 – Fuel measuring unit: short circuit to battery on low level**

   **5380-4 – Fuel measuring unit: short circuit to ground on high level**

   **5380-5 – Fuel measuring unit: open circuit**

   **1442-2 – Fuel measuring unit: contact lost between the measuring unit and the control unit**

   **14251F 5157-31 1425-1F 157-11 157-3 – Fuel rail pressure sensor voltage is higher than expected**

   **1240-14 3C65-1F 157-2 15461-31 3C651F – Setpoint of metering unit in idle mode not plausible**

   **1240-11 3B651F 157-16 15205-31 3B65-1F – setpoint of metering unit in overrun mode not plausible**

   **520500-16 519744-15 5477-31 1565-1F 15651F – Fuel Rail Pressure has exceeded maximum negative deviation limits**

   **519744-18 22651F 2265-1F 8805-31 520500-18 – Fuel rail pressure has exceeded maximum positive deviation limits**

# 295467 40EEEF 519744-15 - Fuel Rail Pressure has exceeded maximum negative deviation limits

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the fuel pressure control. Fuel pressure is controlled by the fuel metering unit **Y-F07**. If the ECU **A-F02** determines that the actual fuel pressure has exceeded the required pressure with the fuel metering unit fully closed compared to a curve which is based on the engine speed, this fault occurs.

**Cause:**
Fuel metering unit **Y-F07** is stuck in the open position, throttle solenoid valve clogged, fuel metering unit without power due to electrical problem. High pressure after throttle solenoid valve (backflow pump pressure too high)

**Possible failure modes:**

1. Faulty fuel metering unit **Y-F07**, internal failure.
2. Faulty fuel metering unit **Y-F07**, wiring.
3. Fault in the throttle valve, internal fault.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Determine the position of the open circuit condition in the fuel metering unit **Y-F07**.

   Disconnect the connector **X-F3YY_1** of the throttle valve wiring.

   Disconnect the connector of the wiring **X-F07** of the fuel metering unit **Y-F07**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F07 (Plug) pin 1** | **X-F3YY_1 (Plug) pin 1** | There should be continuity |
| **X-F07 (Plug) pin 2** | **X-F3YY_1 (Plug) pin 2** | There should be continuity |

   A. If continuity is detected, leave connectors **X-F07** and **X-F3YY_1** disconnected and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the position of the open circuit condition of the throttle solenoid valve.

   Disconnect the connectors **X-F3YY_1** and **X-F3YY** of the throttle valve solenoid valve wiring.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F3YY_1 (Plug) pin 1** | **X-F3YY (Plug) pin 1** | There should be continuity |
| **X-F3YY_1 (Plug) pin 2** | **X-F3YY (Plug) pin 2** | There should be continuity |

   A. If continuity is detected, leave the connector **X-F3YY** disconnected and go to **4**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.

4. Determine the position of the open circuit condition of the throttle solenoid valve.

   Disconnect the connectors **X-F3YY_1** and **X-F3YY** of the throttle valve solenoid valve wiring.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F3YY (Plug) pin 1** | **X-F02E (Plug) pin 7** | There should be continuity |
| **X-F3YY (Plug) pin 2** | **X-F02E (Plug) pin 6** | There should be continuity |

   A. If continuity is detected, continue to step **5**.

   B. If there is no continuity, there is an open circuit, Locate and repair the broken conductor.

5. Check the low pressure system to check for leaks.

   A. If the system has leaks, repair or replace as required.

   B. If the system does not have any leaks, Continue to step **6**.

6. Check operation of the throttle solenoid valve.

   A. If it is not working correctly, repair or replace as required.

   B. If it is working correctly, send a request to the Technical Help Desk.

7. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 41EEF1 519745-17 - Fuel Rail Pressure has exceeded minimum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the fuel pressure control. Fuel pressure is controlled by the fuel metering unit (FMU) . If the ECU **A-F02** determines that the rail pressure is lower than the expected value for the engine speed based on the minimum threshold value, this indicates that fuel pressure in the rail has exceeded the maximum positive deviation limits and this fault occurs.

**Cause:**
Leaks in the high pressure valve: Injection nozzle blocked in the open position, low efficiency of the high pressure valve, internal leaks in the injectors, leaks in the pressure control valve. Low pressure in the high pressure valve due to clogged filter, leaks in the low pressure pipe, faulty pre-pressure pump, faulty gear pump.

**Possible failure modes:**

1. Fault in the low pressure system, clogging
2. Fault in the fuel filter controlled by the relay **K-F230**.
3. Fault in the pipes
4. Fault in the high pressure valve
5. Fault in the injector seal
6. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check that the low pressure system (and the fuel filter controlled by the relay **K-F230**) are not clogged

   A. If the system is clogged, Bleed the system

   B. If the system is not clogged, Continue to step **3**.
3. Check that the pipes between the pre-supply and the fuel metering unit **Y-F07** do not show any sign of malfunctions

   A. If any malfunctions are present, repair or replace as required.

   B. If no malfunctions are present, Continue to step **3**.
4. Check the supply (this may be low due to clogging of the pipes ate the tank outlet) of the pre-supply pump

   A. If the supply is too low, repair or replace as required.

   B. If the supply is not too low, Continue to step **4**.
5. Check the high pressure system to check for leaks

   A. If the system has leaks, repair or replace as required.

   B. If the system does not have any leaks, Continue to step **5**.
6. Check the correct operation of the high pressure pump

A. If the pump is not working correctly, repair or replace the high pressure pump.

B. If the pump is working correctly, Continue to step **6**.

7. Check none of the injectors are tightened more than normal

   A. If one or more of the injectors are too tight, repair or replace one or more injectors.

   B. If one or more of the injectors are not too tight, send a request to the Technical Help Desk

8. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 A20500 1442-0 - Fuel Rail Pressure has exceeded maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the fuel pressure control. Fuel pressure is controlled by the fuel metering unit (FMU) . If the ECU **A-F02** determines that the rail pressure is lower than the expected value for the engine speed based on the maximum threshold value, this indicates that fuel pressure in the rail has exceeded the maximum positive deviation limits and this fault occurs.

**Cause:**
Leaks in the high pressure valve: Injection nozzle blocked in the open position, low efficiency of the high pressure valve, internal leaks in the injectors, leaks in the pressure control valve. Low pressure in the high pressure valve due to clogged filter, leaks in the low pressure pipe, faulty pre-pressure pump, faulty gear pump.

**Possible failure modes:**

1. Fault in the low pressure system, clogging
2. Fault in the fuel filter controlled by the relay **K-F230**.
3. Fault in the pipes
4. Fault in the high pressure valve
5. Fault in the injector seal
6. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check that the low pressure system (and the fuel filter controlled by the relay **K-F230**) are not clogged

   A. If the system is clogged, Bleed the system

   B. If the system is not clogged, Continue to step **3**.
3. Check that the pipes between the pre-supply and the fuel metering unit **Y-F07** do not show any sign of malfunctions

   A. If any malfunctions are present, repair or replace as required.

   B. If no malfunctions are present, Continue to step **3**.
4. Check the supply (this may be low due to clogging of the pipes ate the tank outlet) of the pre-supply pump

   A. If the supply is too low, repair or replace as required.

   B. If the supply is not too low, Continue to step **4**.
5. Check the high pressure system to check for leaks

   A. If the system has leaks, repair or replace as required.

   B. If the system does not have any leaks, Continue to step **5**.
6. Check the correct operation of the high pressure pump

A. If the pump is not working correctly, repair or replace the high pressure pump.

B. If the pump is working correctly, Continue to step **6**.

7. Check none of the injectors are tightened more than normal

   A. If one or more of the injectors are too tight, repair or replace one or more injectors.

   B. If one or more of the injectors are not too tight, send a request to the Technical Help Desk

8. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 D8040B 1240-11 - setpoint of metering unit in overrun mode not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the fuel delivery through the fuel metering unit (FMU) **Y-F07**. The FMU **Y-F07** monitors the presence of any high pressure leakage in overspeed conditions. If the high pressure fuel delivery exceeds the maximum threshold during overspeed and it is not possible to reach the desired fuel pressure, it is assumed that there are leakages from the system and this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the desired fuel rail pressure is lower than expected in overspeed.

**Possible failure modes:**

1. Faulty fuel injectors, internal leakage or stuck open.
2. Faulty pressure relief valve leaking.
3. Internal fault of faulty wiring of the FMU **Y-F07**.
4. Faulty high pressure pump.
5. Fault in the fuel filter, clogged.
6. Faulty low pressure fuel pipes, leaking (air entrance)
7. Fault in the low-pressure gear pump.
8. Faulty electric intake pump (if applicable)
9. Faulty ECU **A-F02**, software.

# 295467 D8040E 1240-14 - Setpoint of metering unit in idle mode not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the fuel delivery through the fuel metering unit (FMU) **Y-F07**. If the ECU **A-F02** determines that it is impossible to reach the correct fuel pressure at engine idle speed, it is assumed that the system is leaking and this fault occurs.

**Cause:**
The Engine Control Unit (ECU) **A-F02** has determined that the controlled fuel rail pressure is less than the expected value with engine speed at idle.

**Possible failure modes:**

1. Faulty fuel injectors, internal leakage or stuck open.
2. Faulty pressure relief valve leaking.
3. Faulty FMU **Y-F07**.
4. Faulty high pressure pump.
5. Fault in the fuel filter, clogged.
6. Faulty low pressure fuel lines, leaking (air entrance).
7. Fault in the low-pressure gear pump.
8. Faulty electric lift pump (if applicable).
9. Faulty ECU **A-F02**, software.

# 295467 3CEFE1 519996-1 - Fuel pressure check: pressure on the rail insufficient, fuel injection inhibited

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors fuel injection. This occurs when the minimum value of the rail pressure sensor **B-F09** is reached. If the rail pressure sensor is below the threshold value, injection is inhibited and this fault occurs.

**Cause:**
Rail pressure sensor **B-F09** too low to allow the engine to start

**Possible failure modes:**

1. Fault in the rail pressure sensor **B-F09**.
2. Tank empty.
3. Fuel filter obstructed.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check that the issue is not due to low pressure in the rail.

   A. If a fault is presentrepair or replace as required.

   B. If the tank is not empty, Continue to step **2**.
3. Check that the fuel tank is not empty.

   A. If the tank is empty, fill it to more than **130.00 bar**.

   B. If the tank is not empty, Continue to step **3**.
4. Check that the fuel filter is not blocked.

   A. If the fuel filter is blocked, repair or replace as required.

   B. If the fuel filter is not blocked, Continue to step **3**.
5. Check that the pump is not broken and that there are no leaks.

   A. If there is a fault in the pump repair or replace as required.

   B. If there is no fault in the pump Continue to step **4**.
6. Check the high pressure system to check for leaks

   A. If the system has leaks, repair or replace as required.

   B. If the system does not have any leaks, send a request to the Technical Help Desk
7. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 18-14 12000E - Fuel pressure check: maximum rail pressure in limp home mode

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the pressure of the fuel supply rail in limp home mode with the Pressure Control Valve (PCV).

**Cause:**
The Pressure Control Valve (PCV) is blocked in the closed position, the backflow system from the PCV is clogged, overcurrent on the PCV due to wiring problems, fuel metering unit **Y-F07** blocked in the full feeding position, no power to the fuel metering unit

**Possible failure modes:**

1. Faulty fuel metering unit **Y-F07**, internal failure.
2. Faulty fuel metering unit **Y-F07**, wiring.
3. Faulty Pressure control valve (PCV), internal failure.
4. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. Go to step **7**.
2. Determine the position of the open circuit condition in the fuel metering unit **Y-F07**.

   Disconnect the connector **X-F3YY_1** of the throttle valve wiring.

   Disconnect the connector of the wiring **X-F07** of the fuel metering unit **Y-F07**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F07 (Plug) pin 1** | **X-F3YY_1 (Plug) pin 1** | There should be continuity |
| **X-F07 (Plug) pin 2** | **X-F3YY_1 (Plug) pin 2** | There should be continuity |

   A. If continuity is detected, leave both connectors disconnected **X-F07** and **X-F3YY_1** and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the position of the short circuit to battery condition in the fuel metering unit **Y-F07**.

   Disconnect the connector of the wiring **X-F07** of the fuel metering unit **Y-F07**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F07 (Plug) pin 2** | Battery positive | There should be no continuity |

   A. If no continuity is detected, leave the connector **X-F07** disconnected and go to step **3**.

   B. If there is no continuity, this indicates a short circuit.Locate and repair the broken conductor.
4. Determine the position of the short circuit to ground condition in the fuel metering unit **Y-F07**.

Disconnect the connector of the wiring **X-F07** of the fuel metering unit **Y-F07**.

Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F07 (Plug) pin 1** | Chassis ground | There should be no continuity |

A. If no continuity is detected, continue to step **4**.

B. If there is no continuity, this indicates a short circuit.Locate and repair the broken conductor.

5. Check for clogging in the return pipe from the Pressure Control Valve (PCV) to the tank.

   A. If there are faults in the system, repair or replace as required.

   B. If there are no faults in the system, Go to step **5**.

6. Check the correct operation of the Pressure Control Valve (PCV).

   A. If faults are detected, repair or replace as required.

   B. If no faults are detected, send a request to the Technical Help Desk.

7. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is detected and normal values are shown on the display, delete the fault code.

# 295467 157-2 9D0002 - Rail pressure raw value is intermittent

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the fuel pressure sensor in the **B-F09** to check for any intermittent operation connections. If the ECU **A-F02** detects more than one pressure jumps, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an intermittent connection in the circuit of the rail fuel pressure sensor **B-F09**.

**Possible failure modes:**

1. Faulty rail pressure sensor **B-F09**, internal fault.
2. Faulty rail fuel pressure sensor **B-F09**, wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active,continue to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **7**.
2. Check the circuit of the rail fuel pressure sensor **B-F09** for an intermittent open circuit.

   Disconnect the wiring from the rail fuel pressure sensor **B-F09** at connector **X-F09**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | **X-F02E pin 63** | There should be continuity. |
| **X-F09 (Plug) pin 2** | **X-F02E pin 62** | There should be continuity. |
| **X-F09 (Plug) pin 3** | **X-F02E pin 42** | There should be continuity. |

   A. If continuity is detected, Locate and repair the damaged conductor.

   B. If there is no continuity, leave the connectors disconnected and go to **3**.
3. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to ground.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 2** | Chassis ground | There should be no continuity. |
| **X-F09 (Plug) pin 3** | Chassis ground | There should be no continuity. |

   A. If there is no continuity, continue to step **4**.

   B. If continuity is detected, Locate and repair the shorted conductor.
4. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to battery.

Set the ignition switch to OFF.

Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | Battery positive | There should be no continuity. |
| **X-F09 (Plug) pin 2** | Battery positive | There should be no continuity. |

A. If there is no continuity, continue to step **6**.

B. If continuity is detected, Locate and repair the shorted conductor.

5. Replace the rail fuel pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 157-20 9D0014 - Rail pressure raw value is above maximum offset

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the offset deviation of the engine mount after a specified waiting time for the fuel pressure sensor in the rail **B-F09**. This allows the rail pressure to be lowered to ambient pressure.

**Cause:**
Inaccurate rail fuel pressure signal **B-F09**.

**Possible failure modes:**

1. Faulty rail pressure sensor **B-F09**, internal fault.
2. Faulty rail fuel pressure sensor **B-F09**, wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active,continue to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **7**.
2. Check the circuit of the rail fuel pressure sensor **B-F09** for an intermittent open circuit.

   Disconnect the wiring from the rail fuel pressure sensor **B-F09** at connector **X-F09**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | **X-F02E pin 63** | There should be continuity. |
| **X-F09 (Plug) pin 2** | **X-F02E pin 62** | There should be continuity. |
| **X-F09 (Plug) pin 3** | **X-F02E pin 42** | There should be continuity. |

   A. If continuity is detected, Locate and repair the damaged conductor.

   B. If there is no continuity, leave the connectors disconnected and go to **3**.
3. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to ground.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 2** | Chassis ground | There should be no continuity. |
| **X-F09 (Plug) pin 3** | Chassis ground | There should be no continuity. |

   A. If there is no continuity, continue to step **4**.

   B. If continuity is detected, Locate and repair the shorted conductor.

4. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to battery.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | Battery positive | There should be no continuity. |
| **X-F09 (Plug) pin 2** | Battery positive | There should be no continuity. |

   A. If there is no continuity, continue to step **6**.

   B. If continuity is detected, Locate and repair the shorted conductor.

5. Replace the rail fuel pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 157-21 9D0015 - Rail pressure raw value is below minimum offset

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the offset deviation of the engine mount after a specified waiting time for the fuel pressure sensor in the rail **B-F09**. This allows the rail pressure to be lowered to ambient pressure.

**Cause:**
Inaccurate rail fuel pressure signal **B-F09**.

**Possible failure modes:**

1. Faulty rail pressure sensor **B-F09**, internal fault.
2. Faulty rail fuel pressure sensor **B-F09**, wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active,continue to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **7**.
2. Check the circuit of the rail fuel pressure sensor **B-F09** for an intermittent open circuit.

   Disconnect the wiring from the rail fuel pressure sensor **B-F09** at connector **X-F09**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | **X-F02E pin 63** | There should be continuity. |
| **X-F09 (Plug) pin 2** | **X-F02E pin 62** | There should be continuity. |
| **X-F09 (Plug) pin 3** | **X-F02E pin 42** | There should be continuity. |

   A. If continuity is detected, Locate and repair the damaged conductor.

   B. If there is no continuity, leave the connectors disconnected and go to **3**.
3. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to ground.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 2** | Chassis ground | There should be no continuity. |
| **X-F09 (Plug) pin 3** | Chassis ground | There should be no continuity. |

   A. If there is no continuity, continue to step **4**.

   B. If continuity is detected, Locate and repair the shorted conductor.

4. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to battery.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | Battery positive | There should be no continuity. |
| **X-F09 (Plug) pin 2** | Battery positive | There should be no continuity. |

   A. If there is no continuity, continue to step **6**.

   B. If continuity is detected, Locate and repair the shorted conductor.

5. Replace the rail fuel pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 157-11 9D000B - Fuel rail pressure sensor voltage is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the rail pressure sensor **B-F09**.

**Cause:**
Short circuit to battery in the rail pressure sensor **B-F09**, faulty

**Possible failure modes:**

1. Faulty rail pressure sensor **B-F09**, internal fault.
2. Faulty rail fuel pressure sensor **B-F09**, wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active,continue to step **4**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **7**.
2. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to battery.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | Battery positive | There should be no continuity. |
| **X-F09 (Plug) pin 2** | Battery positive | There should be no continuity. |

   A. If there is no continuity, continue to step **6**.

   B. If continuity is detected, Locate and repair the shorted conductor.
3. Replace the rail fuel pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 157-4 9D0004 - Fuel rail pressure sensor voltage is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the rail pressure sensor **B-F09**.

**Cause:**
Short circuit to ground in the rail pressure sensor **B-F09**, faulty

**Possible failure modes:**

1. Faulty rail pressure sensor **B-F09**, internal fault.
2. Faulty rail fuel pressure sensor **B-F09**, wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active,continue to step **4**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **7**.
2. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to ground.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 2** | Chassis ground | There should be no continuity. |
| **X-F09 (Plug) pin 3** | Chassis ground | There should be no continuity. |

   A. If there is no continuity, continue to step **6**.

   B. If continuity is detected, Locate and repair the shorted conductor.
3. Replace the rail fuel pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 98000D 152-13 - An external device has activated an ECU reset during normal driving

## Control Module: FPT ECU

**Fault Description:**
The KeepAlive process of the engine control unit (ECU) **A-F02** queries the external devices searching for problems (e.g. memory errors, incorrect initialization status, unexpected reboots of the external device). If a control device reports an error, KeepAlive starts a reset of the ECU **A-F02**. The drivers of the external device can report errors during the initialization (INI) or during the operational phases of the ECU of the normal operating time (DRV). When the control device reports an error and KeepAlive starts a reset of the ECU **A-F02**, this fault occurs and a replacement of the ECU **A-F02** is requested.

# 295467 152-11 98000B - An external device has activated an ECU reset during normal Control unit initialisation

## Control Module: FPT ECU

**Fault Description:**
The KeepAlive process of the engine control unit (ECU) **A-F02** queries the external devices searching for problems (e.g. memory errors, incorrect initialization status, unexpected reboots of the external device). If a control device reports an error, KeepAlive starts a reset of the ECU **A-F02**. The drivers of the external device can report errors during the initialization (INI) or during the operational phases of the ECU **A-F02** of the normal operating time (DRV). When the control device reports an error and KeepAlive starts a reset of the ECU **A-F02**, this fault occurs and a replacement of the ECU **A-F02** is requested.

# 295467 628-13 74020D - ECU internal: reading access to the memory not successful

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the internal processes searching for error reports while trying to read or write on non-volatile memory. When it is no longer possible to read correctly a memory block, this fault occurs and the ECU **A-F02** needs to be replaced.

# 295467 628-12 74020C - ECU internal: writing access to the memory not successful

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the internal processes searching for error reports when trying to read or write on non-volatile memory. When it is no longer possible to write a memory block, this fault occurs and the ECU **A-F02** needs to be replaced.

# 295467 CD051F 1485-31 - Main relay blocked

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** controls the main relay and determines the effective status and carries out main relay diagnostics. If the ECU detects that the main relay is locked, this fault occurs.

**Cause:**
The ECU **A-F02** has detected that the main relay is locked.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue with the normal operation.

2. Visually check the relative connector to check that there are no damaged, bent, or displaced pins, or corroded terminals.

   A. If there are damages, repair the damage found during the inspectionthen verify that the fault has been resolved.

   B. If no damage is present check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 518166-14 16E8EE - Control unit internal error: error of stack memory threshold exceeded

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** contains several electronic components designed to support the performance of the main processors. One of the support functions involves grouping the data to be processed. If this functional group reports an overload of the stack memory threshold, this fault occurs. As this fault is caused by an internal fault, the ECU **A-F02** must be replaced.

# 295467 518201-11 39E8EB - Control unit internal error: erratic shutdown detected

## Control Module: FPT ECU

**Fault Description:**
The system of the engine control unit (ECU) **A-F02** supplies the execution command as the calculation of the "ECU deactivation time". The "incorrect activation counter" is a function of a control counter whose task is to check if the ECU **A-F02** has always been operating from when the ECU **A-F02** has been activated to when it has been deactivated. If the ECU **A-F02** has been incorrectly switched off before completing the shut down procedure (due to power failure, power supply reset, or software reset with the key switch signal set to OFF), the counter is not reset. This causes the subsequent initialization (switching on activation) after reading the counter in order to detect the missed reset and the signalisation of this error.

**Cause:**
The ECU **A-F02** has been switched off while the engine is running.

**Solution:**

1. Check for related faults.

   Use the diagnostic instrument to determine the presence of faults in the battery power supply.

   A. If there are no other faults present, resolve the corresponding fault. Then determine if the fault **518201-11 – Control unit internal error: erratic shutdown detected** has been resolved.

   B. If no faults are detected and this fault is still present, continue with step **2**.
2. End the operations underway and restart the machine.

   Check the ECU **A-F02** for the appropriate software and re-flash if necessary.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 3509-12 B50D0C - ECU internal: Error sensor supplies 1

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5. 0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage of sensor 1 is not within the set range, this fault occurs.

**Cause:**
The ECU sensor supply 1 reference voltage is out of range.

**Possible failure modes:**

1. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
2. Fault in the intake air temperature sensor **B-F65**.
3. Faulty SCR pump module , internal fault or faulty wiring.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **10**.

2. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the DPF differential pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F34 pin 1** | Chassis ground | There should be no continuity. |
| **X-F34 pin 2** | Chassis ground | There should be no continuity. |

   A. If there is continuity, a short circuit to ground is present condition in the wiring.Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **3**.

3. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F34 pin 1** | Chassis ground | There should be no voltage. |
| **X-F34 pin 3** | Chassis ground | There should be no voltage. |

A. If voltage is detected, this indicates a fault in the wiring.Locate and repair the shorted conductor.

B. If there is no voltage, go to step **4**.

4. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 1** | Chassis ground | There should be no continuity. |

   A. If there is continuity, a short circuit to ground is present. Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **5**.

5. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 2** | Chassis ground | There should be no voltage. |

   A. If voltage is detected, this indicates a fault in the wiring.Locate and repair the shorted conductor.

   B. If there is no voltage, go to **6**.

6. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the SCR pump module.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to check the continuity.

   A. If there is continuity, a short circuit to ground is present condition in the wiring.Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **7**.

7. Check the power supply circuit 1 for a short circuit towards a voltage source in the SCR module.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage.

   A. If voltage is detected, this indicates a fault in the wiring. Locate and repair the shorted conductor.

   B. In the absence of voltage, go to **8**.

8. Check the correct operation of the SCR pump module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, go to **9**.

9. Replace pump module.

Use the operator display or the diagnostic tool to check that the fault has been resolved.

A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3509-6 B50D06 - ECU internal: overtemperature in the power supply of sensor 1

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock 'inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5. 0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the ECU **A-F02** detects an overtemperature in the ECU sensor supply reference voltage 1 circuit, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an overtemperature in the supply reference voltage circuit 1 of the ECU sensor.

**Possible failure modes:**

1. Internal fault or faulty wiring of the DPF differential pressure sensor **B-F34**.
2. Internal fault or fault in the wiring of the intake air temperature sensor **B-F65**
3. Faulty SCR pump module , internal fault or faulty wiring.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **10**.
2. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the DPF differential pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F34 pin 1** | Chassis ground | There should be no continuity. |
| **X-F34 pin 2** | Chassis ground | There should be no continuity. |

   A. If there is continuity, a short circuit to ground is present condition in the wiring.Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **3**.
3. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F34 pin 1** | Chassis ground | There should be no voltage. |
| **X-F34 pin 3** | Chassis ground | There should be no voltage. |

A. If voltage is detected, this indicates a fault in the wiring.Locate and repair the shorted conductor.

B. If there is no voltage, go to step **4**.

4. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 1** | Chassis ground | There should be no continuity. |

   A. If there is continuity, a short circuit to ground is present. Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **5**.

5. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 2** | Chassis ground | There should be no voltage. |

   A. If voltage is detected, this indicates a fault in the wiring.Locate and repair the shorted conductor.

   B. If there is no voltage, go to **6**.

6. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the SCR pump module.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to check the continuity.

   A. If there is continuity, a short circuit to ground is present condition in the wiring.Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **7**.

7. Check the power supply circuit 1 for a short circuit towards a voltage source in the SCR module.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage.

   A. If voltage is detected, this indicates a fault in the wiring. Locate and repair the shorted conductor.

   B. In the absence of voltage, go to **8**.

8. Check the correct operation of the SCR pump module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

B. The module is not working correctly, go to **9**.

9. Replace pump module.

   Use the operator display or the diagnostic tool to check that the fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 B50D03 3509-3 - ECU internal: voltage too high in the power supply of sensor 1

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the ECU hardware and cannot be calibrated. If the power supply reference voltage 1 of the sensor exceeds the set threshold, this fault occurs.

**Cause:**
The ECU sensor 1 supply reference voltage exceeds the set range.

**Possible failure modes:**

1. Internal fault or faulty wiring of the DPF differential pressure sensor **B-F34**.
2. Internal fault or fault in the wiring of the intake air temperature sensor **B-F65**.
3. Faulty SCR pump module , internal fault or faulty wiring.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **12**.
2. Disconnect the wiring from the DPF differential pressure sensor **B-F34** at connector **X-F34**.

   Use the diagnostic tool to monitor the status of the **3509-3 – ECU internal: voltage too high in the power supply of sensor 1**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **3**.
3. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F34 (Plug) pin 1** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If the voltage reading is not correct, go to **4**

   B. If the voltage reading is correct, go to **5**
4. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 42** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage is high, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring.Locate and repair the shorted conductor.

5. Disconnect the wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

Use the diagnostic tool to monitor the status of the **3509-3 – ECU internal: voltage too high in the power supply of sensor 1**.

A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **6**.

6. Check the power supply circuit 1 for a short circuit towards a voltage source.

Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 1** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage reading is not correct, go to **7**.

B. If the voltage reading is correct, go to **8**.

7. Check the power supply circuit 1 for a short circuit towards a voltage source.

Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 76** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage is high, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring Locate and repair the shorted conductor.

8. Disconnect the wiring from the SCR pump module.

Use the diagnostic tool to monitor the status of the **3509-3 – ECU internal: voltage too high in the power supply of sensor 1**.

A. If this fault is eliminated after disconnecting a connector, the module has an internal fault. Replace the SCR pump module .

B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **9**.

9. Check the power supply circuit 1 for a short circuit towards a voltage source between the SCR pump and the vehicle side control unit.

Set the ignition switch to ON.

Use a multimeter to check the voltage.

A. If the voltage is high, go to **8**.

B. If the voltage reading is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

10. Check the correct operation of the SCR pump module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

    A. The module is working correctly, contact the Technical Help Desk.

    B. The module is not working correctly, go to **9**.

11. Replace pump module.

    Use the operator display or the diagnostic tool to check that the fault has been resolved.

    A. If the fault has been resolved, return the machine to service.

    B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

12. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3509-5 B50D05 - ECU internal: short circuit in the power supply of sensor 1

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage 1 is below the set range, this fault occurs.

**Cause:**
The ECU sensor supply reference voltage 1 is below the set range.

**Possible failure modes:**

1. Internal fault or faulty wiring of the DPF differential pressure sensor **B-F34**.
2. Internal fault or fault in the wiring of the intake air temperature sensor **B-F65**.
3. Faulty SCR pump module **M-F42**, internal fault or faulty wiring.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **12**.
2. Disconnect the wiring from the DPF differential pressure sensor **B-F34** at connector **X-F34**.

   Use the diagnostic tool to monitor the status of the **3509-5 – ECU internal: short circuit in the power supply of sensor 1**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **3**.
3. Check the supply circuit 1 for an interruption.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F34 (Plug) pin 1** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If there is no voltage or if the voltage is too low, go to **4**

   B. If the voltage reading is correct, go to **5**
4. Check the supply circuit 1 for an interruption.

   Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 42** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If there is no voltage or if the voltage is too low, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring.Locate and repair the shorted conductor.

5. Disconnect the wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

Use the diagnostic tool to monitor the status of the **3509-5 – ECU internal: short circuit in the power supply of sensor 1**.

A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **6**.

6. Check the supply circuit 1 for an interruption.

Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 1** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If there is no voltage or if the voltage is too low, go to **7**.

B. If the voltage reading is correct, go to **8**.

7. Check the supply circuit 1 for an interruption.

Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 76** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If there is no voltage or if the voltage is too low, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring.Locate and repair the shorted conductor.

8. Disconnect the wiring from the SCR pump module.

Use the diagnostic tool to monitor the status of the **3509-5 – ECU internal: short circuit in the power supply of sensor 1**.

A. If this fault is eliminated after disconnecting a connector, the module has an internal fault. Replace the SCR pump module **M-F42**.

B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **9**.

9. Check the power supply circuit 1 for an interruption between the pump module and the vehicle side control unit.

Set the ignition switch to ON.

Use a multimeter to check the voltage.

A. If there is no voltage or if the voltage is too low, go to **7**.

B. If the voltage reading is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

10. Check the correct operation of the SCR pump module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

    A. The module is working correctly, contact the Technical Help Desk.

    B. The module is not working correctly, go to **9**.

11. Replace pump module.

    Use the operator display or the diagnostic tool to check that the fault has been resolved.

    A. If the fault has been resolved, return the machine to service.

    B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

12. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 B60D0C 3510-12 - ECU internal: voltage too low in the power supply of sensor 1

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** power supplies to the sensors. These voltages are monitored by the hardware of the ECU to make sure that they are between a defined range. This range is defined by the hardware of the ECU and cannot be calibrated. If the sensor 2 power supply reference voltage is not within the expected range, this fault occurs.

**Cause:**
The ECU sensor supply 2 reference voltage is out of range.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue with the normal operation.

2. Visually check the relative connector to check that there are no damaged, bent, or displaced pins, or corroded terminals.

   A. If there are damages, repair the damage found during the inspectionthen verify that the fault has been resolved.

   B. If no damage is present check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 B60D06 3510-6 - ECU internal: overtemperature in the power supply of sensor 2

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the ECU hardware and cannot be calibrated. If the ECU **A-F02** detects an overtemperature in the power supply reference voltage circuit 2 of the ECU sensor, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an overtemperature in the power supply reference voltage circuit 2 of the ECU sensor.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue with the normal operation.

2. Visually check the relative connector to check that there are no damaged, bent, or displaced pins, or corroded terminals.

   A. If there are damages, repair the damage found during the inspectionthen verify that the fault has been resolved.

   B. If no damage is present check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 B60D03 3510-3 - ECU internal: voltage too high in the power supply of sensor 2

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is set by the ECU hardware and cannot be calibrated. If the sensor power supply reference voltage 2 is above the expected threshold, this fault occurs.

**Cause:**
The ECU **A-F02** sensor supply 2 reference voltage is above the expected range.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue with the normal operation.
2. Visually check the relative connector to check that there are no damaged, bent, or displaced pins, or corroded terminals.

   A. If there are damages, repair the damage found during the inspectionthen verify that the fault has been resolved.

   B. If no damage is present check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 3510-5 B60D05 - ECU internal: voltage too low in the power supply of sensor 2

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the ECU hardware and cannot be calibrated. If the power supply reference voltage 2 of the sensor is below the set threshold, this fault occurs.

**Cause:**
The ECU sensor 2 supply reference voltage is below the set range.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue with the normal operation.
2. Visually check the relative connector to check that there are no damaged, bent, or displaced pins, or corroded terminals.

   A. If there are damages, repair the damage found during the inspectionthen verify that the fault has been resolved.

   B. If no damage is present check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 3511-12 B70D0C - ECU internal: Error sensor supplies 3

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage of sensor 3 is not within the set range, this fault occurs.

**Cause:**
The ECU sensor supply 3 reference voltage is out of range.

**Possible failure modes:**

1. Fault inside the oil pressure and temperature sensor .
2. Fault inside the intake manifold temperature and pressure sensor **B-F48**.
3. Internal fault or faulty wiring of the rail pressure sensor **B-F09**.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.go to **8**.
2. Disconnect the wiring from the oil temperature and pressure sensor.

   Use the diagnostic instrument to monitor the status of the **3511-12 E42D1F E42D-1F 3511-2 58413-31 – ECU internal: Error sensor supplies 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **3**.
3. Check the power supply 3 circuit for a short circuit.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage.

   A. If the voltage reading is not correct, go to **4**

   B. If the voltage reading is correct, Go to **6**
4. Disconnect the wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Use the diagnostic instrument to monitor the status of the **3511-12 E42D1F E42D-1F 3511-2 58413-31 – ECU internal: Error sensor supplies 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **6**.
5. Check the power supply 3 circuit for a short circuit.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F48 (Plug) pin 3** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage reading is not correct, go to **7**

B. If the voltage reading is correct, go to **8**

6. Check the power supply 3 circuit for a short circuit.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 38** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage reading is not correct, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring.Locate and repair the shorted conductor.

7. Disconnect the wiring from the rail pressure sensor **B-F09**, connector **X-F09**.

Use the diagnostic instrument to monitor the status of the **3511-12 E42D1F E42D-1F 3511-2 58413-31 – ECU internal: Error sensor supplies 3**.

A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **9**.

8. Check the power supply 3 circuit for a short circuit.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 3** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage reading is not correct, go to **9**

B. If the voltage reading is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Check the power supply 3 circuit for a short circuit.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 42** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage reading is not correct, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring.Locate and repair the shorted conductor.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 3511-6 B70D06 - ECU internal: overtemperature in the power supply of sensor 3

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the ECU **A-F02** detects an overtemperature in the ECU sensor supply reference voltage 3 circuit, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an overtemperature in the supply reference voltage circuit 3 of the ECU sensor.

**Possible failure modes:**

1. Fault inside the oil pressure and temperature sensor .
2. Fault inside the intake manifold temperature and pressure sensor **B-F48**.
3. Internal fault or faulty wiring of the rail pressure sensor **B-F09**.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.go to **8**.
2. Check the power supply circuit 3 of the oil pressure and temperature sensor to check for a short circuit to ground.

   Disconnect the wiring from the oil temperature and pressure sensor.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02E**.

   Set the ignition switch to OFF.

   Use a multimeter to check the continuity.

   A. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **3**
3. Check the power supply circuit 3 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage.

   A. If voltage is detected, this indicates a fault in the wiring between the oil temperature and pressure sensor connector and the engine control unit.Locate and repair the shorted conductor.

   B. If there is no voltage, go to **4**
4. Check the supply circuit 3 for a short circuit to ground.

   Disconnect the wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02E**.

Set the ignition switch to OFF.

Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F48 pin 03** | Chassis ground | There should be no continuity. |
| **X-F48 pin 04** | Chassis ground | There should be no continuity. |

A. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.

B. If there is no continuity, leave the connector disconnected and go to **5**.

5. Check the power supply circuit 3 for a short circuit towards a voltage source.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F48 (Plug) pin 3** | Chassis ground | There should be no voltage. |
| **X-F48 pin 04** | Chassis ground | There should be no voltage. |

A. If voltage is detected, this indicates a fault in the wiring.Locate and repair the shorted conductor.

B. If there is no voltage, Go to **6**

6. Check the supply circuit 3 for a short circuit to ground.

Disconnect the wiring from the rail pressure sensor **B-F09**, connector **X-F09**.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02E_6**.

Set the ignition switch to OFF.

Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F09 pin 03** | Chassis ground | There should be no continuity. |
| **X-F09 pin 02** | Chassis ground | There should be no continuity. |

A. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.

B. If there is no continuity, leave the connector disconnected and go to **7**

7. Check the power supply circuit 3 for a short circuit towards a voltage source.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F09 pin 03** | Chassis ground | There should be no voltage. |
| **X-F09 pin 02** | Chassis ground | There should be no voltage. |

A. If voltage is detected, this indicates a fault in the wiring. Locate and repair the shorted conductor.

B. If there is no voltage and each component and the respective wiring operate correctly, there in an internal fault in the ECU.Check the ECU **A-F02** for the appropriate software and update if necessary.

8. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 3511-3 B70D03 - ECU internal: voltage too high in the power supply of sensor 3

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage 3 of the sensor is above the set range, this fault occurs.

**Cause:**
The ECU sensor supply reference voltage 3 is above the set range.

**Possible failure modes:**

1. Fault inside the oil pressure and temperature sensor .
2. Fault inside the intake manifold temperature and pressure sensor **B-F48**.
3. Internal fault or faulty wiring of the rail pressure sensor **B-F09**.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **8**.
2. Disconnect the wiring from the oil temperature and pressure sensor.

   Use the diagnostic instrument to monitor the status of the **3511-3 – ECU internal: voltage too high in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **3**.
3. Check the power supply circuit 3 for a short circuit towards a voltage source between the oil pressure and temperature sensor and the engine side control unit.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage

   A. If the voltage is high, go to **4**

   B. If the voltage reading is correct, Go to **6**
4. Disconnect the wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Use the diagnostic instrument to monitor the status of the **3511-3 – ECU internal: voltage too high in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **6**.

5. Check the power supply circuit 3 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F48 (Plug) pin 3** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If the voltage is high, go to **7**

   B. If the voltage reading is correct, go to **8**

6. Check the power supply circuit 3 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 38** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If the voltage is high, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the voltage value is correct, this indicates faulty wiring between the pressure and temperature sensor of the intake manifold **B-F48** and the engine side control unit.Locate and repair the shorted conductor.

7. Disconnect the wiring from the rail pressure sensor **B-F09**, connector **X-F09**.

   Use the diagnostic instrument to monitor the status of the **3511-3 – ECU internal: voltage too high in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **9**.

8. Check the power supply circuit 3 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 3** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If the voltage is high, go to **9**

   B. If the voltage reading is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Check the power supply circuit 3 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 42** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If the voltage is high, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the voltage value is correct, this indicates faulty wiring between the rail pressure sensor **B-F09** and the engine side control unit.Locate and repair the shorted conductor.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 3511-5 B70D05 - ECU internal: voltage too low in the power supply of sensor 3

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-9300** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage 3 is below the set range, this fault occurs.

**Cause:**
The ECU sensor 3 supply reference voltage is below the set range.

**Possible failure modes:**

1. Internal fault or faulty wiring of the oil temperature and pressure sensor .
2. Internal fault or faulty wiring of the intake manifold temperature and pressure sensor **B-F48**.
3. Internal fault or faulty wiring of the rail pressure sensor **B-F09**.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.go to **8**.
2. Disconnect the wiring from the oil temperature and pressure sensor.

   Use the diagnostic instrument to monitor the status of the **3511-5 – ECU internal: voltage too low in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **3**.
3. Check the power supply circuit 3 for an interruption between the oil pressure and temperature sensor and the engine side control unit.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage.

   A. If there is no voltage or if the voltage is too low, go to **4**

   B. If the voltage reading is correct, Go to **6**
4. Disconnect the wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Use the diagnostic instrument to monitor the status of the **3511-5 – ECU internal: voltage too low in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **6**.

5. Check the supply circuit 3 for an interruption.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F48 pin 03** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If there is no voltage or if the voltage is too low, go to **7**

   B. If the voltage reading is correct, go to **8**

6. Check the supply circuit 3 for an interruption.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 38** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If there is no voltage or if the voltage is too low, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the voltage value is correct, this indicates faulty wiring between the pressure and temperature sensor of the intake manifold **B-F48** and the engine side control unit.Locate and repair the shorted conductor.

7. Disconnect the wiring from the rail pressure sensor **B-F09**, connector **X-F09**.

   Use the diagnostic instrument to monitor the status of the **3511-5 – ECU internal: voltage too low in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **9**.

8. Check the supply circuit 3 for an interruption.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 3** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If there is no voltage or if the voltage is too low, go to **9**

   B. If the voltage reading is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Check the supply circuit 3 for an interruption.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 42** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If there is no voltage or if the voltage is too low, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage value is correct, this indicates faulty wiring between the rail pressure sensor and the engine side control unit.Locate and repair the shorted conductor.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 519648-15 E0EDEF - SCR inducement: error warning triggered by customer(errors that affect NOx efficiency)

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is for informational purposes only and requires no action other than the resolution of the active fault causing this fault to occur. Any of the various faults that could occur in the engine causes the generation of this fault.

# 295467 5840-16 D01610 - SCR inducement: level 1 (torque reduction), triggered by fault relating to interruption in DEF/AdBlue dosing

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is reported for information purposes only and no actions are required other than resolving the active error that has caused this fault. Any of the **Diesel Exhaust Fluid (DEF)/AdBlue®** fluid injection interruption faults of the selective catalytic reduction system (SCR) that remain active for too long will cause this fault.

# 295467 D01600 5840-0 - SCR inducement: level 3 (reduction mode), triggered by fault relating to interruption in DEF/AdBlue dosing

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is reported for information purposes only and no actions are required other than resolving the active error that has caused this fault. Any of the **Diesel Exhaust Fluid (DEF)/AdBlue®** fluid injection interruption faults of the selective catalytic reduction system (SCR) that remain active for a period longer than the threshold causes this fault.

# 295467 D0160F 5840-15 - SCR inducement: warning, triggered by DEF/AdBlue dosing interruption fault

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is generated for information purposes only, therefore no other corrective actions are required other than resolving the active error that has caused this fault. Any interruption in the injection **Diesel Exhaust Fluid (DEF)/ AdBlue®** in the Selective Catalytic Reduction (SCR) system has caused this fault. The active error that causes this fault must be identified and resolved within a certain operating time in order to prevent engine power reduction.

# 295467 7E1410 5246-16 - SCR inducement: level 1 (torque reduction), triggered by fault relating to tampering

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is reported for information purposes only and no actions are required other than resolving the active error that has caused this fault. Any of the **Diesel Exhaust Fluid (DEF)/AdBlue®** tampering detection faults of the Selective Catalytic Reduction system (SCR) that remain active for too long will cause this fault.

# 295467 7E1400 5246-0 - SCR inducement: level 3 (creep mode), triggered by tampering fault

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is reported for information purposes only and no actions are required other than resolving the active error that has caused this fault. Any of the **Diesel Exhaust Fluid (DEF)/AdBlue®** tampering detection faults of the selective catalytic reduction system (SCR) that remain active for too long will cause this fault.

# 295467 5246-15 7E140F - SCR inducement: warning, triggered by fault relating to tampering

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault signalisation is supplied only for information and no other actions are required other than resolving the active error that has caused this fault. Any of the tampering detection faults **Diesel Exhaust Fluid (DEF)/AdBlue®** of the selective catalytic reduction (SCR) system has caused this fault. The active error that causes this fault must be identified and resolved in order to prevent engine power reduction.

# 295467 6819-31 A31A1F - SCR inducement: warning, Repeated offence activated

## Control Module: FPT ECU

**Fault Description:**
Part of the Selective Catalytic Reduction (SCR) system, inducement refers to the detection of abnormal functions in the system. Within this detection, if the engine control unit (ECU) determines that the DEF/AdBlue® consumption is too low, this fault occurs. Even though no corrective actions are required as a response to this particular fault, other active faults or conditions have caused this fault.

# 295467 519646-31 DEEDFF - SCR inducement: serious block of induction reached

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to run the Engine Restart Counter Reset/Unlock inducement configuration in order to restore functionality. Carry out the SCR Fault Repair Verification Test using the diagnostic tool before returning the machine to service. If the lock due to inducement persists, use the Easy Engine software supplied with the diagnostic tool to clear all faults.*

**Fault Description:**
This fault path is generated for information purposes only. One or more inducement locks have been detected as active by the engine control unit (ECU) **A-F02** which has caused locking of the inducement system. The fault that has caused the inducement must be located, resolved, and restored before deleting this error. Use the diagnostic instrument to unlock the inducement.

# 295467 519644-31 DCEDFF - Diagnosis validation is active

## Control Module: FPT ECU

**Fault Description:**
This fault is reported for information purposes only and no actions are required. If this fault is active, it means that the validation mode is active. The validation mode implies deactivation of the inducement strategy for three full-power restarts. During this validation mode, the vehicle will be at full power to allow the detection of any components which have been replaced or the elimination of a previously active fault.

# 295467 A4EEFF 519844-31 - Torque limitation: due to turbocharger protection

## Control Module: FPT ECU

**Fault Description:**
This fault path is generated only for information. This fault requires no actions except for checking the presence of other faults relating to the turbocharger in the relevant memory. If a fault is present, follow the relevant troubleshooting procedure. This fault confirms that a temporary torque limitation has occurred.

# 295467 519845-31 A5EEFF - Torque limitation due to engine protection

## Control Module: FPT ECU

**Fault Description:**
The engine is protected against too high temperature in the air intake gas, against too high temperature of the coolant, against too high temperature of the oil, and against too high temperature of the fuel, by means of a torque reduction. If one of the temperature values exceeds the limit set by the dedicated parameters programmed in the engine control unit (ECU) **A-F02**. If the power reduction exceeds the set value, a fault is saved as a confirmation that a performance limitation has been activated. This is not caused by a faulty component or system, but by extreme operating conditions. This fault is a confirmation of the temporary power limitation. This fault requires no corrective actions except for checking the presence of other faults relating to the engine speed / engine protection that could be present in the relevant memory. If only this fault has been generated, no corrective actions are required. If the power reduction has been caused by an effective fault, also the fault that activated the torque limitation must be present in the fault memory. Follow the troubleshooting procedure for the actual fault.

# 295467 A6EEFF 519846-31 - Torque limitation: injection system active

## Control Module: FPT ECU

**Fault Description:**
This fault has been generated following performance limitation to protect the high-pressure fuel pump from high temperatures. This fault is stored when a power reduction occurs. It is not caused by a component or system fault. This fault code is generated for information purposes only and does not require any further action. If there are other fault codes present which could affect high-pressure fuel pump temperatures, these faults may indicate an actual fault. Follow the troubleshooting procedure for the other fault.

# 295467 A7EEFF 519847-31 - Pressure limitation in the rail and speed caused by temperature too high in the rail

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This function identifies components that limit the ordinary torque request or cause an abnormal restriction of the speed controller. Activating this torque limitation results in an ordinary restriction of the torque request which is much greater than the calibrated percentage at a given position. In addition to this, there are associated component failures that are caused by this limitation. Strong torque limitation is caused by the temperature of the fuel in the rail.

**Cause:**
INFO: active torque limitation due to high fuel temperature

**Solution:**

1. This fault is provided for information purposes only, so no action is required other than to resolve the active fault that caused this failure. If the power reduction occurs due to an actual fault, the torque limitation fault should be in the fault memory. Follow the relevant troubleshooting.

# 295467 700406 1136-6 - Short circuit to battery in the ECU temperature sensor (ECU internal error)

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature sensor of the ECU **A-F02** inside the ECU **A-F02** to check for a short circuit to battery. If the ECU **A-F02** detects a short circuit to battery in the temperature sensor circuit, this fault occurs.

**Possible failure modes:**

1. ECU **A-F02** faulty, internal fault.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and update if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 1136-17 700411 - Short circuit to ground in the ECU temperature sensor (ECU internal error)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature sensor of the ECU **A-F02** inside the ECU **A-F02**, to check for a short circuit to ground. If the ECU **A-F02** detects a short circuit to ground in the temperature sensor circuit, this fault occurs.

**Possible failure modes:**

1. ECU **A-F02** faulty, internal fault.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and update if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 1136-2 700402 - ECU temperature sensor reading not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature sensor of the ECU **A-F02** inside the ECU **A-F02**, to check for the presence of a temperature signal. If the ECU **A-F02** detects a non-plausible temperature signal in the temperature sensor circuit, this fault occurs.

**Possible failure modes:**

1. ECU **A-F02** faulty, internal fault.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and update if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 690003 105-3 - Engine intake air temperature sensor voltage is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature and pressure sensor of the intake manifold **B-F48** checking for a short circuit towards a high voltage source or an open circuit. If the ECU **A-F02** senses the presence of a short circuit towards a high voltage source or an open circuit in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**, this fault occurs, If this fault occurs, the ambient temperature value is set by the ECU **A-F02** at the last valid value detected or at a default replacement value, once the fault is validated.

**Cause:**
The ECU **A-F02** has sensed a voltage greater than the threshold in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature and pressure sensor of the intake manifold **B-F48**, short circuit towards a high voltage source or open circuit.
2. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Check the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48** for an interruption.

   Disconnect the engine wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E pin 38** | **X-F48 pin 03** | There should be continuity. |
| **X-F02E pin 95** | **X-F48 pin 01** | There should be continuity. |
| **X-F02E pin 96** | **X-F48 pin 04** | There should be continuity. |

   A. If there is continuity, leave connectors **X-F48** and **X-F02E** disconnected and go to **3**.

   B. If there is no continuity, this indicates an open circuit in the engine wiring between the connector **X-F02E** and the connector **X-F48**, locate and repair the broken conductor.
3. Check the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48** for a short circuit towards another circuit.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E pin 96** | All other pins in connector **X-F02E_6** | There should be no continuity. |
| **X-F02E pin 95** | All other pins in connector **X-F02E_6** | There should be no continuity. |

A. If there is continuity, there is a short circuit towards another circuit in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**. Locate and repair the shorted conductor.

B. If there is no continuity, leave the connectors disconnected and go to **4**.

4. Check the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48** for a short circuit towards voltage.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E pin 96** | Chassis ground | There should be no voltage. |
| **X-F02E pin 38** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards a voltage source in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**. Locate and repair the shorted conductors.

   B. In the absence of voltage, go to **5**.

5. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 690004 105-4 - Engine intake air temperature sensor voltage is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the circuit of the temperature signal of the temperature and pressure sensor of the intake manifold **B-F48**. If the ECU **A-F02** senses that the voltage in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48** is below the expected value, this fault occurs. If this fault occurs, the ambient temperature value is blocked by the ECU **A-F02** at the last valid value detected or at a fixed default value, once the fault is validated.

**Cause:**
The ECU **A-F02** has sensed a voltage lower than the threshold in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature and pressure sensor of the intake manifold **B-F48**, short circuit to ground.
2. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **4**.
2. Check the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48** for a short circuit to ground.

   Disconnect the engine wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Disconnect the engine wiring (EN) from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch **S-007** in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E pin 38** | Chassis ground | There should be no continuity. |
| **X-F02E pin 38** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity during one of the two checks, there is a short circuit to ground or towards another circuit in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**, locate and repair the damaged or shorted conductor.

   B. If there is no continuity in both checks, go to step **3**.
3. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is found and the display shows normal values, erase fault code.

# 295467 9E1203 4766-3 - High check in signal range

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature sensor at the exhaust downstream of the Diesel Oxidation Catalyst (DOC) **B-F33** to check the presence of a short circuit towards a high voltage source. If the ECU **A-F02** determines the presence of a short circuit towards a high voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33**, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** on the last valid value detected or on a default replacement value once the fault has been validated.

**Cause:**
The ECU **A-F02** has detected a voltage higher than permitted in the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC system **B-F33**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature sensor at the exhaust downstream of the DOC **B-F33**, short circuit towards a high voltage source.
2. Faulty temperature sensor at the exhaust downstream of the DOC **B-F33**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **5**.

2. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33** for a short circuit towards another circuit.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 27** | All other pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Receptacle) pin 28** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33**, Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.

3. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33** for a short circuit towards a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 27** | Chassis ground | There should be no voltage. |
| **X-F02V (Receptacle) pin 28** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards a voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33**, Locate and repair the shorted conductors.

B. If there is no voltage, go to step **4**.

4. Replace the temperature sensor at the exhaust downstream of the DOC **B-F33**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 9E1204 4766-4 - Low check in signal range

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature signal circuit of the temperature sensor at the exhaust downstream of the diesel oxidation catalyst (DOC) **B-F33**. If the ECU **A-F02** determines that the voltage in the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33** is lower than the expected value, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** on the last valid value detected or on a default replacement value once the fault has been validated.

**Cause:**
The ECU **A-F02** has detected a voltage lower than expected in the temperature signal circuit of the exhaust temperature sensor downstream of the DOC **B-F33**.

**Possible failure modes:**

1. Faulty temperature signal wire in the temperature sensor at the exhaust downstream of the DOC **B-F33**, short circuit to ground.
2. Faulty temperature sensor at the exhaust downstream of the DOC **B-F33**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **4**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F113** to check for a short circuit to ground.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 27** | Chassis ground | There should be no continuity. |
| **X-F02V pin 27** | All other pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Receptacle) pin 28** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 28** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity during one of the checks, this indicates a short circuit to ground or to another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33** Locate and repair the damaged or shorted conductor.

   B. If there is no continuity on either check, go to step **3**.
3. Replace the temperature sensor at the exhaust downstream of the DOC **B-F33**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 4765-3 9D1203 - Diagnostic fault check for SCR high in oxidation catalyst upstream temperature

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature sensor at the exhaust upstream of the diesel oxidation catalyst (DOC) **B-F32** checking for a short circuit towards a high voltage source. If the ECU **A-F02** senses the presence of a short circuit towards a high voltage source in the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32**, this fault occurs. If this fault occurs, the temperature value is blocked by the ECU **A-F02** at the last valid value detected or at a default value, once the fault is validated.

**Cause:**
The ECU **A-F02** has detected a voltage higher than expected in the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature sensor at the exhaust upstream of the DOC **B-F32**, short circuit towards a high voltage source.
2. Faulty temperature sensor at the exhaust upstream of the DOC **B-F32**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **6**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32** for a short circuit towards another circuit.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V pin 30** | All other pins in connector **X-F02V** | There should be no continuity. |
| ***NOTE:*** *The connector* ***X-F02V (Receptacle) pin 27*** *is the ground return side of the temperature signal of the temperature sensor at the exhaust upstream of the DOC* ***B-F32****. The value must be between* ***169.7 – 738.2 Ω*** *according to the temperature at the exhaust* ***-40 – 800 °C*** *(****-40 – 1472 °F****).* | | |

   A. If there is continuity, there is a short circuit towards another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F32**, Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.
3. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32** for a short circuit towards a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 30** | Chassis ground | There should be no voltage. |
| **X-F02V (Receptacle) pin 27** | Chassis ground | There should be no voltage. |

A. If there is voltage, there is a short circuit towards a voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F32**, Locate and repair the shorted conductors.

B. If there is no voltage, go to step **4**.

4. Check the correct operation of the temperature sensor at the exhaust upstream of the DOC **B-F32** following the procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, go to step **6**.

   B. If the sensor is not working correctly, go to step **54**.

5. Replace the exhaust gas temperature sensor upstream of the DOC **B-F32**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 9D1204 4765-4 - Diagnostic fault check for SCR low in oxidation catalyst upstream temperature

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature signal circuit of the temperature sensor at the exhaust upstream of the diesel oxidation catalyst (DOC) **B-F32**. If the ECU **A-F02** senses that the voltage in the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32** is below the expected value, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** at the last valid value detected or at a default value once the fault is validated.

**Cause:**
The ECU **A-F02** has detected a voltage lower than expected in the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature sensor at the exhaust upstream of the DOC **B-F32**, short circuit to ground.
2. Faulty temperature sensor at the exhaust upstream of the DOC **B-F32**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **5**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32** for a short circuit to ground.

   Disconnect the Stage 5 (S5) engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 30** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 30** | All other pins in connector **X-F02V** | There should be no continuity. |
| ***NOTE:*** *The connector* ***X-F02V (Receptacle) pin 27*** *is the ground return side of the temperature signal of the temperature sensor at the exhaust upstream of the DOC* ***B-F32****. The value must be between* ***169.7 – 738.2 Ω*** *according to the temperature at the exhaust* ***-40 – 800 °C*** *(****-40 – 1472 °F****).* | | |

   A. If there is continuity during one of the checks, this indicates a short circuit to ground or to another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F32** locate and repair the damaged or shorted conductor.

   B. If there is no continuity on either check, go to step **3**.
3. Check the correct operation of the temperature sensor at the exhaust upstream of the DOC **B-F32** following the procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, go to step **5**.

   B. If the sensor is not working correctly, go to step **4**.

4. Replace the exhaust gas temperature sensor upstream of the DOC **B-F32**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518654-9 FEE9E9 - Timeout error of CAN-receive-frame CM1BC from Body Computer

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node A of the CAN Bus is the main vehicle interface bus. The ECU **A-F02** supplies a CAN terminating resistor for node A of the CAN Bus inside the ECU **A-F02**. The ECU **A-F02** receives the CM1BC CAN message from the vehicle control unit containing information on the activation percentage of the fan, the adjustable speed limitation request switch, the second speed limitation request switch and the switches for requesting forced regeneration and disabling of the particulate filter. If the ECU **A-F02** detects a timeout error of the CM1BC message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a CM1BC message timeout.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN fault or low voltage in vehicle control unit.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN wiring harness, open or short circuit.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.go to step **7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**.

5. Check the CAN circuit of the ECU **A-F02** for a short circuit.

Disconnect the engine wiring from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to **6**.

6. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H terminal | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L terminal | There should be continuity. |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If there is continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 FDE9FF 518653-31 - CAN error from VCM control unit relating to the engine shutdown request from the auxiliary switch

## Control Module: FPT ECU

**Fault Description:**
This code does not describe a fault but a switching off due to an external request. No intervention is required. Check the source of the fault that has caused the engine to stop.

# 295467 5EE9F3 518494-19 - Timeout error of CAN-receive-frame TSC1PE (bit control error)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1PE containing the information regarding torque/speed request from the power take-off. If the ECU **A-F02** detects a timeout error for message TSC1PE, this error occurs.

**Cause:**
The ECU **A-F02** has detected a TSC1PE message timeout error.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.

4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If there is continuity, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the machine to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5EE9FF 518494-31 - Timeout error of CAN-receive-frame TSC1PE, error condition

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1PE CAN message providing information regarding torque/speed from the PTO. If the ECU **A-F02** detects an invalid TSC1PE message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an invalid TSC1PE message.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Reading |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to**6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If no continuity is detected, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If continuity is detected, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the vehicle to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518494-11 5EE9EB - Timeout error of CAN-receive-frame TSC1PE, out of range

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1PE CAN message providing information regarding torque/speed from the PTO. If the ECU **A-F02** detects an invalid TSC1PE message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an invalid TSC1PE message.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Reading |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to**6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If no continuity is detected, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If continuity is detected, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the vehicle to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 5EE9EE 518494-14 - Timeout error of CAN-receive-frame TSC1PE, counter error (lost frame)

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1PE CAN message containing the information regarding torque/speed from the PTO. The rolling counter logic is used to identify errors caused by intermittent missing of the CAN frame. If the ECU **A-F02** detects an error in the rolling counter (missing frame) for the TSC1PE message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an error in the counter (frame missing).

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.

4. Check the ECU **A-F02** grounding.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Reading |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

   A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

   B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

   A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is correct, go to**6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

   A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

   A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. If no continuity is detected, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If continuity is detected, go to **9**

9. Check the correct operation of the PTO.

   A. If it is not working correctly, replace it and return the vehicle to service.

   B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518494-9 5EE9E9 - Timeout error of CAN-receive-frame TSC1PE from power take-off (engine speed sensor)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1PE containing the information regarding torque/speed request from the power take-off. If the ECU **A-F02** detects a timeout error for message TSC1PE, this error occurs.

**Cause:**
The ECU **A-F02** has detected a TSC1PE message timeout error.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.

4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Reading |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to**6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If no continuity is detected, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If continuity is detected, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the vehicle to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518495-9 5FE9E9 - Timeout error of CAN-receive-frame TSC1PE from power take-off (active mode)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1PE containing the information regarding torque/speed requested by the power take-off. If the ECU **A-F02** detects a timeout error for message TSC1PE and the fault condition occurs continuously for more than **10 ms**, this error occurs.

**Cause:**
The ECU **A-F02** has detected a timeout error of message TSC1PE for more than **10 ms**.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.

4. Check the ECU **A-F02** grounding.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Reading |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

   A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

   B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

   A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is correct, go to**6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

   A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

   A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. If no continuity is detected, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If continuity is detected, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the vehicle to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 60E9E9 518496-9 - Timeout error of CAN-receive-frame TSC1PE from power take-off (passive mode)

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1PE CAN message providing information regarding torque/speed from the PTO. If the ECU **A-F02** detects a timeout error of the TSC1PE message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a TSC1PE message timeout error.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.

4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If there is continuity, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the machine to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 518254-11 6EE8EB - Timeout error of CAN-receive-frame TSC1VE, out of range

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1VE CAN message containing the information regarding the torque/speed request from the vehicle control unit. If the ECU **A-F02** detects an invalid TSC1VE message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an invalid TSC1VE message.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the vehicle control unit.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.

4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the vehicle control unit.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If there is continuity, go to **9**

9. Check the correct operation of the vehicle control unit.

A. If it is not working correctly, replace it and return the machine to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 61000C 97-12 - Water in fuel sensor faulty

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the voltage output from the water sensor in the fuel **B-F217** in order to determine the presence of any water in the fuel supply. If water is detected in the fuel, warnings will be displayed to the operator about the risk of damaging the engine if continuing to use the unit. A ground signal from the water sensor in the fuel **B-F217** indicates the presence of water. This fault code is displayed to warn the operator that the ECU **A-F02** has detected water in excess in the supply system or a fault in the water in fuel sensor circuit.

**Cause:**
Faulty water in fuel sensor **B-F217**.

**Possible failure modes:**

1. Excess water in the fuel supply.
2. Faulty water in fuel sensor **B-F217**, wiring or internal (mechanical and/or electrical) fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is still present and remains active, continue with step **2**.

   B. If the fault is no longer present or is in an inactive state, continue with **7**.
2. Check fuel for water contamination.

   A. If there is water contamination, continue with step **3**.

   B. If there is no water contamination, continue with **4**.
3. Check the correct operation of the water in fuel sensor **B-F217**.

   Purge fuel supply system, replace fuel filter(s) and refill with fuel that is free of water contamination.

   Start and run the engine for 5 minutes.

   Check for code to return to active status.

   A. If code returns in an active status, replace water in fuel sensor **B-F217**.

   B. If code remains inactive, return the machine to service.
4. Check for open, short, and grounded circuit conditions in the water in fuel sensor **B-F217** circuit.

   Disconnect the water in fuel sensor **B-F217** at connector **X-F217**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | **X-F02V (Receptacle) pin 70** | There should be continuity. |
| **X-F217 (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F217 (Receptacle) pin 3** | **X-F02V (Receptacle) pin 75** | There should be continuity. |

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 70** | **X-F02V** all other pins | There should be no continuity |
| **X-F02V (Receptacle) pin 75** | **X-F02V** all other pins | There should be no continuity |

Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | Ground | There should be no continuity |
| **X-F217 (Receptacle) pin 3** | Ground | There should be no continuity |

A. If the results are not as expected for any of the wiring tests listed above, there is an open, short or grounded circuit condition in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

B. If the results are as expected in all of the wiring tests listed above, the wiring is okay. Leave the connectors disconnected and go to **5**.

5. Check the power supply voltage of the water in fuel sensor **B-F217**.

With the ignition switch in the ON position, use a multimeter to perform the following test on the wiring side of the water in fuel sensor:

| From | To | Reading |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | Ground | There should be ignition switch voltage. |

A. If there is ignition switch voltage present, continue with step **6**.

B. If no voltage is detected in the ignition switch, there is an open circuit or a short circuit to ground between **X-F217 (Receptacle) pin 1** and **X-F02V (Receptacle) pin 70**. Locate and repair the open circuit or the short circuit in the wiring.

6. Replace the water in fuel sensor **B-F217**, then check to see if this fault has been resolved.

A. If the fault has been resolved, return the machine to service.

B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damages are found and the display shows normal values, erase fault code.

# 295467 A20505 1442-5 - Open circuit on the fuel dosing unit

## Control Module: FPT ECU

**Fault Description:**
The ECU **A-F02** monitors the voltage and the correct operation of the fuel metering unit **Y-F07**. If the fuel metering unit **Y-F07** is not operating, the fuel pressure will reach the maximum value.

**Cause:**
Wiring disconnected or faulty fuel metering unit **Y-F07**.

**Possible failure modes:**

1. Fuel metering unit **Y-F07** solenoid coil, defective.
2. Faulty fuel metering unit **Y-F07** control circuit, broken wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**.

2. Check condition of fuel metering unit **Y-F07** solenoid coil.

   Disconnect the engine wiring harness from the fuel metering unit **Y-F07** at connector **X-F07**.

   Use a multimeter to measure the resistance of the fuel metering unit **Y-F07** solenoid coil:

| From | To | Value |
|---|---|---|
| **X-F07 (Receptacle) pin 1** | **X-F07 (Receptacle) pin 2** | The resistance should be **2.8 – 3.2 Ω**. |

   A. If there is between **2.8 – 3.2 Ω** leave the connector **X-F07** disconnected and go to **3**.

   B. If the result is infinite resistance, the fuel metering unit **Y-F07** solenoid coil is faulty, replace the fuel metering unit **Y-F07**.

3. Verify the condition of the fuel metering unit **Y-F07** control circuit.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   Use a multimeter to check for continuity in the engine wiring harness:

| From | To | Value |
|---|---|---|
| **X-F07 (Receptacle) pin 1** | **X-F02E (Receptacle) pin 7** | There should be continuity. |
| **X-F07 (Receptacle) pin 2** | **X-F02E (Receptacle) pin 6** | There should be continuity |

   A. If there is continuity in both checks, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If no continuity is detected on the high side or low side control circuit, this indicates an interruption. Locate and repair the broken conductor.

4. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 A20506 1442-6 - Fuel metering unit has an over-temperature error

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the voltage and the correct operation of the fuel metering unit **Y-F07**. If the fuel metering unit **Y-F07** is not operating, the fuel pressure will reach the maximum value.

**Cause:**

- high voltage in the battery;
- high internal temperature in the ECU **A-F02**;
- open circuit or wiring problems.

**Possible failure modes:**

1. Fault in the battery, voltage too high;
2. Fuel metering unit **Y-F07** solenoid coil, defective.
3. Faulty fuel metering unit **Y-F07** control circuit, broken wiring.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**.
2. Check for faults in the battery.

   Check the condition of the battery charge.

   Check that the battery voltage is correct.

   A. If no problems have been detected,go to **3**.

   B. If problems have been detected,replace the battery.
3. Check condition of fuel metering unit **Y-F07** solenoid coil.

   Disconnect the engine wiring harness from the fuel metering unit **Y-F07** at connector **X-F07**.

   Use a multimeter to measure the resistance of the fuel metering unit **Y-F07** solenoid coil:

| From | To | Value |
|---|---|---|
| **X-F07 (Receptacle) pin 1** | **X-F07 (Receptacle) pin 2** | The resistance should be **2.8 – 3.2 Ω**. |

   A. If there is between **2.8 – 3.2 Ω** leave the connector **X-F07** disconnected and go to **3**.

   B. If the result is infinite resistance, the fuel metering unit **Y-F07** solenoid coil is faulty, replace the fuel metering unit **Y-F07**.
4. Verify the condition of the fuel metering unit **Y-F07** control circuit.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

Use a multimeter to check for continuity in the engine wiring harness:

| From | To | Value |
|---|---|---|
| **X-F07 (Receptacle) pin 1** | **X-F02E (Receptacle) pin 7** | There should be continuity. |
| **X-F07 (Receptacle) pin 2** | **X-F02E (Receptacle) pin 6** | There should be continuity |

A. If there is continuity in both checks, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If no continuity is detected on the high side or low side control circuit, this indicates an interruption. Locate and repair the broken conductor.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 3064-7 F80B07 - DPF system: particulate filter damaged

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the integrity of the particulate filter. In order to determine the integrity of the particulate filter, the pressure drop measured on the empty filter (low soot) in stationary conditions is compared with the reference values determined on a new undamaged DPF. An error is detected if the maximum differential pressure value saved at stationary state is lower than a threshold that depends on the flow of the volume.

**Cause:**
The particulate filter has failed or is disassembled

**Possible failure modes:**

1. Faulty particulate filter, failed or disassembled
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Go to **6**.
2. Check for black smoke at the exhaust pipe.

   A. If there is black smoke, the particulate filter could be disassembled. Install it correctly. If the fault occurs again go to **5**.

   B. If there is no black smoke, contact the Technical Help Desk.
3. Check that the particulate filter is operating correctly.

   A. If a fault is present,replace the filter.

   B. If a fault is not present,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 3703-7 770E07 - Particulate filter blocked inhibit request switch

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the particulate filter regeneration switch. The particulate filter regeneration function allows the filter to be reset through intervention of the diagnostic tool or through the dedicated switch on the vehicle.
When the switch remains locked in the closed position for longer than expected, the fault occurs.

**Cause:**
The particulate filter regeneration switch remains blocked in the closed position.

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration , wiring or switch.
2. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or active, it may be intermittent and currently inactive. Go to step **6**.
2. Check the correct operation of the particulate filter regeneration switch and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, continue to step **5**.
3. Check the correct operation of the particulate filter regeneration switch by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch . After having carried out the regeneration reset the switch use counter.

   A. If the switch is working correctly, contact the Technical Help Desk.

   B. If the switch is not working correctly, continue to step**4**.
4. Replace the particulate filter regeneration switch.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.
5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

B. If no damage is detected and normal values are shown on the display, delete the fault code.

# 295467 4781-0 AD1200 - DPF system: particulate filter clogged

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the regeneration switch of the particulate filter . The particulate filter regeneration function allows restoring the filter by using the diagnostic instrument or the dedicated switch on the vehicle. The filter regeneration occurs when the soot load exceeds the permitted limit. When the particulate filter is overloaded with an excessive accumulation of soot, higher than permitted also after regeneration, this fault occurs.

**Cause:**
The filter regeneration has not been carried out for too much time.

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration , wiring or switch.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Go to **6**.
2. Check the correct operation of the particulate filter regeneration switch and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to **5**.
3. Check the correct operation of the particulate filter regeneration switch by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch . After having carried out the regeneration reset the switch use counter.

   A. If the switch is working correctly, contact the Technical Help Desk.

   B. If the switch is not working correctly, go to **4**.
4. Replace the particulate filter regeneration switch.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault is resolved, return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and re-flash if necessary.
5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 8F0E1F 3727-31 - Request switch for DPF regeneration number of interventions high

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the particulate filter regeneration switch . The particulate filter regeneration function allows the filter to be restored via the diagnostic instrument or a dedicated switch on the vehicle. The number of regenerations requested through the button is limited. When this number exceeds 255, this fault will occur.

**Cause:**
Particulate filter regeneration has been requested more than 255 times.

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration , wiring or switch.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Go to **6**.
2. Check the correct operation of the particulate filter regeneration switch and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to **5**.
3. Check the correct operation of the particulate filter regeneration switch by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch . After having carried out the regeneration reset the switch use counter.

   A. If the switch is working correctly, contact the Technical Help Desk.

   B. If the switch is not working correctly, go to **4**.
4. Replace the particulate filter regeneration switch.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault is resolved, return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and re-flash if necessary.
5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 3696-0 700E00 - DPF regeneration - Request switch for DPF regeneration number of interventions beyond the maximum limit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the particulate filter regeneration switch **SW-F243**. The particulate filter regeneration function **SW-F243** allows the filter to be reset through intervention of the diagnostic tool or through the dedicated switch on the vehicle.
The number of regenerations requested through the button is limited; when it exceeds 255, this failure occurs.

**Cause:**
Particulate filter regeneration has been requested more than 255 times.

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration **SW-F243**, wiring or switch.
2. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or active, it may be intermittent and currently inactive. Go to step **6**.
2. Check the correct operation of the particulate filter regeneration switch **SW-F243** by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch **SW-F243**. After having carried out the regeneration reset the switch use counter.

   A. If the switch **SW-F243** is working correctly, contact the Technical Help Desk.

   B. If the switch **SW-F243** is not working correctly, continue to step**5**.
3. Check the correct operation of particulate filter regeneration switch by performing particulate filter regeneration using the diagnostic tool.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the particulate filter switch. After having carried out the regeneration reset the switch use counter.

   A. If the switch is working correctly, contact the Technical Help Desk.

   B. If the switch is not working correctly, continue to step**4**.
4. Replace the particulate filter regeneration switch **SW-F243**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.
5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

B. If no damage is detected and normal values are shown on the display, delete the fault code.

# 295467 518201-31 39E8FF - Control unit internal error: erratic shutdown detected

## Control Module: FPT ECU

**Fault Description:**
The system of the Engine Control Unit (ECU) **A-F02** supplies the execution command as the calculation of the "ECU deactivation time". The "incorrect activation counter" is a function of a control counter whose task is to check if the ECU **A-F02** has always been operating from when the ECU **A-F02** has been activated to when it has been deactivated. If the ECU **A-F02** has been incorrectly switched off before completing the shut down procedure (due to power failure, power supply reset, or software reset with the key switch signal set to OFF), the counter is not reset. This causes the subsequent initialization (switching on activation) after reading the counter in order to detect the missed reset and the signalisation of this error.

**Cause:**

The ECU **A-F02** has been switched off while the engine is running due to:

- a loss of power supply;
- a software reset **A-F02**.

**Solution:**

1. Check that the error is not sporadic or intermittent.

   A. If the fault is not constant, it is possible that the operator might have disconnected the power supply before the afterrun has completed or immediately after the key off.Adjust the duration of the ECU afterrun accordingly **A-F02**.

   B. If the fault is always present, continue with **1**.
2. Check for related faults.

   Use the diagnostic instrument to determine the presence of faults in the battery power supply.

   A. If other faults are present in the battery supply, resolve the corresponding fault. Then determine if the fault has been resolved.

   B. If other faults are not detected on the battery supply, continue with step **2**.
3. End the operations underway and restart the machine.

   Check the ECU **A-F02** for the appropriate software and re-flash if necessary.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 152-14 98000E - Visibility of software resets in DSM

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the presence of possible errors in the software inside the ECU **A-F02**. If the ECU **A-F02** detects an error in the software, the software undergoes a complete reset and this fault occurs.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash if necessary.
   A. If the fault has been resolved, the machine can resume service.
   B. If the fault has not been resolved, contact the Technical Help Desk.

# 295467 98001F 152-31 - ECU has an internal fault: software resets in DSM 1

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the presence of possible errors in the software inside the ECU **A-F02**. If the ECU **A-F02** detects an error in the software, the software undergoes a complete reset and this fault occurs.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash if necessary.
   A. If the fault has been resolved, the machine can resume service.
   B. If the fault has not been resolved, replace the ECU.

# 295467 DDEDF0 519645-16 - SCR inducement: level 1 (torque reduction), triggered by EGR valve blocked

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
Faults in the EGR and SCR systems are monitored and trigger different warnings and reactions. The Inducement starts with a warning, then a reduction in torque and if this fault has not been corrected, a slow mode is activated with a sharp reduction in the maximum speed of the vehicle. These faults are grouped into different categories.

**Cause:**
INFO: Level 1 Inducement due to EGR valve blocked

**Solution:**

1. This fault report is provided for information only, therefore no further actions are required other than resolving the active error that has caused this fault. One of the faults at the exhaust gas recirculation system valve ( EGR) or related components active for a longer time causes this problem to occur.

# 295467 DDEDE0 519645-0 - SCR inducement: level 3 (torque reduction), triggered by EGR valve blocked

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
Faults in the EGR and SCR systems are monitored and trigger different warnings and reactions. The Inducement starts with a warning, then a reduction in torque and if this fault has not been corrected, a slow mode is activated with a sharp reduction in the maximum speed of the vehicle. These faults are grouped into different categories.

**Cause:**
INFO: warning for the driver due to EGR valve blocked

**Solution:**

1. This fault report is provided for information only, therefore no further actions are required other than resolving the active error that has caused this fault. One of the faults at the exhaust gas recirculation system valve ( EGR) or related components active for a longer time causes this problem to occur.

# 295467 14E8FF 518164-31 - Limitation for level 2 correction of fuel quantity on injection

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** will check in internally the quantity of fuel to be delivered to the fuel metering unit. If the ECU **A-F02** determines that the level 2 of fuel quantity is lower than level 1, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a level 2 of fuel quantity lower than level 1.

**Possible failure modes:**

1. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and update if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 15E8FF 518165-31 - Torque limitation activated for engine idle speed correction

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** will check internally the quantity of fuel to be delivered to the fuel metering unit. When the level 2 of fuel quantity is incorrect, the ECU **A-F02** will supply a minimum stable speed at the set torque, until the correct quantity of fuel of level 2 is supplied. If the ECU **A-F02** determines that the level 2 of fuel quantity is incorrect, the ECU will set the engine at idling speed and this fault occurs.

**Cause:**
The ECU **A-F02** has detected an incorrect level 2 of fuel quantity.

**Possible failure modes:**

1. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and update if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 98F0FF 520344-31 - ECU internal failure - Safety management unit alarm group 0 Failure 1 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520344-11 98F0EB - ECU internal failure - Safety management unit alarm group 0 Failure 11 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520345-31 99F0FF - ECU internal failure - Safety management unit alarm group 0 Failure 12 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520345-11 99F0EB - ECU internal failure - Safety management unit alarm group 0 Failure 15 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 9AF0FF 520346-31 - ECU internal failure - Safety management unit alarm group 0 Failure 16 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520346-11 9AF0EB - ECU internal failure - Safety management unit alarm group 0 Failure 3 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 9BF0FF 520347-31 - ECU internal failure - Safety management unit alarm group 0 Failure 4 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 9BF0EB 520347-11 - ECU internal failure - Safety management unit alarm group 0 Failure 7 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520348-31 9CF0FF - ECU internal failure - Safety management unit alarm group 0 Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520348-11 9CF0EB - ECU internal failure - Safety management unit alarm group 1 Failure 0 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520349-31 9DF0FF - ECU internal failure - Safety management unit alarm group 1 Failure 1 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 9DF0EB 520349-11 - ECU internal failure - Safety management unit alarm group 1 Failure 11 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520350-31 9EF0FF - ECU internal failure - Safety management unit alarm group 1 Failure 12 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520350-11 9EF0EB - ECU internal failure - Safety management unit alarm group 1 Failure 15 issued

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** carries out internal extended monitoring of the alarms of the error management module (EMM), which are signalled by the hardware unit of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults of it. The SMU centralises all alarm signals relative to the safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in various groups whose status is saved in the relevant records. This fault indicates that a process internal fault is present. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 520351-31 9FF0FF - ECU internal failure - Safety management unit alarm group 1 Failure 16 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520351-11 9FF0EB - ECU internal failure - Safety management unit alarm group 1 Failure 3 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520352-31 A0F0FF - ECU internal failure - Safety management unit alarm group 1 Failure 4 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520352-11 A0F0EB - ECU internal failure - Safety management unit alarm group 1 Failure 7 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 A1F0FF 520353-31 - ECU internal failure - Safety management unit alarm group Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 A1F0EB 520353-11 - ECU internal failure - Safety management unit alarm group 2 Failure 15 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520354-31 A2F0FF - ECU internal failure - Safety management unit alarm group 2 Failure 18 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520354-11 A2F0EB - ECU internal failure - Safety management unit alarm group 2 Failure 19 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520356-31 A4F0FF - ECU internal failure - Safety management unit alarm group 2 Failure 5 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520356-11 A4F0EB - ECU internal failure - Safety management unit alarm group 2 Failure 7 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 A5F0FF 520357-31 - ECU internal failure - Safety management unit alarm group 2 Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520357-11 A5F0EB - ECU internal failure - Safety management unit alarm group 3 Failure 0 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 A6F0FF 520358-31 - ECU internal failure - Safety management unit alarm group 3 Failure 1 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520358-11 A6F0EB - ECU internal failure - Safety management unit alarm group 3 Failure 12 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520359-31 A7F0FF - ECU internal failure - Safety management unit alarm group 3 Failure 14 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520359-11 A7F0EB - ECU internal failure - Safety management unit alarm group 3 Failure 16 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520360-31 A8F0FF - ECU internal failure - Safety management unit alarm group 3 Failure 17 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520360-11 A8F0EB - ECU internal failure - Safety management unit alarm group 3 Failure 18 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 A9F0FF 520361-31 - ECU internal failure - Safety management unit alarm group 3 Failure 19 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520361-11 A9F0EB - ECU internal failure - Safety Management Unit Alarm Group 3 Failure 2 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 520362-31 AAF0FF - ECU internal failure - Safety management unit alarm group 3 Failure 20 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520362-11 AAF0EB - ECU internal failure - Safety management unit alarm group 3 Failure 26 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 ABF0FF 520363-31 - ECU internal failure - Safety management unit alarm group 3 Failure 27 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520363-11 ABF0EB - ECU internal failure - Safety management unit alarm group 3 Failure 28 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520364-31 ACF0FF - ECU internal failure - Safety management unit alarm group 3 Failure 3 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520364-11 ACF0EB - ECU internal failure - Safety management unit alarm group 3 Failure 4 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520365-31 ADF0FF - ECU internal failure - Safety management unit alarm group 3 Failure 5 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 520365-11 ADF0EB - ECU internal failure - Safety management unit alarm group 3 Failure 6 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520366-31 AEF0FF - ECU internal failure - Safety management unit alarm group 3 Failure 7 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 AEF0EB 520366-11 - ECU internal failure - Safety management unit alarm group 3 Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520367-31 AFF0FF - ECU internal failure - Safety management unit alarm group 3 Failure 9 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 AFF0EB 520367-11 - ECU internal failure - Safety management unit alarm group 4 Failure 1 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 B0F0FF 520368-31 - ECU internal failure - Safety management unit alarm group 4 Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 B0F0EB 520368-11 - ECU internal failure - Safety management unit alarm group 4 Failure 17 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520369-31 B1F0FF - ECU internal failure - Safety management unit alarm group 4 Failure 18 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 B2F0FF 520370-31 - ECU internal failure - Safety management unit alarm group 4 Failure 5 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520370-11 B2F0EB - ECU internal failure - Safety management unit alarm group 4 Failure 6 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 B3F0FF 520371-31 - ECU internal failure - Safety management unit alarm group 4 Failure 9 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520371-11 B3F0EB - ECU internal failure - Safety management unit alarm group 6 Failure 1 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 B4F0FF 520372-31 - ECU internal failure - Safety management unit alarm group 6 Failure 11 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520372-11 B4F0EB - ECU internal failure - Safety management unit alarm group 6 Failure 12 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 520373-31 B5F0FF - ECU internal failure - Safety management unit alarm group 6 Failure 15 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520373-11 B5F0EB - ECU internal failure - Safety management unit alarm group 6 Failure 16 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520374-31 B6F0FF - ECU internal failure - Safety management unit alarm group 6 Failure 3 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 B6F0EB 520374-11 - ECU internal failure - Safety management unit alarm group 6 Failure 4 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520375-31 B7F0FF - ECU internal failure - Safety management unit alarm group 6 Failure 7 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520375-11 B7F0EB - ECU internal failure - Safety Management Unit Alarm Group 6 Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 520355-31 A3F0FF - ECU internal failure - Safety management unit alarm group 2 Failure 29 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

**Cause:**
The ECU **A-F02** has an internal problem.

**Possible failure modes:**

1. Fault in the ECU **A-F02**, hardware or software.

**Solution:**

1. Check that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step**2**,

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. go to step **6**.
2. Clear the 2/3 level error from the fault memory, the procedure is independent of level 1 errors.

   Drive the vehicle a short distance (just a few kilometres); if diagnostics is possible, check the operational point where the error occurs.

   A. If the error returns, replace the ECU **A-F02**.

   B. If the error does not return, clearing the fault memory was sufficient. The machine can be returned to service.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is detected and normal values are shown on the display, delete the fault code.

# 295467 BBF0EB 520379-11 - ECU internal failure - Safety management unit alarm group 2 Failure 30 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

**Cause:**
The ECU **A-F02** has an internal problem.

**Possible failure modes:**

1. Fault in the ECU **A-F02**, hardware or software.

**Solution:**

1. Check that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Clear the 2/3 level error from the fault memory, the procedure is independent of level 1 errors.

   Drive the vehicle a short distance (just a few kilometres); if diagnostics is possible, check the operational point where the error occurs.

   A. If the error returns, replace the ECU **A-F02**.

   B. If the error does not return, clearing the fault memory was sufficient. The machine can be returned to service.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 A3F0EB 520355-11 - ECU internal failure - Safety management unit alarm group 2 Failure 4 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

**Cause:**
The ECU **A-F02** has an internal problem.

**Possible failure modes:**

1. Fault in the ECU **A-F02**, hardware or software.

**Solution:**

1. Check that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Clear the 2/3 level error from the fault memory, the procedure is independent of level 1 errors.

   Drive the vehicle a short distance (just a few kilometres); if diagnostics is possible, check the operational point where the error occurs.

   A. If the error returns, replace the ECU **A-F02**.

   B. If the error does not return, clearing the fault memory was sufficient. The machine can be returned to service.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 520369-11 B1F0EB - ECU internal failure - Safety management unit alarm group 4 Failure 2 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

**Cause:**
The ECU **A-F02** has an internal problem.

**Possible failure modes:**

1. Fault in the ECU **A-F02**, hardware or software.

**Solution:**

1. Check that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Clear the 2/3 level error from the fault memory, the procedure is independent of level 1 errors.

   Drive the vehicle a short distance (just a few kilometres); if diagnostics is possible, check the operational point where the error occurs.

   A. If the error returns, replace the ECU **A-F02**.

   B. If the error does not return, clearing the fault memory was sufficient. The machine can be returned to service.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 1128-18 680412 - Turbocharger boost pressure is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The pressure sensor **B-F48** sends status and feedback information at regular intervals to the engine control unit (ECU) **A-F02** relating to the operating status of the turbocharger. If the pressure sensor **B-F48** detects that the current pressure value of the turbocharger is lower than the set threshold, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a turbocharger actuator blockage condition or turbocharger efficiency is impaired.

**Possible failure modes:**

1. Fault in the turbocharger.
2. Fault in the **B-F48**pressure sensor.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **5**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. Go to step **7**.
2. Carry out the tests to verify operation of the turbocharger pipes.

   A. If faults are identified, Replace the turbocharger.

   B. If the fault has not been resolved, go to step **3**
3. As there is no method for field testing, replace the pressure sensor **B-F48**. Check if the fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 3695-2 6F0E02 - DPF regeneration emergency switch: Value not plausible

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the particulate filter regeneration switch **SW-F243**. The particulate filter regeneration function allows the filter to be restored via intervention of the diagnostic instrument or via the dedicated switch **SW-F243** on the vehicle. When the emergency switch **SW-F243** is activated while driving and filter regeneration is not useful or required at that moment, this fault occurs.

**Cause:**
The particulate filter regeneration switch **SW-F243** is activated while driving the vehicle at high speed or it is faulty.

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration **SW-F243**, wiring or switch.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Go to **6**.
2. Check the correct operation of the connector **X-F243** of the particulate filter regeneration switch **SW-F243** and the wiring to which they are connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to **5**.
3. Check the correct operation of the particulate filter regeneration switch **SW-F243** by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch **SW-F243**. After having carried out the regeneration reset the switch use counter.

   A. If the switch **SW-F243** is working correctly, contact the Technical Help Desk.

   B. If the switch **SW-F243** is not working correctly, go to**4**.
4. Replace the particulate filter regeneration switch **SW-F243**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault is resolved, return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 1659-2 7B0602 - Deviation between the measured value and expected value of the engine cooling thermostat

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the circuit of the coolant temperature sensor **B-F21**. If the coolant temperature sensor **B-F21** does not detect the minimum required temperature, this fault occurs.

**Cause:**

The coolant temperature sensor **B-F21** detects that the temperature is too high. This can be caused by:

- environment too cold in the cab heater at full power;
- corroded connectors in the additional resistor wiring;
- engine thermostat blocked in the open position.

**Possible failure modes:**

1. Faulty coolant temperature sensor **B-F21**, internal fault.
2. Faulty signal circuit in the coolant temperature sensor **B-F21**.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Before carrying out the required checks, make sure that the engine is not used in extreme environmental conditions.

   Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to step **6**.

2. Check the conditions of the coolant temperature sensor **B-F21**.

   Disconnect the engine wiring from the coolant temperature sensor **B-F21** at connector **X-F21**.

   Use a multimeter to measure the resistance of the coolant temperature sensor **B-F21**:

| From | To | Value |
|---|---|---|
| Coolant temperature sensor **X-F21 pin 1** | Coolant temperature sensor **X-F21 pin 2** | There must be a measurable quantity of resistance according to the effective coolant temperature, between **100 – 50,000 Ω**. |

   A. If an appropriate value of resistance is detected, leave the connector disconnected and go to **3**.

   B. If there is infinite resistance, the coolant temperature sensor **B-F21** has failed internally. Replace sensor.

3. Check the circuit of the coolant temperature sensor **B-F21** for an interruption.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | **X-F21 pin 1** | There should be continuity. |

A. If continuity is detected, leave the connectors disconnected and go to **4**.

B. If there is no continuity, it means that there is an open circuit in the engine wiring between the connector **X-F21 pin 1** of the coolant temperature sensor **B-F21** and the connector **X-F02E (Receptacle) pin 100** of the ECU **A-F02**.Locate and repair the conductor interruption.

4. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards another circuit (high voltage source).

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit (high voltage source) in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connectors disconnected and go to **5**.

5. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards the power supply.

   With the ignition switch set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards power supply in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. In the absence of voltage, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 870E10 3719-16 - DPF system: particulate filter clogged

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the integrity of the particulate filter. In order to determine the integrity of the particulate filter, the pressure drop measured on the empty filter (low soot) in stationary conditions is compared with the reference values determined on a new undamaged DPF. An error is detected if the maximum differential pressure value saved at stationary state is lower than a threshold that depends on the flow of the volume.

**Cause:**
The particulate filter is clogged

**Possible failure modes:**

1. Faulty particulate filter, failed or disassembled
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. go to step **4**.
2. Check if the filter is clogged.

   A. If it is clogged. clean it carefully.

   B. If it is not clogged, go to **3**.
3. Check that the particulate filter is operating correctly.

   A. If a fault is present,replace the filter.

   B. If a fault is not present,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5A150F 5466-15 - Particulate filter overloaded (level 1)

## Control Module: FPT ECU

**Fault Description:**
When the regeneration of the filter is insufficient due to low exhaust temperatures for a prolonged period of time (engine running at idle or low load for a prolonged period), or in the presence of a damaged diesel oxidation catalyst (DOC) (not producing supply gas), the flow resistance of the filter can increase to values above the critical values. The engine control unit (ECU) **A-F02** monitors the soot load levels until battery voltage reaches a value exceeding **10 V** and engine reaches a standard speed. If the soot load level is high or the pressure differential in the diesel particulate filter (DPF) exceeds the limits defined by the ECU **A-F02** based on the exhaust flow, the filter is overloaded (the flow resistance is too high) and this fault occurs. As a consequence of this fault, the vehicles switches to "emergency mode" and it must undergo maintenance using the diagnostic tool.

# 295467 1A151F AE0010 6677-31 174-16 1A15-1F - Fuel temperature has exceeded a maximum limit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the fuel temperature sensor **B-F04**. If the ECU **A-F02** detects a too high fuel temperature, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a too high oil temperature.

**Possible failure modes:**

1. High ambient temperature.
2. Faulty fuel temperature sensor **B-F04**, internal failure.
3. Faulty fuel temperature sensor **B-F04**, hardware.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Determine the effective fuel temperature.

   Use a thermometer or a thermal gun, as close as possible to the fuel temperature sensor **B-F04**, to measure the fuel temperature.

   A. If the measured temperature is less than **84.96 °C** (**193.9 °F**), go to **3**.

   B. If the measured temperature is greater than **84.96 °C** (**193.9 °F**), locate and resolve any ambient conditions or operational factors of the engine, such as improper use. Resolve any physical conditions that cause engine overheating.
3. Check the conditions of the fuel temperature sensor **B-F04**.

   Disconnect the engine wiring from the fuel temperature sensor **B-F04** at connector **X-F04**.

   Use a multimeter to measure the resistance of the fuel temperature sensor **B-F04**:

| From | To | Value |
|---|---|---|
| **X-F04 (Plug) pin 1** | **X-F04 (Plug) pin 2** | There should be a value greater than **250 Ω**. |

   A. If the measured resistance is lower than **250 Ω**, the fuel temperature sensor **B-F04** has failed internally. Replace sensor.

   B. If the measured resistance is greater than **250 Ω**, leave the fuel temperature sensor connector **B-F04** disconnected and go to **4**.
4. Check the integrity of the fuel temperature sensor **B-F04**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V_2**.

Inspect the wiring and relative connectors checking for damaged, bent, or displaced pins, corroded terminals, or open or stripped wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector **X-F04** disconnected and go to **5**.

5. Replace the fuel temperature sensor **B-F04**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 A90F05 4009-5 - Open circuit in the fuel filter heater actuator

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors correct operation of the fuel filter contactor **K-F230**. When the ECU **A-F02** detects an error in the signal of the fuel filter heater contactor **K-F230** , this fault occurs.

**Cause:**
The ECU **A-F02** has detected an error in the signal of the fuel filter heater contactor **K-F230**.

**Possible failure modes:**

1. Fault in the wiring.
2. Fault in the fuel filter heater contactor **K-F230**.
3. Fault in the fuel filter resistor.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check the conditions of the fuel filter heater contactor **K-F230**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Disconnect the wiring from the fuel filter heater contactor **K-F230** at connector **X-F230**.

   With the ignition switch set to OFF, use a multimeter to carry out the following checks:

| From | To | Value |
|---|---|---|
| **X-F230** pin 85 | **X-F02V (Receptacle) pin 20** | There should be continuity |
| **X-F230** pin 86 | Chassis ground | There should be a reading of **12 V** |

   A. If the checks are correct, go to step **8**

   B. If the checks are not correct, locate and repair or replace the damaged conductors.
3. Check the correct operation of the fuel filter heater contactor **K-F230**.

   A. If the contactor is working correctly, check that the correct operation of the fuel filter resistor.

   B. If the contactor is not working correctly, go to step **6**
4. As there is no method for field testing or re-flashing, replace the fuel filter heater contactor **K-F230**. Check if the fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 A90F06 4009-6 - Fuel filter heater actuator has an over-temperature error

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors correct operation of the fuel filter contactor **K-F230**. When the ECU **A-F02** detects overtemperature, this fault occurs.

**Cause:**

The overtemperature may be caused by:

- Battery voltage too high;
- High temperature inside the ECU;
- A problem of high load or a problem in the wiring.

**Possible failure modes:**

1. Fault in the wiring.
2. Fault in the battery.
3. Fault in the fuel filter heater contactor **K-F230**.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check that the battery voltage is correct.

   Use the multimeter to check the correct voltage:

| From | To | Value |
|---|---|---|
| Battery terminal (+) | Battery terminal (+) | There should be a voltage of **12 V**. |

   A. If the voltage measured is not approximately **12 V**, charge the battery and repeat the battery test. Then go to step **5**

   B. If the voltage measured is approximately **12 V**, go to step **5**.
3. Check the conditions of the fuel filter heater contactor **K-F230**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Disconnect the wiring from the fuel filter heater contactor **K-F230** at connector **X-F230**.

   With the ignition switch set to OFF, use a multimeter to carry out the following checks:

| From | To | Value |
|---|---|---|
| **X-F230** pin 85 | **X-F02V (Receptacle) pin 20** | There should be continuity |
| **X-F230** pin 86 | Chassis ground | There should be a reading of **12 V** |

   A. If the checks are correct, go to step **8**

B. If the checks are not correct, locate and repair or replace the damaged conductors.

4. Check the correct operation of the fuel filter heater contactor **K-F230**.

   A. If the contactor is working correctly, check that the correct operation of the fuel filter resistor.

   B. If the contactor is not working correctly, go to step **6**

5. As there is no method for field testing or re-flashing, replace the fuel filter heater contactor **K-F230**. Check if the fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 4009-3 A90F03 - Fuel Filter Heater Actuator is shorted to battery voltage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors correct operation of the fuel filter heater contactor **K-F230**. When the ECU **A-F02** detects a short circuit to battery in the wiring of the fuel filter heater contactor **K-F230** , this fault occurs.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring of the fuel filter heater contactor **K-F230**.

**Possible failure modes:**

1. Fault in the wiring, short circuit to battery.
2. Fault in the fuel filter heater contactor **K-F230**.
3. Fault in the fuel filter resistor.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check the conditions of the fuel filter heater contactor **K-F230**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Disconnect the wiring from the fuel filter heater contactor **K-F230** at connector **X-F230**.

   With the ignition switch set to OFF, use a multimeter to carry out the following checks:

| From | To | Value |
|---|---|---|
| **X-F230** pin 85 | **X-F02V (Receptacle) pin 20** | There should be continuity |
| **X-F230** pin 86 | Chassis ground | There should be a reading of **12 V** |

   A. If the checks are correct, go to step **3**

   B. If the checks are not correct, locate and repair or replace the damaged conductors.
3. Check for a short circuit to positive in the wiring of the fuel filter heater contactor **K-F230**.

   With the ignition switch set to ON, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 20** | All other pins of **X-F02V** | There should be no continuity. |

   A. If there is no continuity, go to step **8**

   B. If continuity is detected, locate and repair or replace the damaged conductors.
4. Check the correct operation of the fuel filter heater contactor **K-F230**.

   A. If the contactor is working correctly, check that the correct operation of the fuel filter resistor.

B. If the contactor is not working correctly, go to step **6**

5. As there is no method for field testing or re-flashing, replace the fuel filter heater contactor **K-F230**. Check if the fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 4009-4 A90F04 - Fuel Filter Heater Actuator is shorted to ground

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors correct operation of the fuel filter heater contactor **K-F230**. When the ECU **A-F02** detects a short circuit to ground in the wiring of the fuel filter heater contactor **K-F230** , this fault occurs.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring of the fuel filter heater contactor **K-F230**.

**Possible failure modes:**

1. Fault in the wiring, short circuit to ground.
2. Fault in the fuel filter heater contactor **K-F230**.
3. Fault in the fuel filter resistor.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check the conditions of the fuel filter heater contactor **K-F230**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Disconnect the wiring from the fuel filter heater contactor **K-F230** at connector **X-F230**.

   With the ignition switch set to OFF, use a multimeter to carry out the following checks:

| From | To | Value |
|---|---|---|
| **X-F230** pin 85 | **X-F02V (Receptacle) pin 20** | There should be continuity |
| **X-F230** pin 86 | Chassis ground | There should be a reading of **12 V** |

   A. If the checks are correct, go to step **8**

   B. If the checks are not correct, locate and repair or replace the damaged conductors.
3. Check for a short circuit to ground in the wiring of the fuel filter heater contactor **K-F230**.

   With the ignition switch set to ON, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 20** | ground | There should be no continuity. |

   A. If there is no continuity, go to step **8**

   B. If continuity is detected, locate and repair or replace the damaged conductors.
4. Check the correct operation of the fuel filter heater contactor **K-F230**.

   A. If the contactor is working correctly, check that the correct operation of the fuel filter resistor.

B. If the contactor is not working correctly, go to step **6**

5. As there is no method for field testing or re-flashing, replace the fuel filter heater contactor **K-F230**. Check if the fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 670400 1127-0 - Turbocharger control: pressure value above the upper threshold

## Control Module: FPT ECU

**Fault Description:**
The control unit of the eVGT actuator **A-F14** sends status and feedback information at regular intervals to the engine control unit (ECU) **A-F02** via the CAN (Controller Area Network) network regarding the operational state of the turbocharger. If the eVGT control unit **A-F14** detects that the pressure value in the turbocharger, due to engine speed or ambient pressure, is much higher than the indicated threshold, this fault occurs.

**Cause:**
The ECU **A-F02** detects that the signals of the turbocharger pressure regulating system (turbocharger speed sensor **B-F17**, overpressure air temperature and pressure sensor **B-F48** and exhaust gas pressure sensor inside the control unit of the exhaust baffle actuator **A-F30**) vary from their standard value or that the eVGT actuator is clogged.

**Possible failure modes:**

1. Fault in the turbocharger speed sensor **B-F17**.
2. Fault in the overpressure air pressure and temperature sensor **B-F48**.
3. Fault in the exhaust gas pressure sensor inside the exhaust baffle actuator control unit **A-F30**.
4. Fault in the eVGT actuator.
5. Fault in the eVGT actuator control unit **A-F14**.
6. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check the correct operation of the turbocharger speed sensor ( **B-F17**).

   A. If the sensor is okay, pass on to point **3**.

   B. If the sensor is not working correctly, replace as required.
3. Check the correct operation of the overpressure air temperature and pressure sensor **B-F48**.

   A. If the sensor is okay, pass on to point **4**.

   B. If the sensor is not working correctly, replace as required.
4. Check the correct operation of the exhaust gas pressure sensor inside the exhaust baffle actuator control unit **A-F30**.

   A. If the sensor is okay, pass on to point **5**.

   B. If the sensor is not working correctly, Replace the control unit.
5. Carry out the checks to test operation of the eVGT actuator.

   A. If faults are identified, repair or replace as required.

   B. If the fault has not been resolved, pass on to point **6**

6. As there is no method for field testing or reprogramming the control unit, replace the eVGT actuator **A-F14** control unit. Check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and the main connectors to check the there are no faults, bent pins or incorrect positioning, corroded terminals or broken wires. Check that the connectors have been installed correctly. Bend the wiring to identify intermittent faults or short circuits in the relevant cables. Operate the machine while you monitor the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

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295467 02F0E7 520194-7 - Throttle valve (TVA): stuck in the closed position ..... 81
295467 03F0E5 520195-5 - Throttle valve (TVA): open circuit error in the power stage ..... 68
295467 03F0E6 520195-6 - Throttle valve (TVA): overcurrent error in the power stage ..... 70
295467 03F0E7 520195-7 - Throttle valve (TVA): stuck on open position ..... 82
295467 06E8FF 518150-31 - Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI2 shut-off ..... 195
295467 0FEEE7 519695-7 - DPF differential pressure sensor: plausibility error in the pipe ..... 234
295467 100-2 640002 - Engine oil pressure not plausible ..... 54
295467 102-15 66000F - Plausibility check for high air pressure upstream of intake valve sensor ..... 226
295467 102-3 660003 - Engine Intake Air Pressure Sensor voltage is higher than expected ..... 228
295467 108-2 6C0002 - Turbocharger boost pressure: value not plausible ..... 215
295467 110-16 6E0010 - Engine coolant temperature has exceeded the pre-warning threshold ..... 129
295467 1116-31 5C041F - Diagnostic fault check to report the error due to injection quantity correction ... 199
295467 1128-18 680412 - Turbocharger boost pressure is lower than expected ..... 446
295467 1136-17 700411 - Short circuit to ground in the ECU temperature sensor (ECU internal error) .... 319
295467 1136-18 700412 - Temperature sensor inside ECU: Temperature too low ..... 67
295467 1136-2 700402 - ECU temperature sensor reading not plausible ..... 320
295467 1231-11 CF040B - CAN error: error on the CAN network node 1 ..... 105
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295467 157-4 9D0004 - Fuel rail pressure sensor voltage is lower than expected ..... 268
295467 15E8FF 518165-31 - Torque limitation activated for engine idle speed correction ..... 380
295467 1648-12 70060C - ECU has an internal fault: "WDA active" reported due to errors in query/response communication ..... 207

295467 1659-2 7B0602 - Deviation between the measured value and expected value of the engine cooling thermostat . . . . . 449
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295467 168-4 A80004 - ECU internal voltage 5V, transfer box: Battery voltage too low . . . . . 96
295467 170E0E 3607-14 - Engine speed limitation via fuel injection cut off is active . . . . . 131
295467 172-2 AC0002 - Plausibility error in temperature sensor 1 . . . . . 89
295467 174-3 AE0003 - Fuel Temperature Sensor voltage is higher than expected . . . . . 158
295467 174-4 AE0004 - Fuel Temperature Sensor voltage is lower than expected . . . . . 160
295467 18-14 12000E - Fuel pressure check: maximum rail pressure in limp home mode . . . . . 259
295467 190-0 BE0000 - Engine overspeed condition identified . . . . . 132
295467 1A151F AE0010 6677-31 174-16 1A15-1F - Fuel temperature has exceeded a maximum limit . . . 453
295467 1B0014 27-20 - EGR Valve: leak in valve in closed position . . . . . 14
295467 1DECE6 519197-6 - EGR Valve: overcurrent error in the power stage . . . . . 16
295467 1EECE3 519198-3 - EGR Valve: short circuit to battery on output 2 of the power stage . . . . . 21
295467 1EECE4 519198-4 - EGR Valve: short circuit to ground on output 2 of the power stage . . . . . 23
295467 1FECE5 519199-5 - EGR Valve: voltage below the minimum threshold . . . . . 26
295467 2791-31 E70A1F - EGR Valve: Current limited . . . . . 12
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295467 3064-7 F80B07 - DPF system: particulate filter damaged . . . . . 366
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295467 3510-5 B60D05 - ECU internal: voltage too low in the power supply of sensor 2 . . . . . 291
295467 3511-12 B70D0C - ECU internal: Error sensor supplies 3 . . . . . 292
295467 3511-3 B70D03 - ECU internal: voltage too high in the power supply of sensor 3 . . . . . 298
295467 3511-5 B70D05 - ECU internal: voltage too low in the power supply of sensor 3 . . . . . 301
295467 3511-6 B70D06 - ECU internal: overtemperature in the power supply of sensor 3 . . . . . 295
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295467 520194-5 02F0E5 - Throttle valve (TVA): voltage below the minimum threshold . . . . . 80
295467 520195-15 03F0EF - Throttle valve (TVA): overtemperature error in the power stage . . . . . 72
295467 520195-3 03F0E3 - Throttle valve (TVA): short circuit to battery on output 1 of the power stage . . 74
295467 520195-4 03F0E4 - Throttle valve (TVA): short circuit to ground on output 1 of the power stage . . 76
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295467 520359-31 A7F0FF - ECU internal failure - Safety management unit alarm group 3 Failure 14 issued . . . . . 409
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295467 660004 102-4 - Engine intake air pressure sensor voltage is lower than expected ..... 230
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295467 7E1410 5246-16 - SCR inducement: level 1 (torque reduction), triggered by fault relating to tampering ..... 308
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# 11.2. DIAGNOSTIC SERVICE MANUAL 100HP MODELS

# SERVICE MANUAL

## F6BGL413A F6BGL413A*V005

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# 540110 ENGINE - Test Visual check crankcase system

## Preparation

- Ignition switch set to OFF position.

## Check oil filler cap

1. Visually check the oil filler cap
   - Visually check for pollution and blow by (oil filler cap dismounted)
   - Go to **2**
2. Check oil filler cap
   - If no pollution or blow by, go to **4**
   - If pollution or blow by is present, go to **3**
3. Possible root cause
   - Vapour coming out
   - Emulsion (condensation and fuel) visible: oil mist clogged and/or incorrect oil type or viscosity

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check ventilation crankcase system

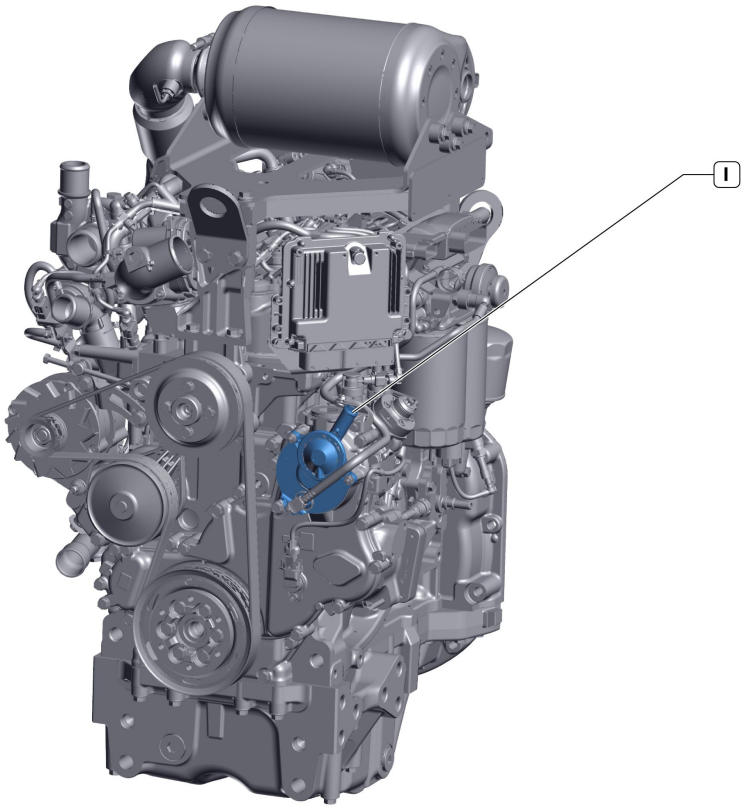
4. Visually check the ventilation lines
   - Check ventilation lines for damage, leaks, pollution and blockage
   - See figures below for aid and go to **5**




275059 1

**Connection from crankcase to intake air system**

| Ref. | Description |
|---|---|
| **(1)** | Pipe from crankcase system |
| **(2)** | Connector to intake air system |




275060 2

**Blow-by valve pipe connector**

| Ref. | Description |
|---|---|
| **(1)** | Blow-by valve connector |

5. Check ventilation crankcase system
   - No damage or leaks
   - No blockage (blockages in the crankcase system may lead to higher boost pressure)
   - If the ventilation crankcase system is OK, go to **7**
   - If the ventilation crankcase system is NOT OK, go to **6**
6. Possible root cause
   - Oil separator clogged
   - Lines damaged, cracked, aged or clogged
   - Rubber seals are damaged or aged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

7. The crankcase system works properly.

# 540610 CYLINDER HEAD - Test Check cylinder mechanics

## Preparation

General checks

- Battery voltage is sufficient
- Vehicle fuses are OK
- Engine oil level correct
- Engine is warm, if possible
- No deposits on the undersides of the valve heads
- Offboard tools: cylinder compression tester tool and cylinder pressure loss tester tool

## Check cylinder compression

Preparation

- Ignition switch set to OFF position
- Remove the fuel injectors
- With suitable piping fixtures, seal off the fuel rail outlets to the fuel injectors
- Unplug the connectors of the crankshaft and camshaft speed sensors

***NOTE:*** *The compression test is used to compare the pressure conditions in the individual combustion chambers.*

1. Check cylinder compression
   - Follow the Cylinder compression tester tool operator manual to connect the pressure gauge to cylinder number 1
   - Crank the engine for **8 s** and record the maximum pressure reached
   - Repeat steps 1 and 2 for all the cylinders.
   - Perform compression test for each cylinder twice
   - Calculate average compression pressure for each cylinder and compare the results
   - See the figure below for indications and go to **2**




271860 1

**Example of cylinder compression tester tool**

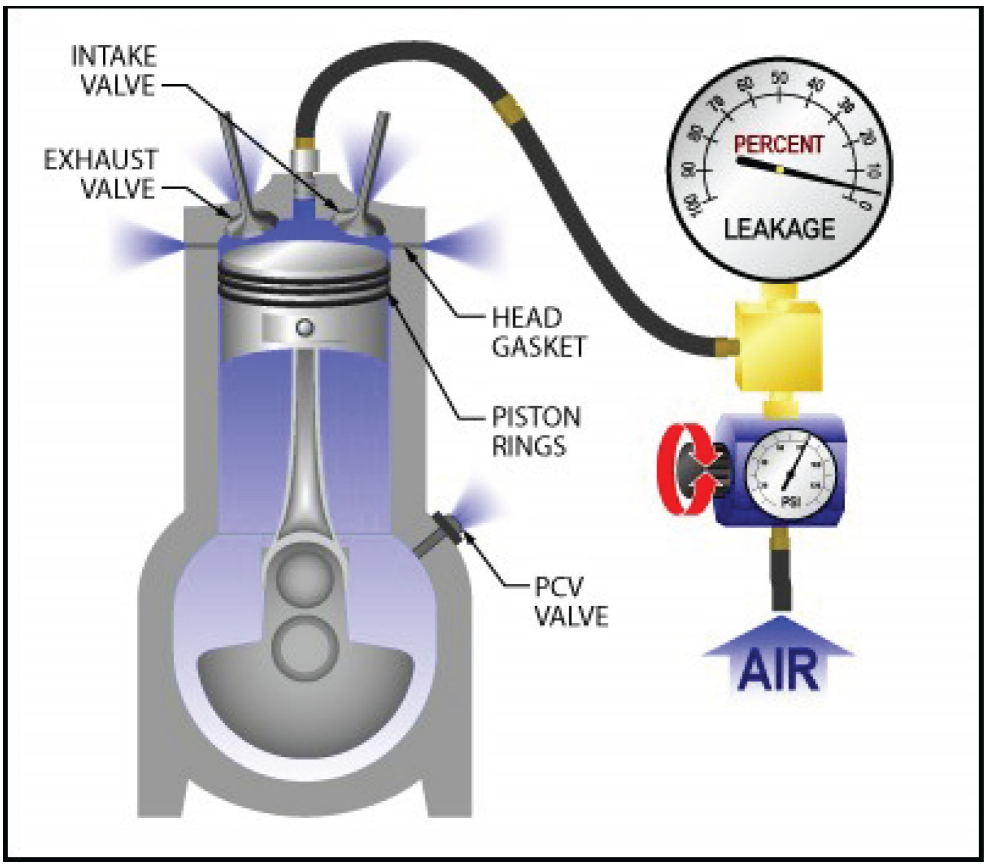
2. Check cylinder compression
   A. Compression should build up quickly in a healthy engine
   B. Similar compression pressure values between all cylinders
   C. If the cylinder compression is OK, go to **4**
   D. If the cylinder compression is NOT OK, go to **3**
3. Possible root cause
   - Low compression reading on the first stroke, followed by gradually increasing pressure on successive strokes: worn piston rings and/or cylinder
   - Low compression reading on the first stroke, which does not build up during successive strokes: leaking valves or a faulty head gasket
   - Low reading from two adjacent cylinders: faulty head gasket between the two cylinders
   - Engine mechanical failure. Deviating compression in one or more cylinders
   - Further check with pressure loss test

***NOTE:*** *After having eliminated the cause of the error, delete the fault memory and repeat the reading.*

## Check cylinder pressure loss

4. Preparation
   - Ignition switch set to OFF position
   - Remove the fuel injectors
   - With suitable piping fixtures, seal off the fuel rail outlets to the fuel injectors
   - The piston must be exactly in the TDC of the compression stroke using a TDC indicator tool
   - Connect the pressure loss tester to the compressed air network ( from **5 bar** to **10 bar**) and calibrate the tester
5. Check cylinder pressure loss
   - Follow the Cylinder pressure loss tester tool operator manual to connect the tool to the suspicious cylinder
   - The pressure loss resulting from leakage is indicated in percent on the Pressure Gauge
   - Check for leaks and noises
   - See the figure below for indications and go to **6**

***NOTE:*** *The expected value for the pressure loss is displayed as a percentage.*




271861 2

**Schematic of the pressure loss test**

6. Check cylinder pressure loss
   - If the indicated air leakage percentage is in the OK area, go to **8**
   - If the indicated air leakage percentage is not in the OK area, go to **7**

7. Possible root cause
   - Noises in the exhaust – Exhaust valve leaking
   - Noises in the intake tract – Inlet valve leaking
   - Noises on crankcase ventilation, oil filler cap or oil dipstick – Wear of cylinder track, piston rings, crack or hole in the piston, defective cylinder head gasket
   - Noises at the injector opening of the adjacent cylinder – cylinder head gasket leaking
   - Bubble formation in the cooling system – cylinder head gasket leaks, crack(s) in the cylinder head

***NOTE:*** *After having eliminated the cause of the error, delete the fault memory and repeat the reading.*

8. The cylinder works properly.

# 540744 EGR VALVE - Test Check the EGR valve actuator

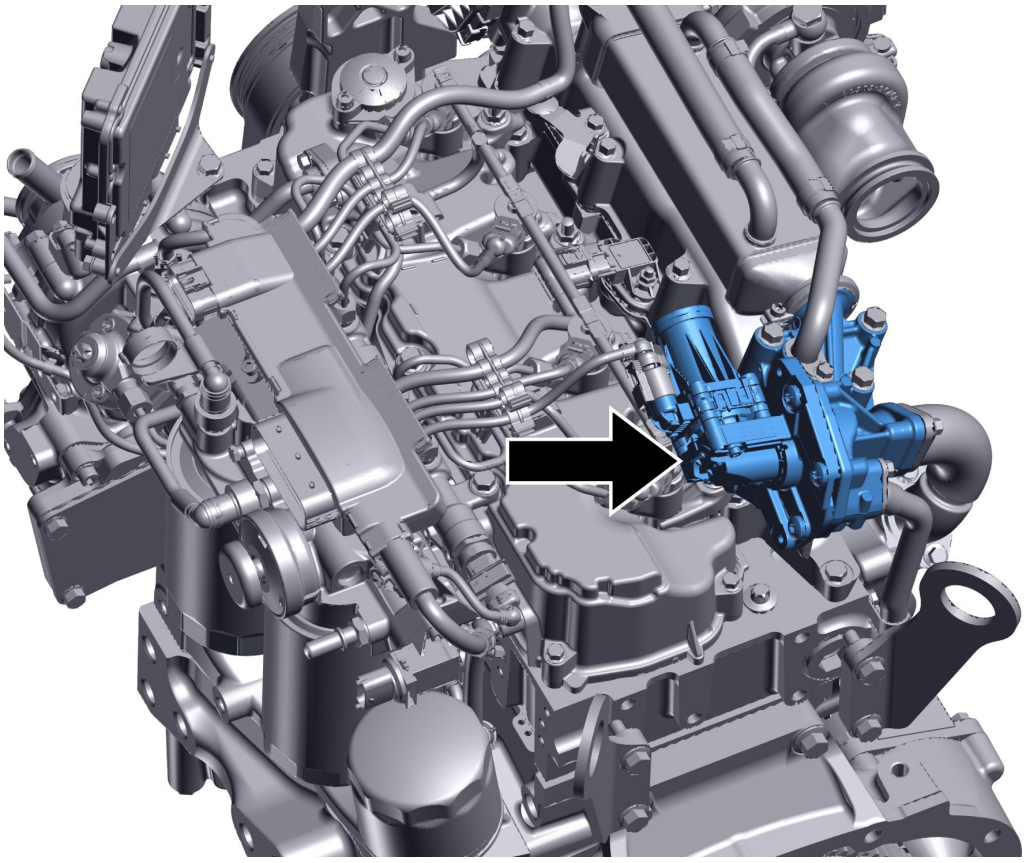
## Preparation

General checks

- Ignition switch set to OFF position

## Check

1. Check the EGR system
   - Visually check for damage or leaks in the fittings and in the pipes of the EGR valve
   - Remove the pipes to allow a visual check of the EGR valve
   - Manually check that the EGR valve is working correctly
   - See the figure below for the location of the EGR valve, then go to **2**



275038 1

**EGR valve location**

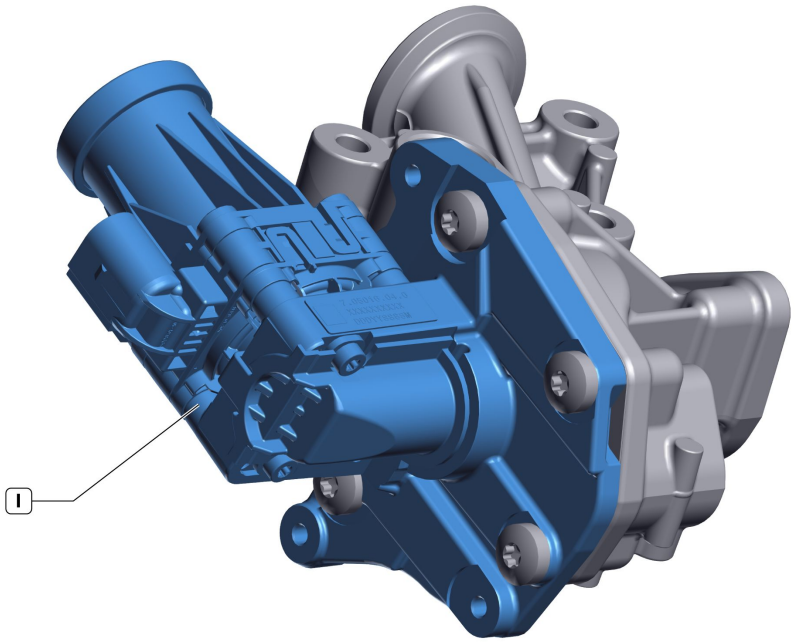
2. Check the EGR valve
   A. Fittings, flanges and pipes correctly fastened
   B. No sticking or damage to the EGR valve
   C. If the EGR valve is working correctly, go to **4**
   D. If the EGR valve is NOT working correctly, go to **3**

3. Possible root cause
   - Fittings, flanges and pipes not fastened correctly
   - EGR valve blocked or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check operation of the EGR valve

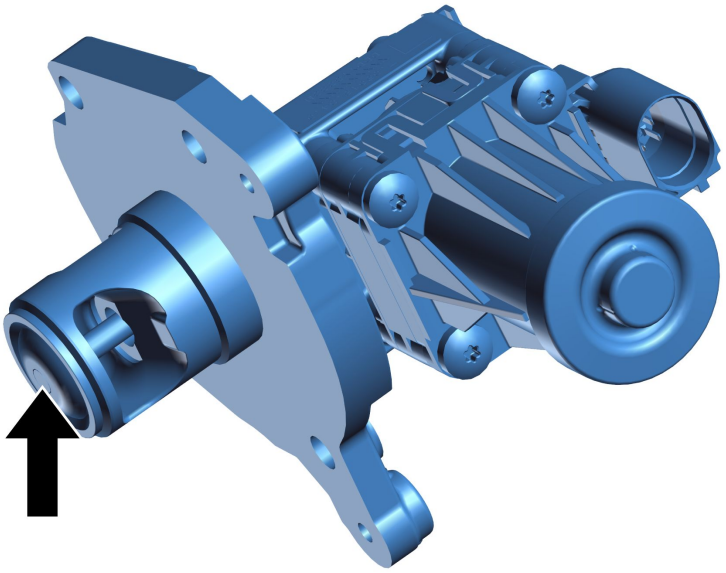
4. Check operation of the EGR valve
   - Remove the EGR valve from the engine
   - Operate the EGR valve by powering it with battery voltage
   - Use a dial gauge to check that the stroke completed by the EGR valve corresponds to the nominal value of **6 mm**
   - See the figure below and go to **5**




275039 2

**EGR valve actuator**

| Ref. | Description |
|---|---|
| (1) | EGR valve actuator module |



275040 3

**Location of EGR valve throttle**

5. Check operation of the EGR valve
   A. No sticking or damage to the EGR valve throttle
   B. No faults or damage to the EGR valve actuator module
   C. Complete opening of the EGR valve ( **6 mm**)
   D. If the EGR valve is operating correctly, go to **7**
   E. If the EGR valve is NOT operating correctly, go to **6**
6. Possible root cause
   - EGR valve throttle blocked or damaged
   - Actuator module of the EGR valve faulty or damaged
   - Electrical fault in the component. Check the wiring and the component electrically

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

7. The EGR valve is working correctly, .

# 542010 FILTER ASSEMBLY - Test Check external fuel leakage engine area

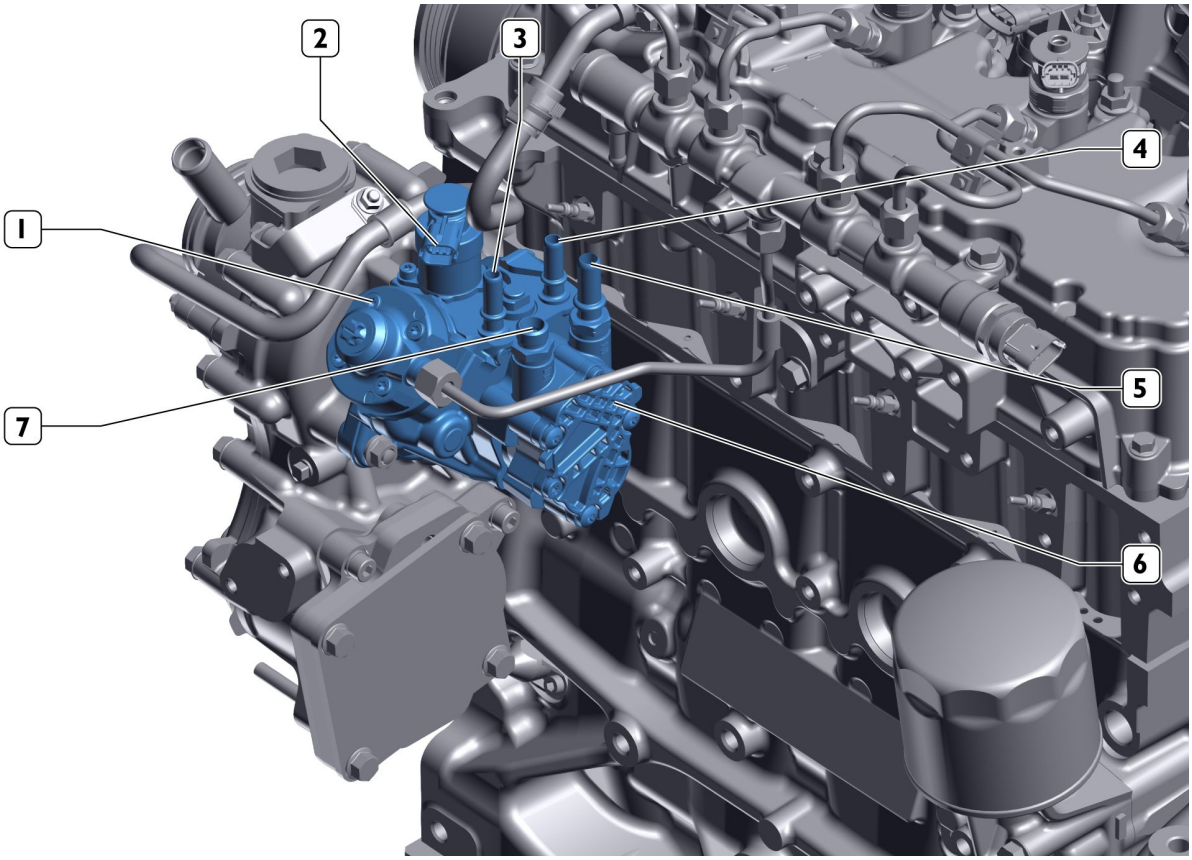
## Preparation

- Run the engine till it reaches normal operating temperature.

## Check

Check external fuel leakage engine area

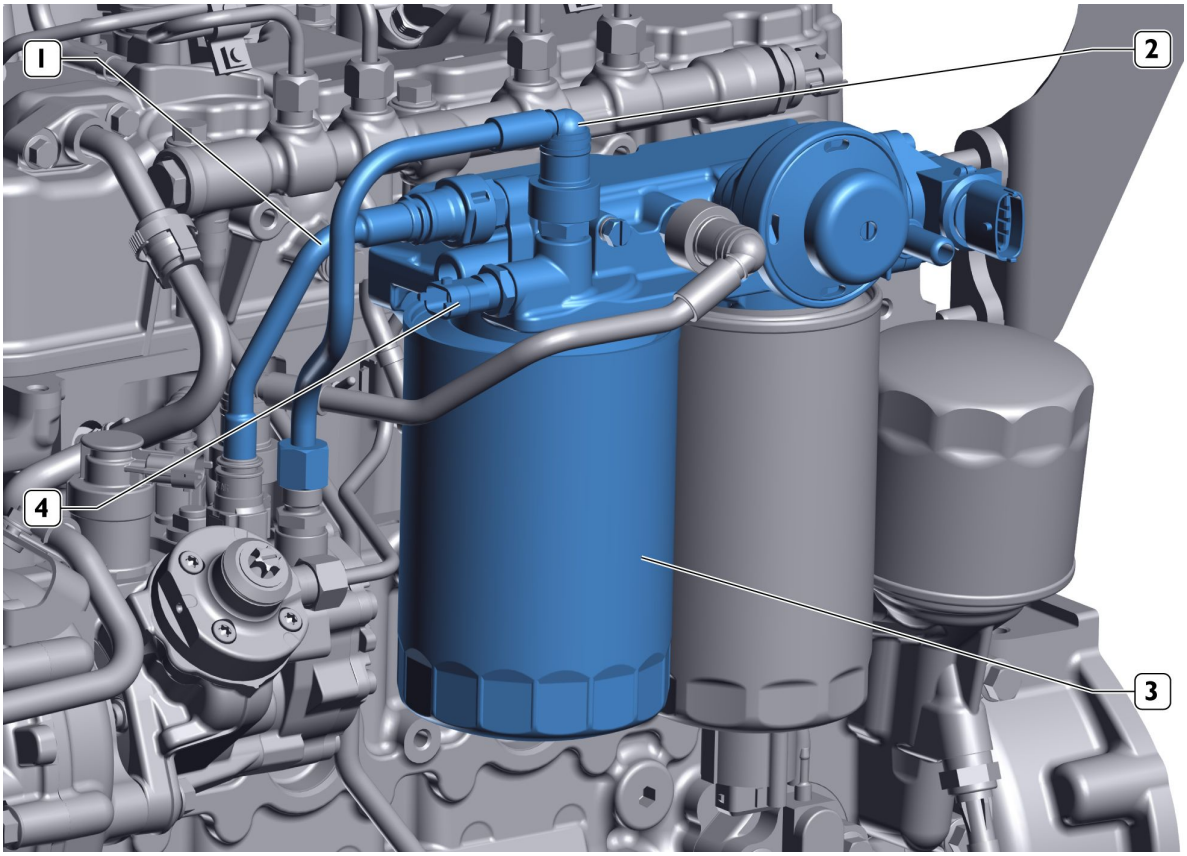
- Check for fuel leakage at low pressure hose connectors
- Check connectors of the fuel filter
- Check connectors of the high pressure pump
- Check connectors of the metering unit
- Check for kinked fuel hoses
- See figures below for explanation and go to **1**




275054 1

**Location of the main components of the fuel pump**

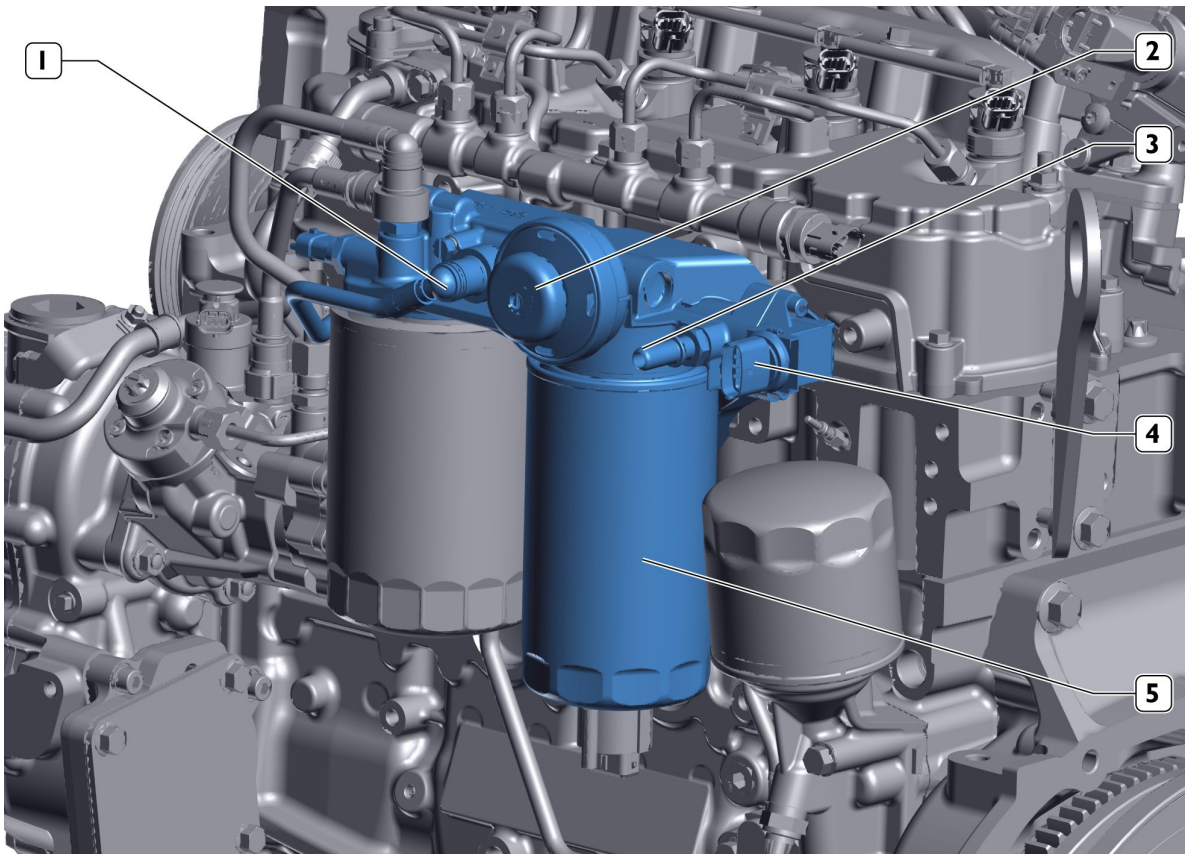
| Ref. | Description |
|---|---|
| **(1)** | High-pressure pump |
| **(2)** | Pressure regulator valve (fuel metering unit) |
| **(3)** | High pressure pump from main filter |
| **(4)** | Return to reservoir |
| **(5)** | Low pressure pump intake from pre-filter |
| **(6)** | Gear low pressure pump |
| **(7)** | Delivery from low pressure pump to main filter |




276359 2

**Location of the main filter components**

| Ref. | Description |
|---|---|
| **(1)** | Outlet from main filter outlet to high pressure pump |
| **(2)** | Main filter inlet from low pressure pump |
| **(3)** | Main fuel filter |
| **(4)** | Fuel temperature sensor |




276358 3

**Location of pre-filter components**

| Ref. | Description |
|---|---|
| **(1)** | Outlet from pre-filter to low pressure pump |
| **(2)** | Manual priming pump |
| **(3)** | Pre-filter inlet |
| **(4)** | Fuel heater |
| **(5)** | Pre-filter |

1. Check for visible external fuel leakage in the engine area
   A. If no external fuel leakage in the engine area is visible, go to **3**
   B. If external fuel leakage in the engine area is visible, go to **2**
2. Possible root cause
   - Connectors loose or worn
   - Hoses are damaged

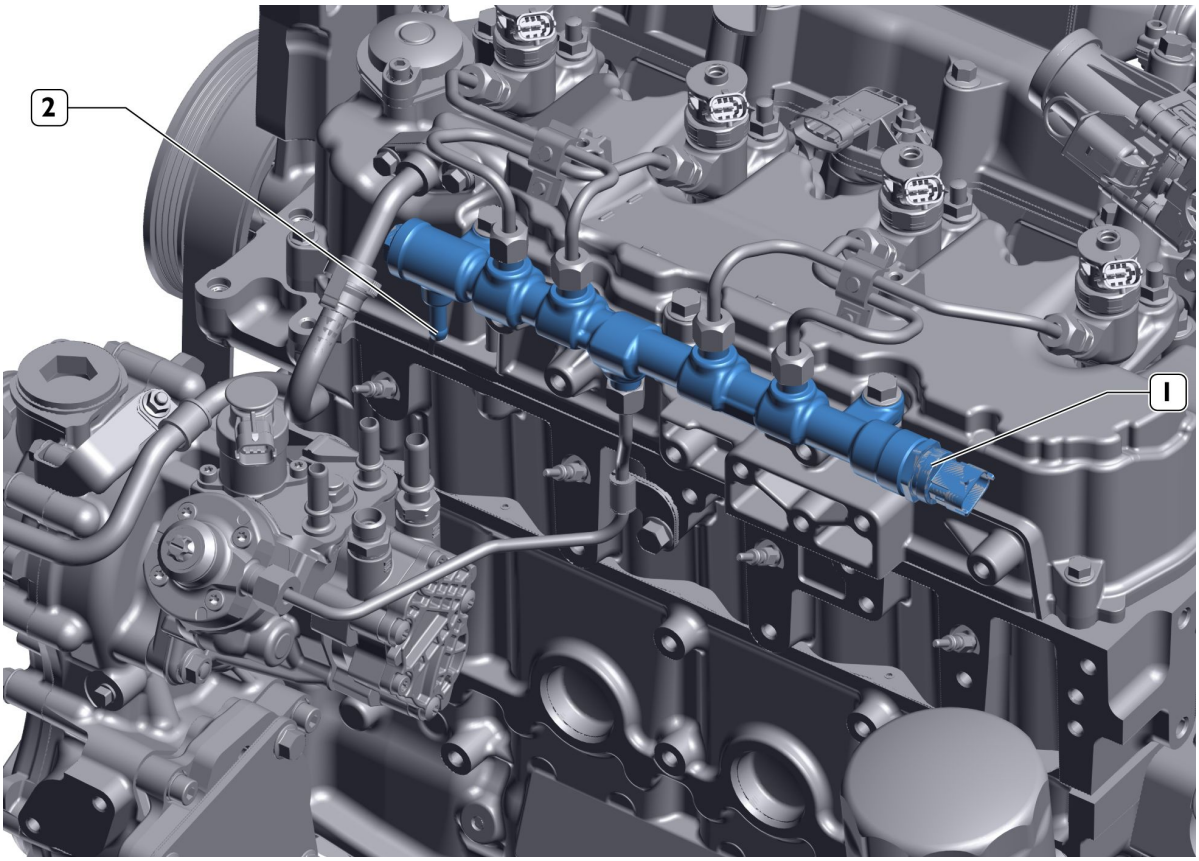
***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The fuel system works properly.

# 542024 ONE-WAY FEED PIPE - Test Check pressure limiting valve (PLV) backflow rate

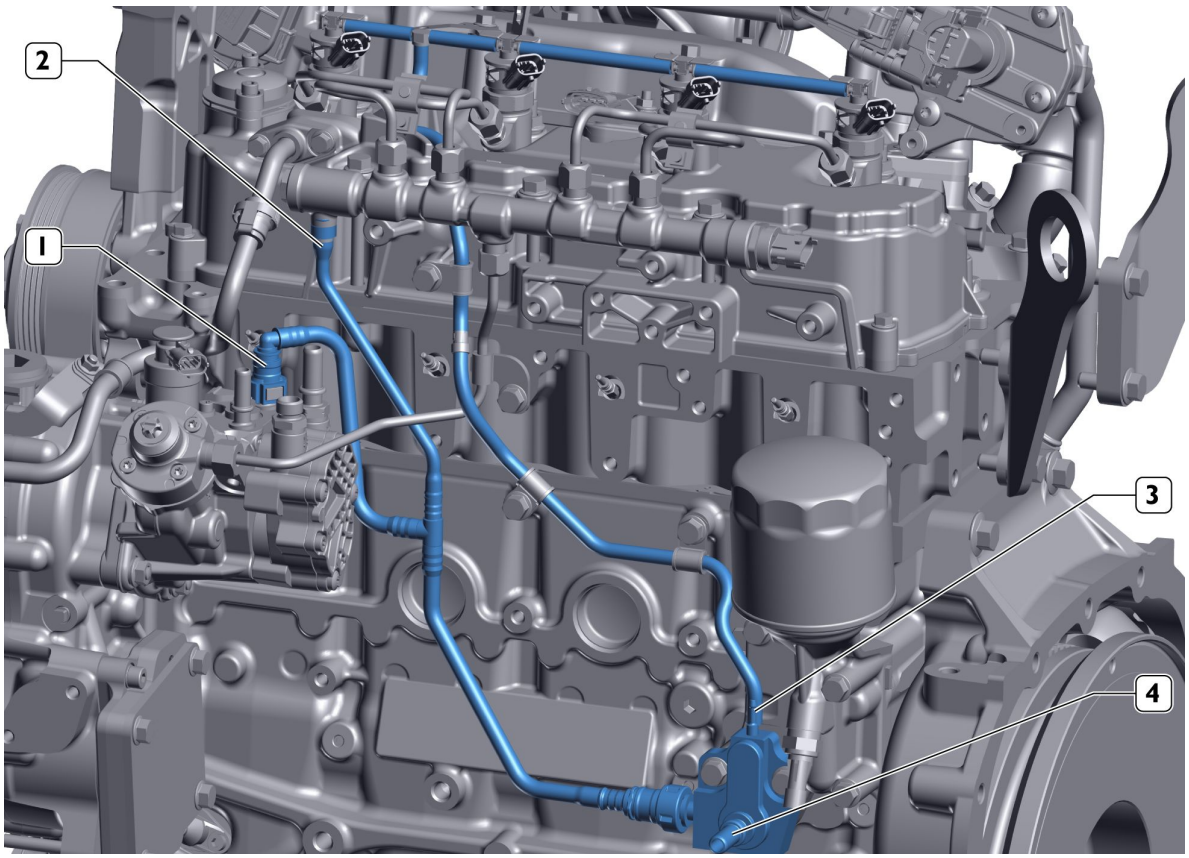
## Preparation

- Disconnect the connection pipe to the pressure limiting valve fitting (PLV)
- Connect the adaptor and hose to the pressure limiting valve backflow line (PLV)
- Plug the fitting on the connecting pipe to the pressure limiting valve (PLV)
- Tighten the system (ensure that there is no leakage)
- Prepare the measuring cup
- To prepare for the operation, observe the figures below:




275052 1

| Ref. | Description |
|---|---|
| (1) | Pressure sensor |
| (2) | Pressure limiting valve |




276360 2

**Location of the backflow line**

| Ref. | Description |
|---|---|
| **(1)** | Backflow fitting to tank from high pressure pump |
| **(2)** | Pressure limiting valve backflow fitting |
| **(3)** | Injectors total backflow fitting |
| **(4)** | Total backflow to tank |

## Check

Offboard tools

- Hose and adapter at the fitting on the PLV valve
- Plug the fitting on the connecting pipe to the pressure limiting valve (PLV)
- Measuring cup (minimum **250 mL**)

Check: Engine can start.

- If possible second person should increase speed to **1500 RPM** and go to **1**

Check: Engine cannot start.

- Turn the ignition to ON position and use the starter to crank the engine and go to **1**

***NOTE:*** *For the measurement of backflow in **60 s** under cranking condition, crank the engine for 5-6 times, and **10 s - 12 s** each time is recommended. The starter may be damaged if works continuously for a long time.*

1. Check there is no return flow into the pressure limiting valve outlet (PLV).
   A. If there is no return flow into the pressure limiting valve outlet (PLV), go to **3**
   B. If there is a return flow into the pressure limiting valve outlet (PLV), go to **2**
2. Possible root cause
   - Pressure limiting valve (PLV) in the opening position
   - Leak in the pressure limiting valve (PLV)

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The pressure limiting valve (PLV) works properly.

# 542410 TURBO CHARGER - Test Check turbo system

## Preparation

- This check requires the pressure hand pump as off-board tool



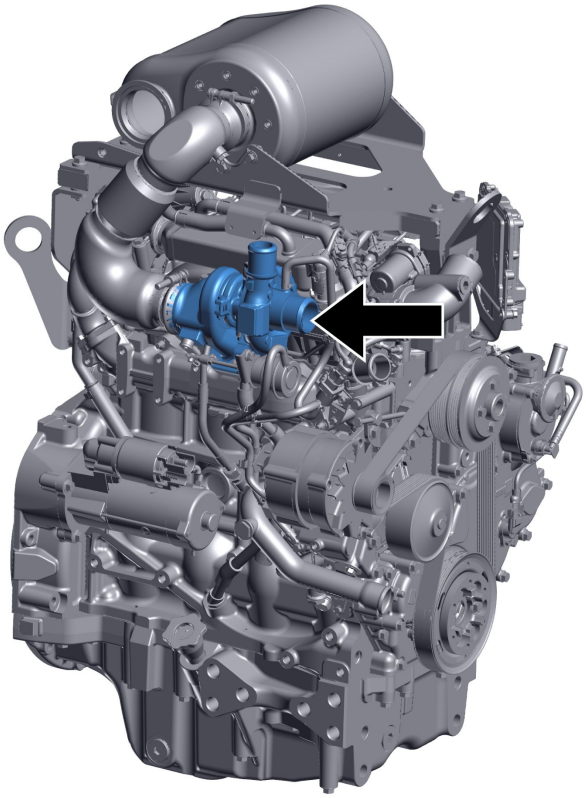
271746 1

**Example of pressure hand pump**

## Check turbo charger

1. Check turbo charger.
   - Start engine in low idle
   - Check the turbo charger mechanical sounds
   - Turn the ignition switch to OFF position
   - Dismount the air intake and boost pressure pipes to get access to the turbo charger blades
   - Visually check the turbo charger for debris
   - Check manually the rotation of the turbo charger wheel by moving it
   - Check manually the bearing of the turbo charger by feel if it is moving under pressure
   - See figure below for aid and go to **2**

***NOTE:*** *Please take special care/attention to not damage the turbo. Use clean gloves when touching the turbo wheel blade. Only use small amount of force to move the wheel.*



275030 2
**Air turbo charger**

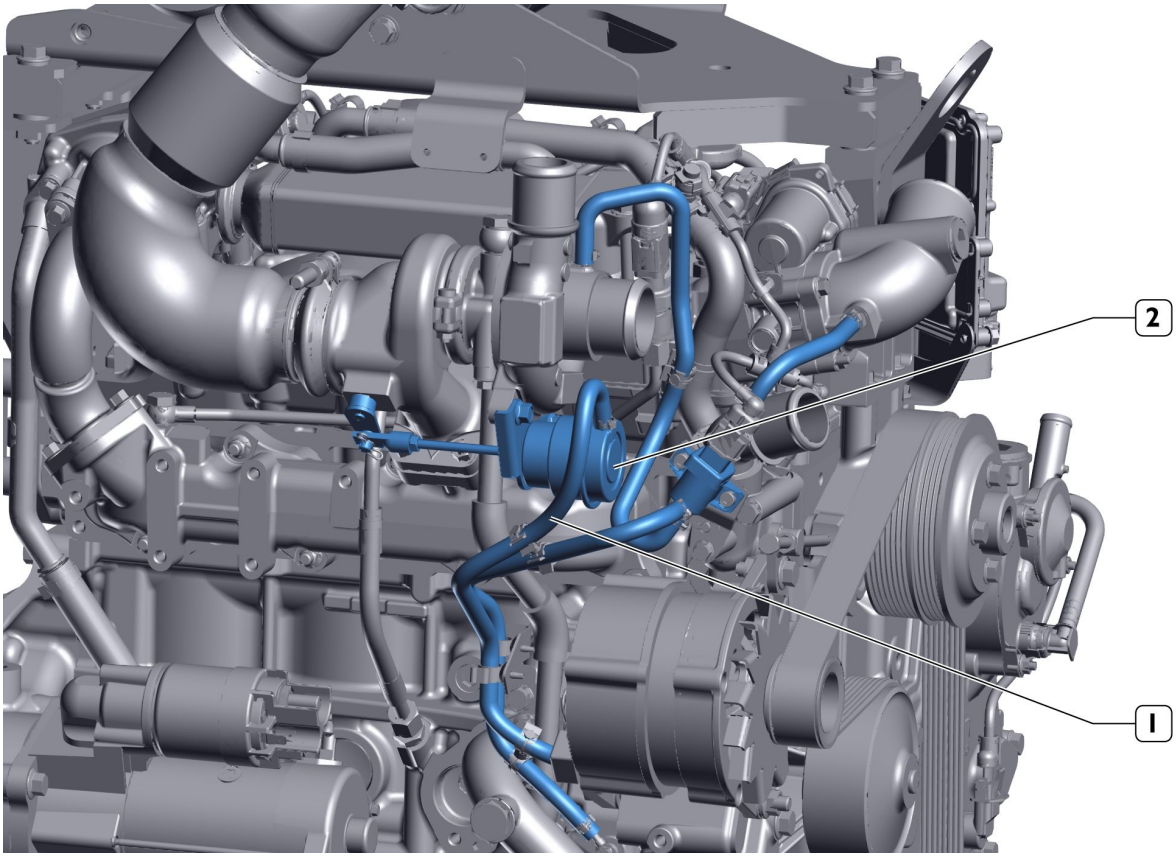
2. Check turbo charger
   A. Bearing of the turbo charger not damaged
   B. Compressor and/or turbine wheels of the turbo charger not blocked or stiff
   C. Turbo charger not damaged
   D. If turbo charger is not damaged, go to **4**
   E. If turbo charger is damaged, go to **3**
3. Possible root cause
   - Bearing of the turbo charger damaged
   - Compressor and/or turbine wheels of the turbo charger blocked or stiff
   - Turbo charger damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check wastegate valve

4. Check wastegate valve.
   - Visually check the wastegate valve for debris
   - Check if the hose of the wastegate valve is lose or damaged
   - Use a pressure hand pump to check the correct actuation of the wastegate valve
   - See figure below for aid and go to **5**

***NOTE:*** *Pump and monitor gradually the pressure at wastegate valve in order to check if the actuation of the valve is reached at lower pressure than* ***2.5 bar****(absolute pressure). The air pressure changes constantly depending on altitude or weather conditions. Therefore, the pressure is absolutely measured during our tests. The pressure is always related to absolute zero - the absolute vacuum p(abs)= p(amb) +p(bar).*




275031 3

**Wastegate valve**

| Ref. | Description |
|---|---|
| **(1)** | Wastegate valve hose |
| **(2)** | Wastegate valve |

5. Check wastegate valve.
   A. Wastegate valve hose not lose and not damaged
   B. Wastegate valve leverage not blocked and not damaged
   C. Wastegate valve not blocked and not damaged
   D. Check the moving of the wastegate rod at approximately **2.5 bar** (absolute pressure) for the actuation of the valve
   E. If wastegate valve is not damaged, go to **7**
   F. If wastegate valve is damaged, go to **6**
6. Possible root cause
   - Wastegate valve hose lose or damaged
   - Wastegate valve leverage blocked or damaged
   - Wastegate valve blocked or damaged (probably caused by damaged valve spring)

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

7. The turbo charger works properly.

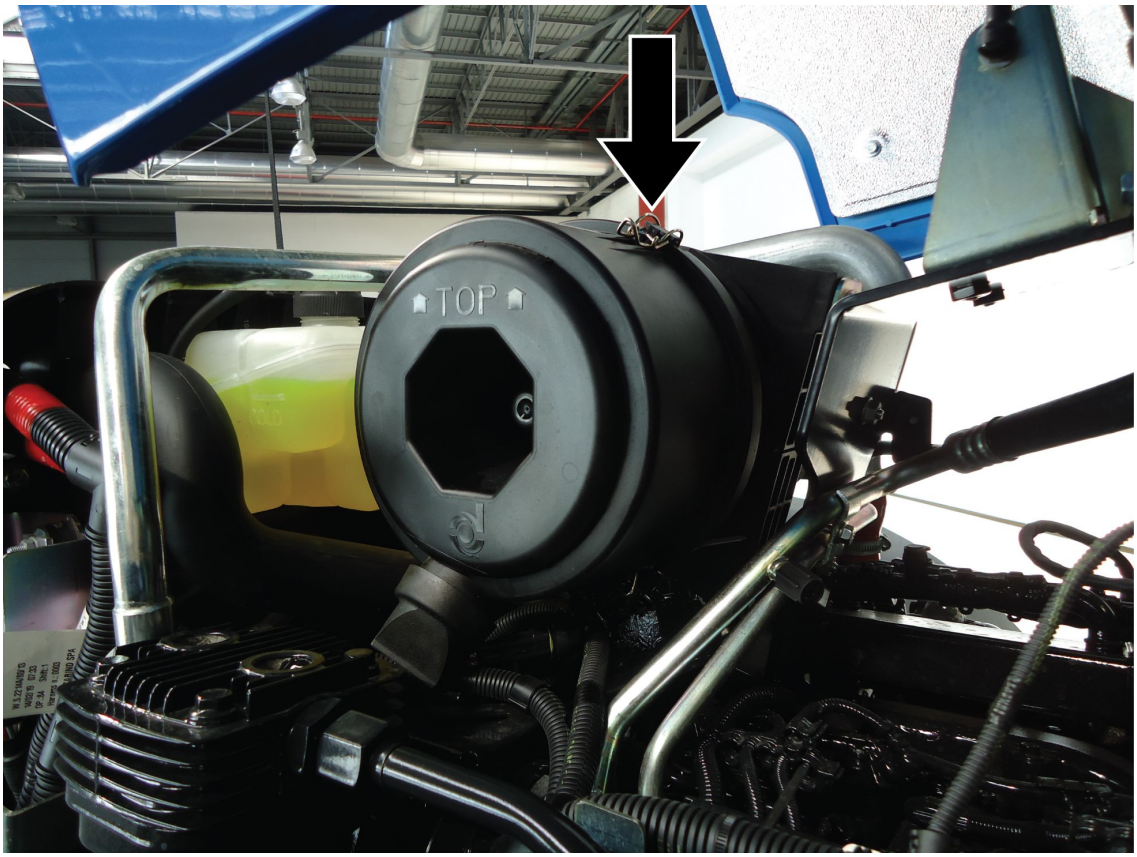
# 542420 AIR DELIVERY PIPES - Test Check intake air system

## Preparation

- Ignition switch set to OFF position.
- Air filter clean.

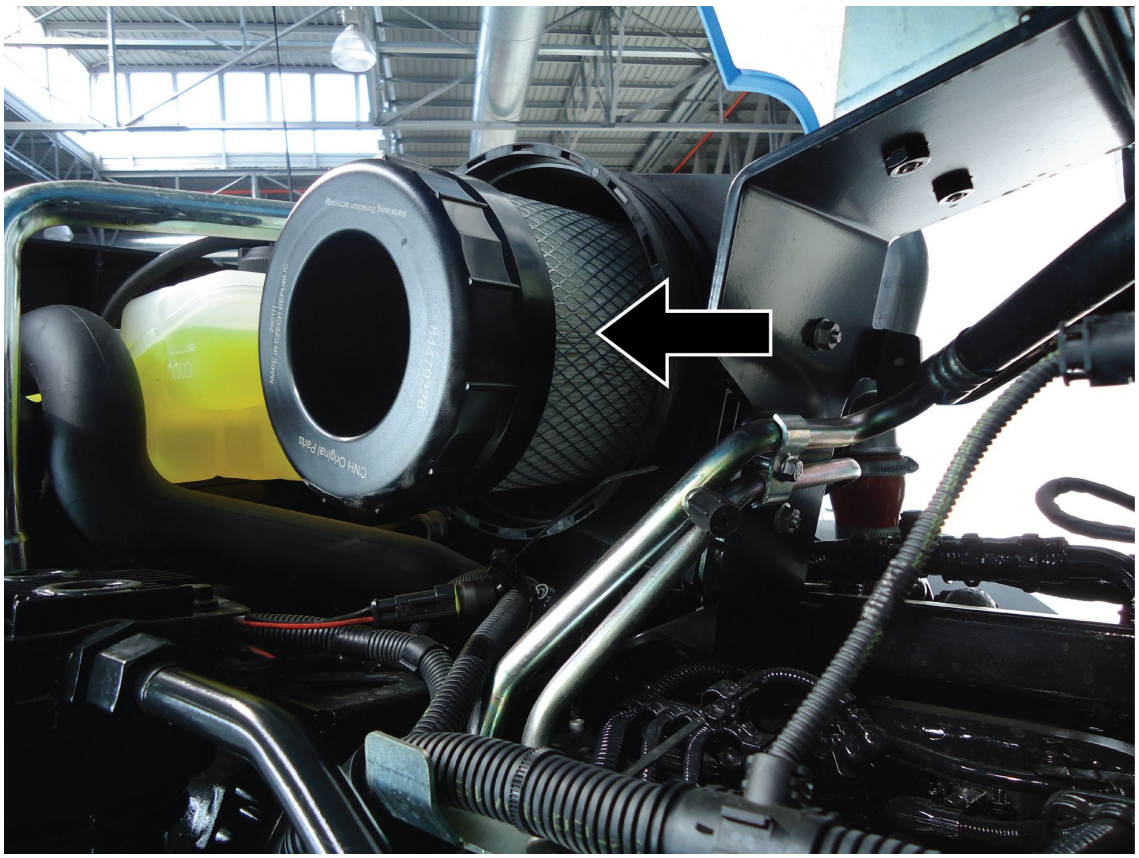
## Visually check air filter and housing

1. Visually check air filter and housing.
   - Check air filter cover/housing clamps for correct fitting and tightness.
   - Open the air filter and housing.
   - Visually check air filter and housing for any contamination.
   - Visually check air filter and housing for physical damage.
   - See figures below for aid and go to **2**




275023 1

**Air filter housing clamps**



275024 2

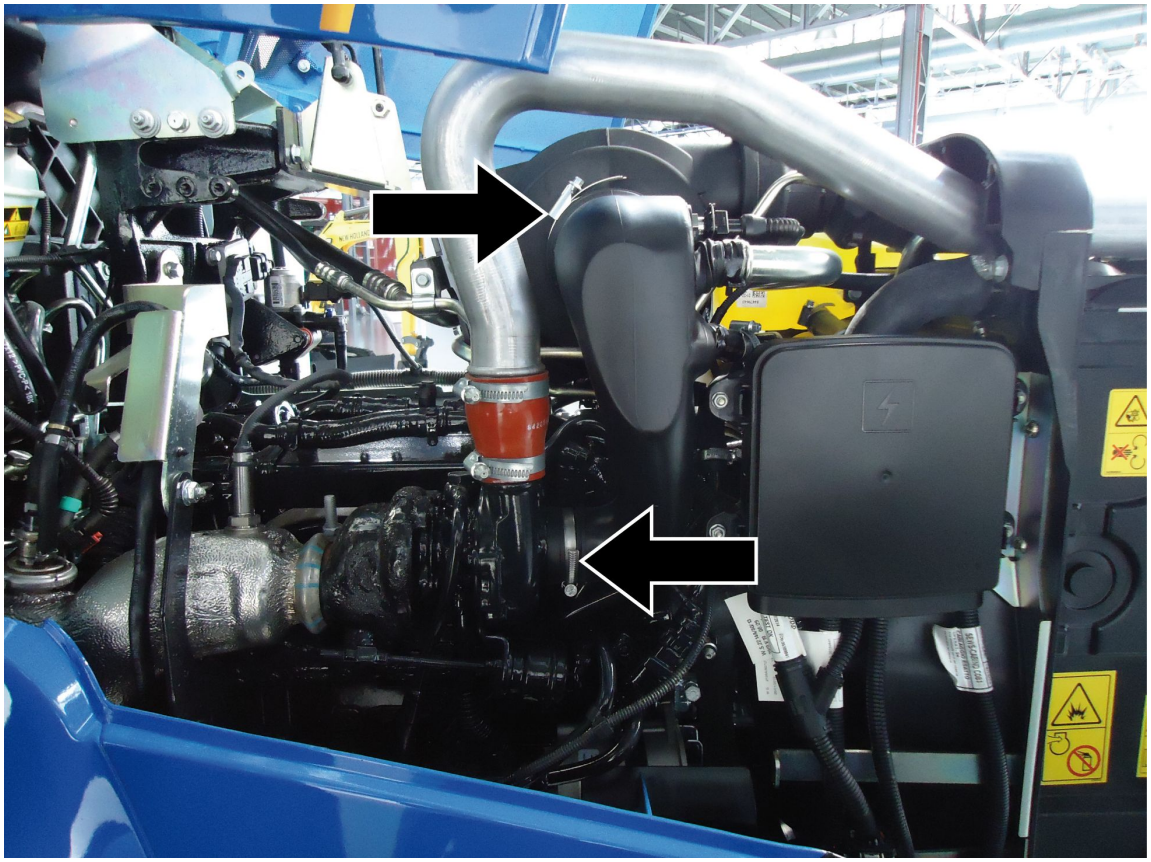
**Intake air filter**

2. Check if air filter and housing are OK.
   A. No loose clamps.
   B. Air filter are not clogged.
   C. Air filter housing are not damaged.
   D. If air filter and housing are OK, go to **4**.
   E. If air filter and housing are NOT OK, go to **3**.
3. Possible root cause
   - Loose clamps.
   - Air filter clogged, causing too low air flow.
   - Damaged air filter housing.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Visually check air pipes

4. Visually check air pipes.
   - Visually check intake air pipes for correct fittings and tightness.
   - See figures below for aid and go to **5**



275025 3

**Intake air pipe upstream of the turbocharger**

5. Check if air pipes are OK.
   A. Air pipes are not damaged.
   B. Air pipes are installed correctly.
   C. If air pipes are OK, go to **7**.
   D. If air pipes are NOT OK, go to **6**.
6. Possible root cause
   - Air pipes are damaged.
   - Air pipes are not installed correctly.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

7. The intake air system works properly.

# 542420 AIR DELIVERY PIPES - Test Check charge air system

## Preparation

- Ignition switch set to OFF position.
- Air filter is clean
- Offboard tools: recommended tools BOSCH SMT 300




271804 1

**Example of smoke test tool (Bosch SMT 300)**

## Visually check air charge piping

1. Visually check the following air charge piping for damages, loose fittings, tightness:
   - Air charge pipes upstream and downstream the turbo charger.
   - Pipes upstream and downstream the charge air cooler.
   - Pipe from the charge air cooler to the intake air manifold.
   - See figures below for aid and go to **2**




275026 2

**Boost pressure lines**

| Ref. | Description |
|---|---|
| (1) | Exhaust pipe outlet from Turbocharger |
| (2) | Supercharging air pipe to heat exchanger |




275027 3

**Boost pressure lines to intake air manifold**

| Ref. | Description |
|---|---|
| **(1)** | Pipe from the charge air cooler to intake air manifold |

2. Check air charge piping:
   A. Charge pipes are not damaged.
   B. No loose clamps.
   C. If air charge piping is not damaged, go to **4**.
   D. If air charge piping is damaged, go to **3**.
3. Possible root cause
   - Charge pipes damaged.
   - Loose clamps.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check air cooler and pressure pipes with smoke test tool

***NOTE:*** *Basic Testing Procedure*

4. The following procedure **5** describe how to perform a basic testing procedure in order to detect air cooler and/or pressure pipes leakages. Through this procedure is possible to check the following components:
   - Gasket leak.
   - Clamps leak.
   - Pipe/manifold damages.
   - Charge air cooler damages.

5. Procedure:
   - Connect the smoke test tool to workshop air supply.
   - Connect the smoke test tool to battery supply terminals.
   - Connect smoke supply hose to system being tested (flow control valve full opened).
   - Press “ON” button and fill system with smoke for **5 min**.
   - Use white light supplied and look for exiting smoke or use ultraviolet light supplied to look for fluorescent dye deposit at exact location of a leak.
   - See figures below for aid and go to **6**



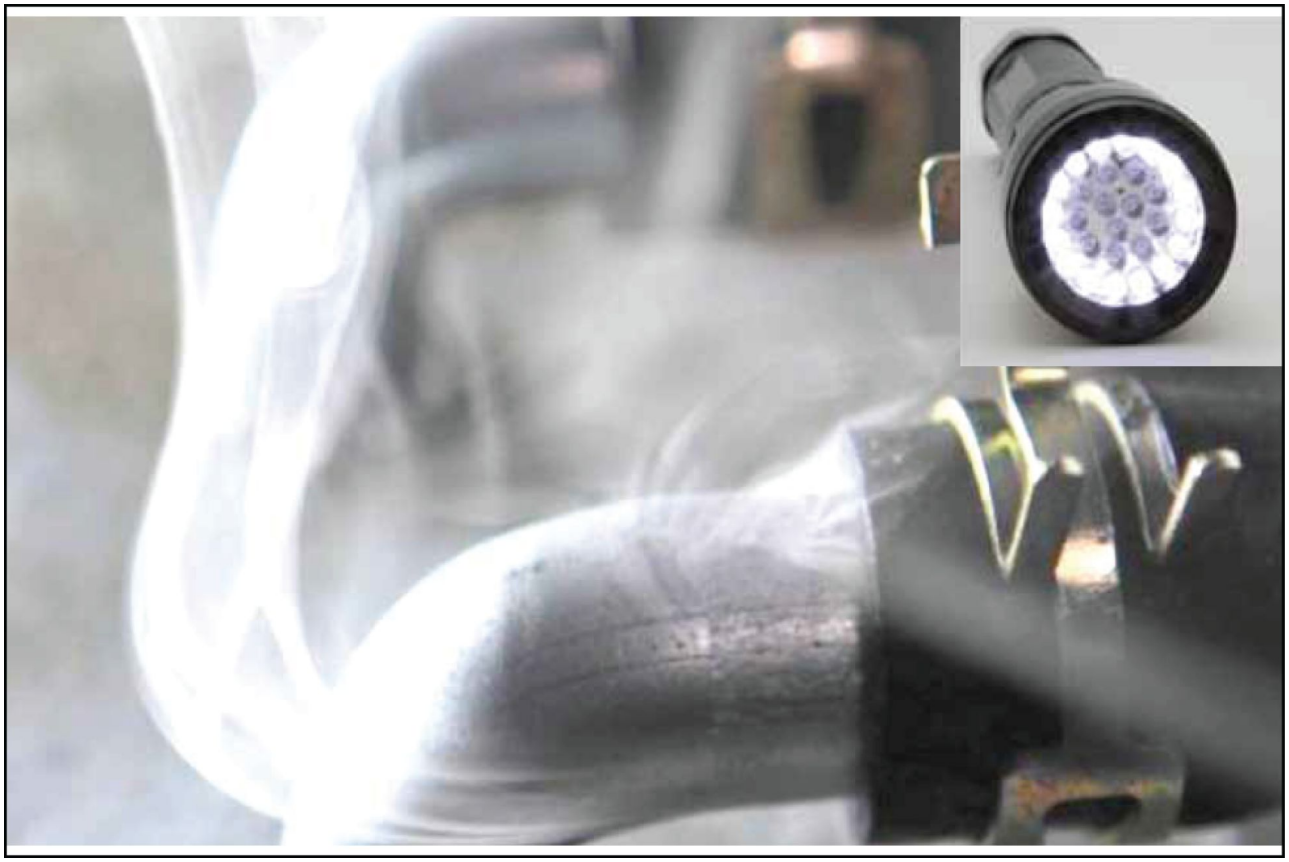
271808 4

**Example of smoke test tool for air intake leakage check**



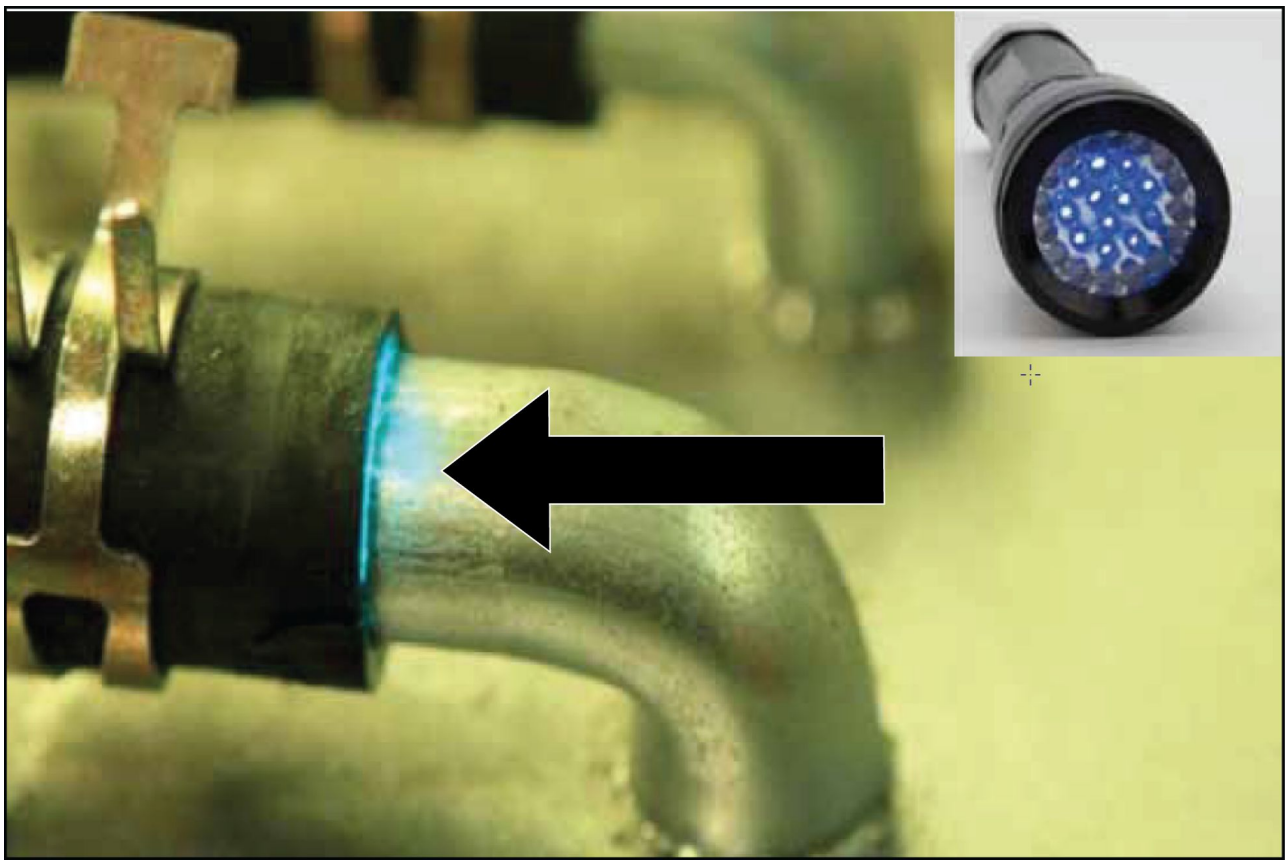
271809 5

**Example of leakage detection with smoke test tool**



271810 6

**Vapours can be identified under white light (example)**



271811 7

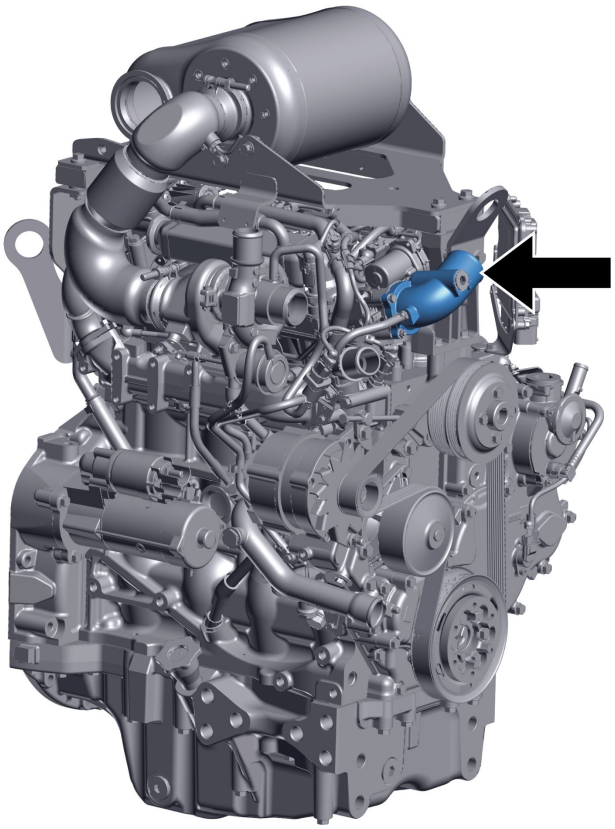
**Dye can be identified under UV light with yellow glass**

6. Smoke leak test the air cooler and charged air pipes with smoke leak tester
   A. Charge air pipes are not damaged
   B. Charge air pipes are correctly fitted
   C. Charge air cooler pipes are not damaged
   D. Charge air cooler pipes are correctly fitted
   E. Charge air cooler is not damaged
   F. Gasket/seals are not damaged
   G. If charge air cooler is not damaged, go to **8**.
   H. If charge air cooler is damaged, go to **7**.
7. Possible root cause
   - Charge air pipes are damaged
   - Charge air pipes are not correctly fitted
   - Charge air cooler pipes are damaged
   - Charge air cooler pipes are not correctly fitted
   - Gasket/seals are damaged
   - Intake air manifold is not correctly fitted and/or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Visually check intake air manifold

8. Visually check intake air manifold
   - Start engine and run the engine in idle.
   - Visually check the intake air manifold for leaks/wall cracks.
   - See figure below for aid and go to **9**



275028 8

**Intake air manifold location**

9. Visually check intake air manifold
   A. Intake air manifold correctly fixed and not damaged.
   B. If intake air manifold is OK, go to **11**.
   C. If intake air manifold is NOT OK, go to **10**.
10. Possible root cause
    - Intake air manifold is not correctly fixed or damaged.
    - Damaged gasket.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Visually check charge air cooler air leakage

11. Check charge air cooler
    - Ignition switch set to OFF position
    - Check charge air cooler for cracks and damages
    - Check the charge air pipes to/from the air cooler for damage/spits/loose fitting
    - Check on air leakage using pressurized air
    - Ignition switch set to ON position and start engine
    - Check on air leakage during idle
    - See figure below for aid and go to **12**




275029 9

**Charge air cooler pipes**

| Ref. | Description |
|---|---|
| **(1)** | Pipe from turbocharger to supercharging air heat exchanger |
| **(2)** | Charge air cooler pipe to intake air manifold |

12. Check charge air cooler
    A. Charge air cooler is neither damaged nor cracked.
    B. Charge air cooler pipes are neither damaged nor cracked.
    C. If charge air cooler is not damaged, go to **14**.
    D. If charge air cooler is damaged, go to **13**.

13. Possible root cause
    - Damaged charge air cooler
    - Damaged charge air cooler pipes

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

14. The charge air system works properly.

# 543420 FAN - Test Check cooling system

## Preparation

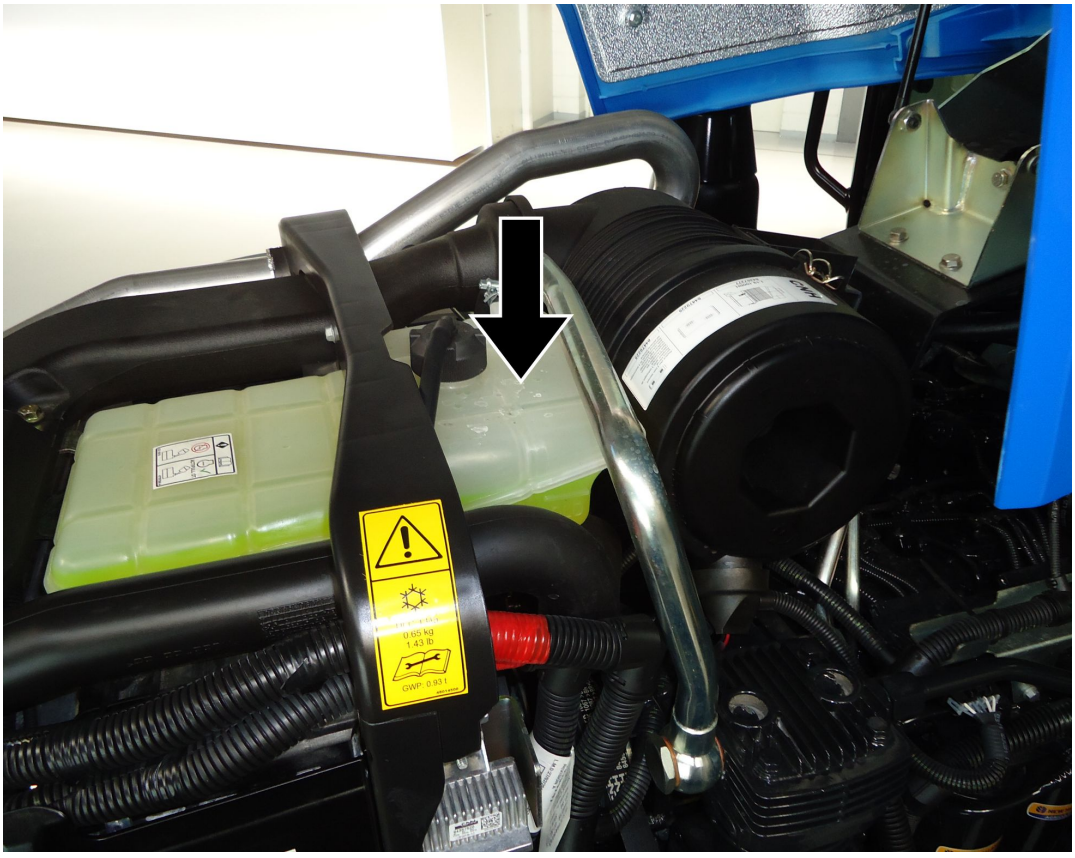
- Ignition switch set OFF position
- Sufficient coolant liquid available at coolant reservoir

## Check coolant reservoir

1. Static pressure test with engine OFF
   - Turn the engine OFF and make sure that the engine is not hot
   - Carefully remove the coolant cap from the expansion coolant bottle, be aware of any trapped/ hot coolant
   - Make sure that coolant is at the recommended level in the expansion coolant bottle
   - Select a suitable cap adapter, wet its rubber gasket with water/ coolant and fit it carefully to the expansion coolant bottle, make sure that the adapter cap properly seals the expansion coolant bottle
   - Install the pressure pump onto the adapter using the quick-connect
   - Using the pump, pressurise the system to the customer specified value
   - When the pressure reach the determined pressure value, stop pumping and watch the pump pressure gauge. If the pressure start to decrease, this indicate a leak in the system
   - With the system kept pressurised, check the radiator and housing for external leak and also check engine oil cooler for internal leakage
   - After the test is completed, depressurised the coolant system and fill the coolant to the correct level, refit the coolant cap
   - If static pressure test with engine OFF is OK, go to **2**
   - If static pressure test with engine OFF is not OK, go to **3**

2. Dynamic pressure test with engine ON
   - Turn the engine ON at idle and make sure that the engine is not hot
   - Carefully remove the coolant cap from the expansion coolant bottle, be aware of the any trapped/ hot coolant
   - Make sure that coolant is at the recommended level in the expansion coolant bottle
   - Select a suitable cap adapter, wet its rubber gasket with water/ coolant and fit it carefully to the expansion coolant bottle, make sure that the adapter cap properly seals the expansion coolant bottle
   - Install the pressure gauge onto the adapter using the quick-connect
   - Start the engine and monitor the pressure gauge. A rapid increase in coolant pressure indicate a damage cylinder head or cylinder head gasket, which leaks cylinder pressure to the coolant system
   - After the test is completed, stop the engine and depressurised the coolant system and fill the coolant to the correct level, refit the coolant cap
   - See figure below for aid and go to **3**

***NOTE:*** *The pressure pump, the adapter and the quick-connect are included in the coolant system pressure testing tool and they should useful for both cooling pressure test procedures.*



275034 1

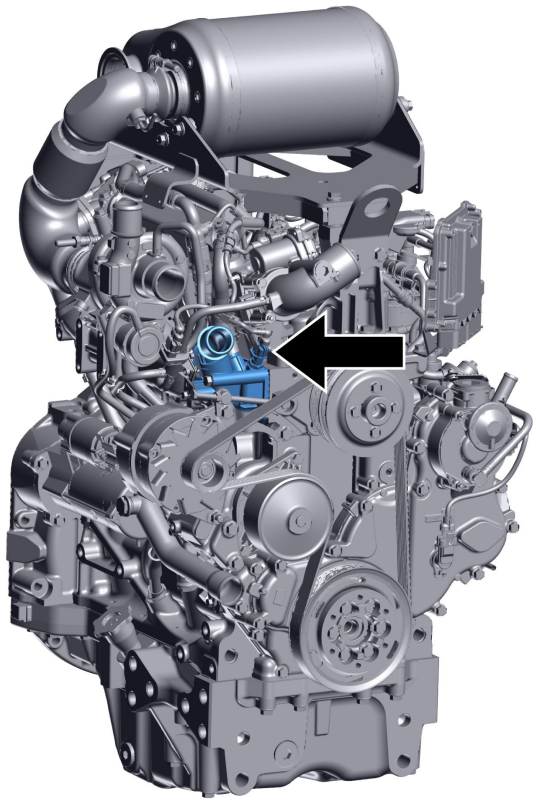
**Location of coolant tank**

3. Check coolant reservoir
   A. No coolant leakage recognizable during static check
   B. No indication of damaged cylinder head gasket during dynamic check
   C. If coolant reservoir is not damaged, go to **5**
   D. If coolant reservoir is damaged, go to **4**
4. Possible root cause
   - Coolant leakage
   - Damaged cylinder head gasket

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

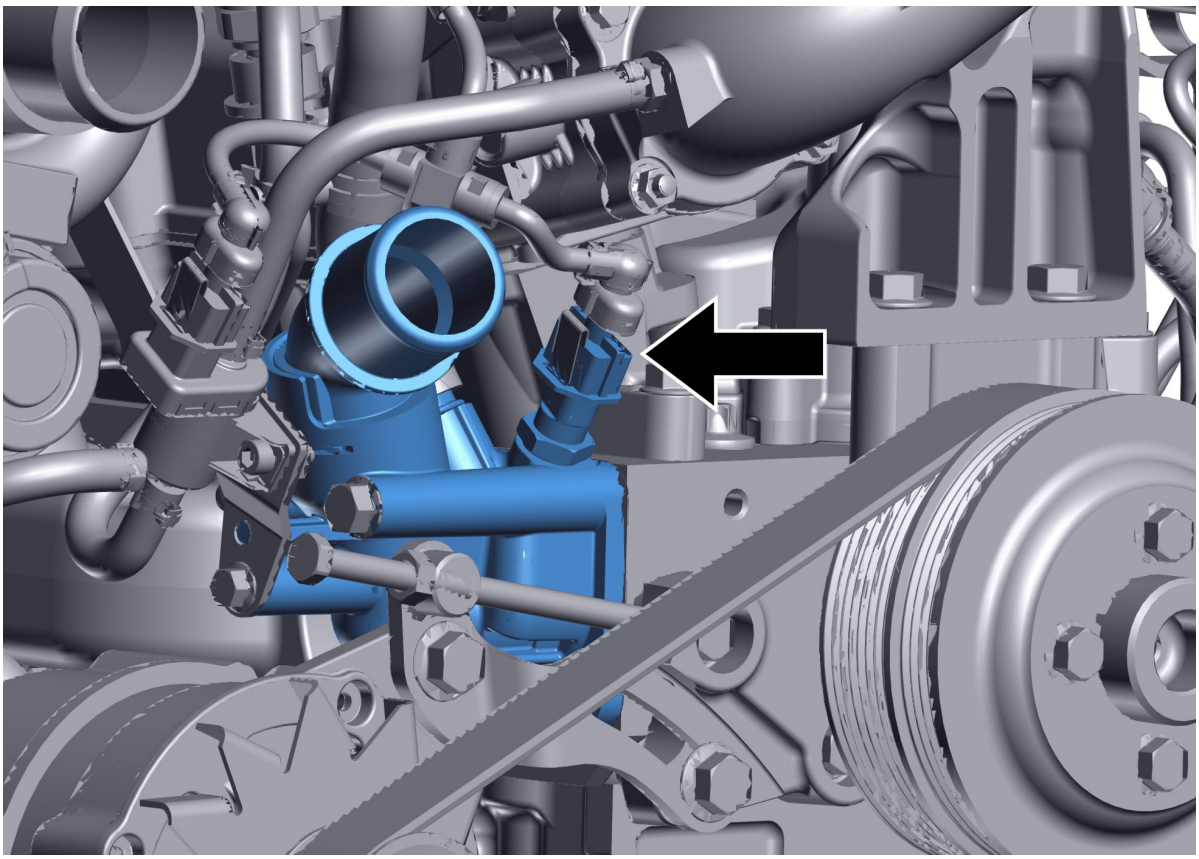
## Visually check coolant temperature sensor

5. Check coolant temperature sensor
   - Visually check the connector of the sensor
   - Check if the sensor is installed correctly
   - Check the sensor assembly to the engine body
   - See figures below for aid and go to **6**



275035 2

**Engine coolant temperature sensor location**



275036 3

**Engine coolant temperature sensor**

6. Check coolant temperature sensor.
   A. Connector of the sensor not damaged and not contaminated
   B. The sensor is mounted in the correct orientation
   C. The sensor is correctly fitted to the engine body
   D. If connector of the sensor is not damaged, go to **8**
   E. If connector of the sensor is damaged, go to **7**
7. Possible root cause
   - Connector of the sensor damaged and/or contaminated
   - The sensor is not mounted in the correct orientation
   - The sensor is loosely fitted to the engine body

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Read out coolant temperature sensor value

## Preparation

8. - Cold engine
   - Diagnosis tester connected to vehicle
   - Ignition On
   - Engine Off.
   - Offboard tool Diagnosis tester

9. • Read out coolant temperature value with diagnostic tester.
   • Go to **10**
10. Read out coolant temperature sensor value
    A. Coolant temperature sensor value equal environment temperature
    B. If coolant temperature sensor is not damaged, go to **12**
    C. If coolant temperature sensor is damaged, go to **11**
11. Possible root cause
    • Offset error coolant temperature sensor.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

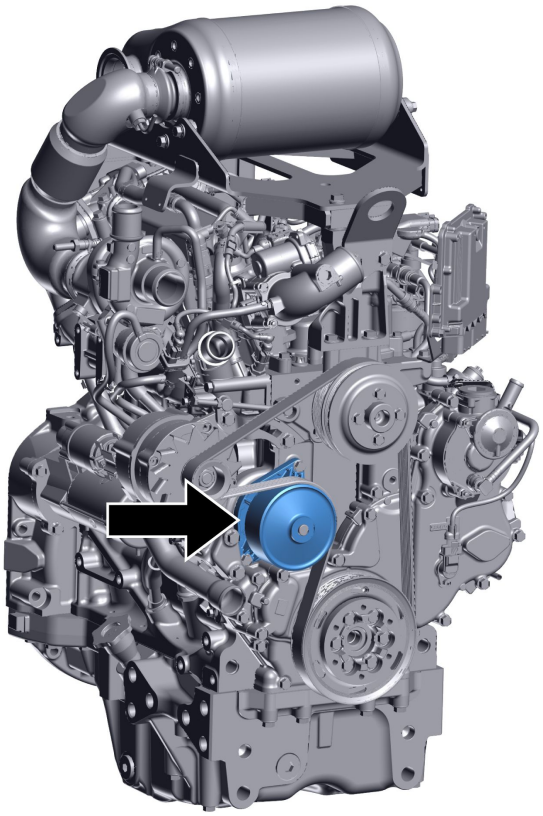
## Visually check cooling system

12. Check fan
    • Start the engine and check if the fan is working correctly
    • Check the fan for damage and pollution
    • Go to **13**
13. Visually check cooling system
    A. Drive belt not damaged, if present
    B. No leaks from actuating hydraulic circuit, if present
    C. If cooling system is not damaged, go to **15**
    D. If cooling system is damaged, go to **14**
14. Possible root cause
    • Drive belt could be damaged
    • Actuating hydraulic circuit (if present) could be damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify*

## Mechanically check water pump

15. Check water pump
    • Set ignition OFF
    • Check water pump for tightness
    • Ignition switch set to ON position and start engine
    • Check the water pump mechanical sounds
    • See figure below for aid and go to **16**



275037 4

**Location of water pump**

16. Check water pump
    A. Water pump not damaged or leak
    B. If water pump is not damaged, go to **18**
    C. If water pump is damaged, go to **17**
17. Possible root cause
    - Water pump damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## FAN activation check

18. General checks
    - Battery voltage is sufficient
    - Vehicle fuses are OK
    - Connectors/plugs OK. No loose contact or corrosion.
    - Offboard tool Diagnosis tester

## Preparation

19. - Connect the diagnostic tester
    - Start the engine and keep in idle

20. • Activate the fan and change its speed
    • Set successive the three activation modes: Full, Medium and Idle
    • Check for modified fan speed for each activation mode
    • Go to **21**
21. FAN activation check
    A. The FAN speed is respectively Full, Medium and Idle speed
    B. If Fan is not damaged, go to **23**
    C. If Fan is damaged, go to **22**
22. Possible root cause
    • Communication loss with diagnosis tester
    • Electrical connection could be damaged
    • FAN could be defective or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Visco FAN activation check

23. General checks
    • Battery voltage is sufficient
    • Vehicle fuses are OK
    • Connectors/plugs OK. No loose contact or corrosion.
    • Offboard tool Diagnosis tester

## Preparation

24. • Connect the diagnostic tester
    • Start the engine and keep in idle
25. • Activate the fan and change its speed
    • Check for visco FAN speed on different settings: it can be varied from **10%** to **90%**
    • Check for modified visco FAN speed
    • Go to **26**
26. Visco FAN activation check
    A. The visco FAN speed can be ranged from **10%** to **90%** of its maximum speed
    B. If the visco fan is not damaged, go to **25**
    C. If the visco fan is damaged, go to **27**
27. Possible root cause
    • Communication loss with diagnosis tester
    • Electrical connection could be damaged
    • Visco FAN could be defective or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Engine temperature adjustment check

28. General checks
    - Battery voltage is sufficient
    - Vehicle fuses are OK
    - Connectors/plugs OK. No loose contact or corrosion.
    - Offboard tool Diagnosis tester

## Preparation

29. • Set the key to ON.
    - Connect the diagnostic tester
30. • Through diagnosis tester simulate the change of coolant temperature
    - Adjustment is possible in the range from **-40 °C** to **-110 °C**.
    - Go to **31**
31. This coolant temperature modification could have the following feedbacks:
    A. Increasing/decreasing of temperature indicator on cluster
    B. Pop up of excessive temperature
    C. At high temperatures: activation of fan at max speed.
    D. If the coolant temperature have this feedbacks, go to **33**
    E. If the coolant temperature don't have this feedbacks, go to **32**
32. Possible root cause
    - Communication loss with diagnosis tester
    - Electrical connection could be damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

33. The cooling system works properly.

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SERVICE

INJECTOR

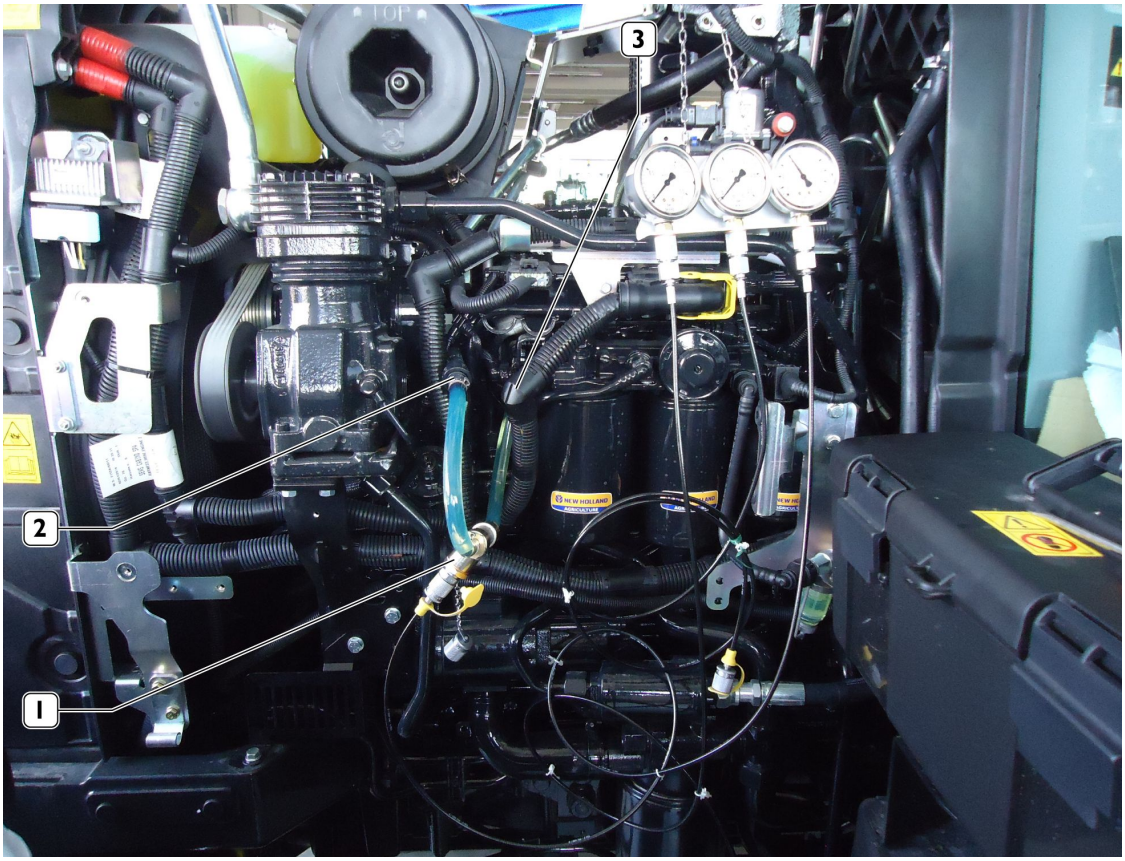
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# 771010 INJECTION PUMP ASSY - Pressure test Check pressure between main filter and high pressure pump

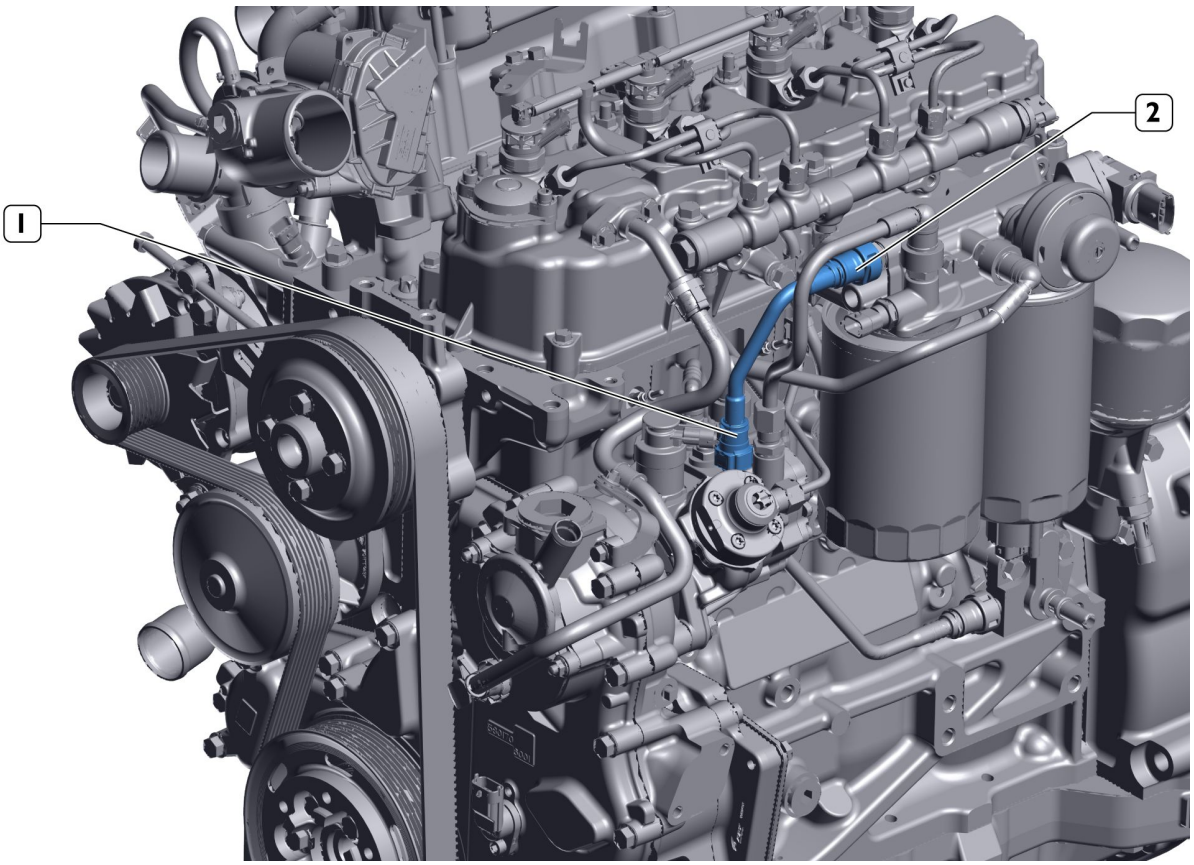
## Preparation

- Visually check all related components for any signs of leakage
- Disconnected the pipe between main filter outlet and high pressure pump inlet
- Connect the flexible tube to the two terminal (main filter outlet and high pressure pump inlet)
- Install the pressure gauge between the main filter and high pressure pump
- Tighten the system (ensure that there is no leakage)
- To prepare for the operation, observe the figures below:




275046 1

| Ref. | Description |
|---|---|
| (1) | T-connector to manometer |
| (2) | High-pressure pump intake |
| (3) | Main filter outlet to high pressure pump |




276361 2

**Locations of high-pressure pump intake**

| Ref. | Description |
|---|---|
| **(1)** | High-pressure pump intake |
| **(2)** | Main filter outlet to high pressure pump |

## Check pressure between main filter and high pressure pump

Offboard tools

- Low pressure vacuum gauge
- Adaptors
- Hose

Check pressure between main filter and high pressure pump

- Start or crank engine and let run for several minutes (please wait at least **30 s** while engine cranking sessions)
- Observe pressure built up in several engine conditions and note values
- See table below for a list of expected results and go to **1**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than* ***10 s ~ 12 s*** *each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Pressure value (rel.) bar | | Remark |
|---|---|---|---|
| | Minimum | Maximum | |
| Low idle speed | **3,0 bar** | **6,2 bar** | At **850 RPM** |
| High idle | **3,0 bar** | **6,2 bar** | At **1500 RPM** |

1. Check if the pressures measured are in the range explained in the table above.
   A. If the expected results are OK, go to **4**
   B. If the expected results are NOT OK (Gear pump pressure too low, below minimum values), go to **2**
   C. If the expected results are NOT OK (Gear pump pressure too high, above maximum values), go to **3**

***NOTE:*** *The pressure difference between at the main filter inlet and outlet should be less than* ***2.0 bar****. Otherwise replace main filter*

2. Possible root cause (Gear pump pressure too low, below minimum values):
   - check tightness of tubes, connectors. Any small defect in tightness will lead to a reduced suction pressure. Air will be sucked into the system and the diesel flow will be reduced (check that there are no air bubbles in the backflow from the pump)
   - Main filter blocked or damaged
   - Pre-filter blocked or damaged
   - Tubes/connectors are damaged
   - Overflow-valve in high pressure pump sticking in open position (check the high pressure pump backflow rate)
   - Rare but possible: defective gear pump (exclude the possibility of other fuel delivery component problems before making this conclusion)
3. Possible root cause (Gear pump pressure too high, above maximum values):
   - Tubes/connectors between main-filter and high pressure pump blocked or damaged (check main filter blocked or damaged)
   - Overflow valve in high-pressure-pump blocked, dirty, sticking in closed position (check the high pressure pump backflow rate)
   - Inlet high pressure pump blocked (check the filter in the inlet bolt of the pump)
   - Backflow pipe blocked or damaged

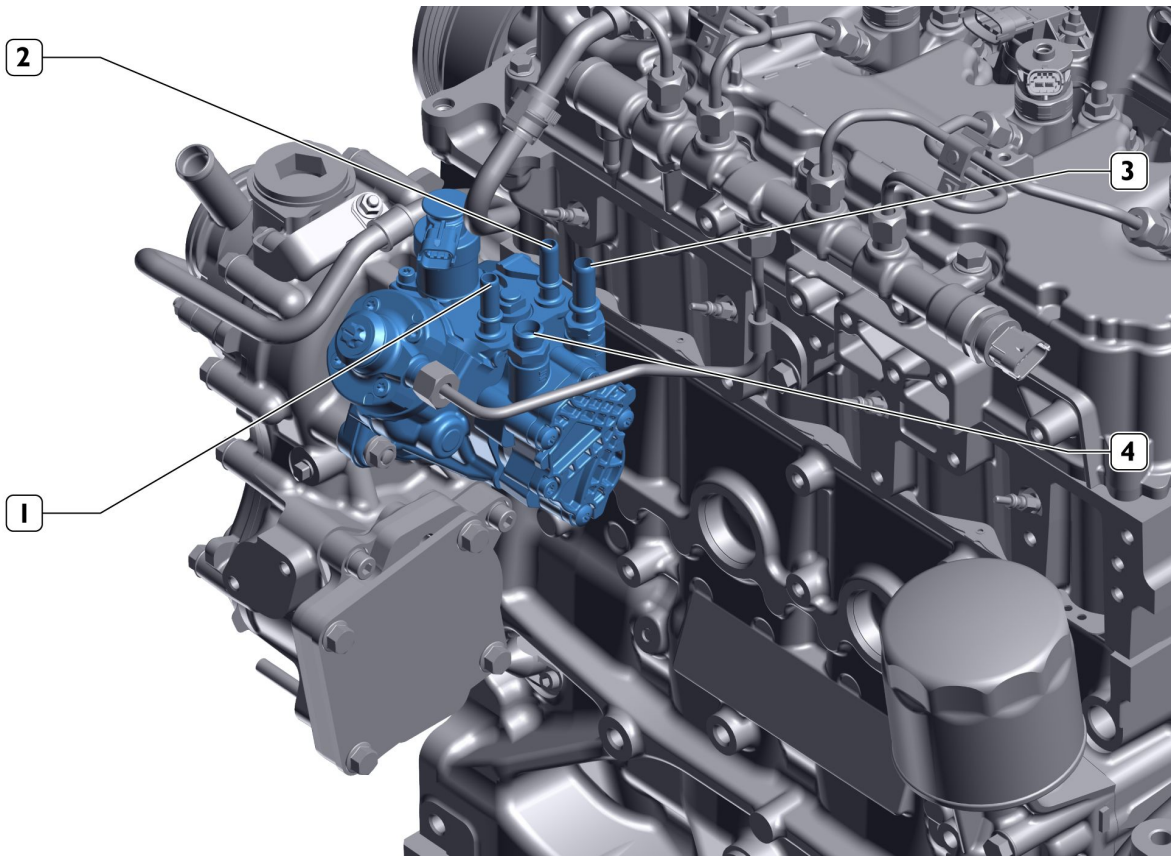
***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The system works properly.

# 771010 INJECTION PUMP ASSY - Test Check high pressure pump backflow rate

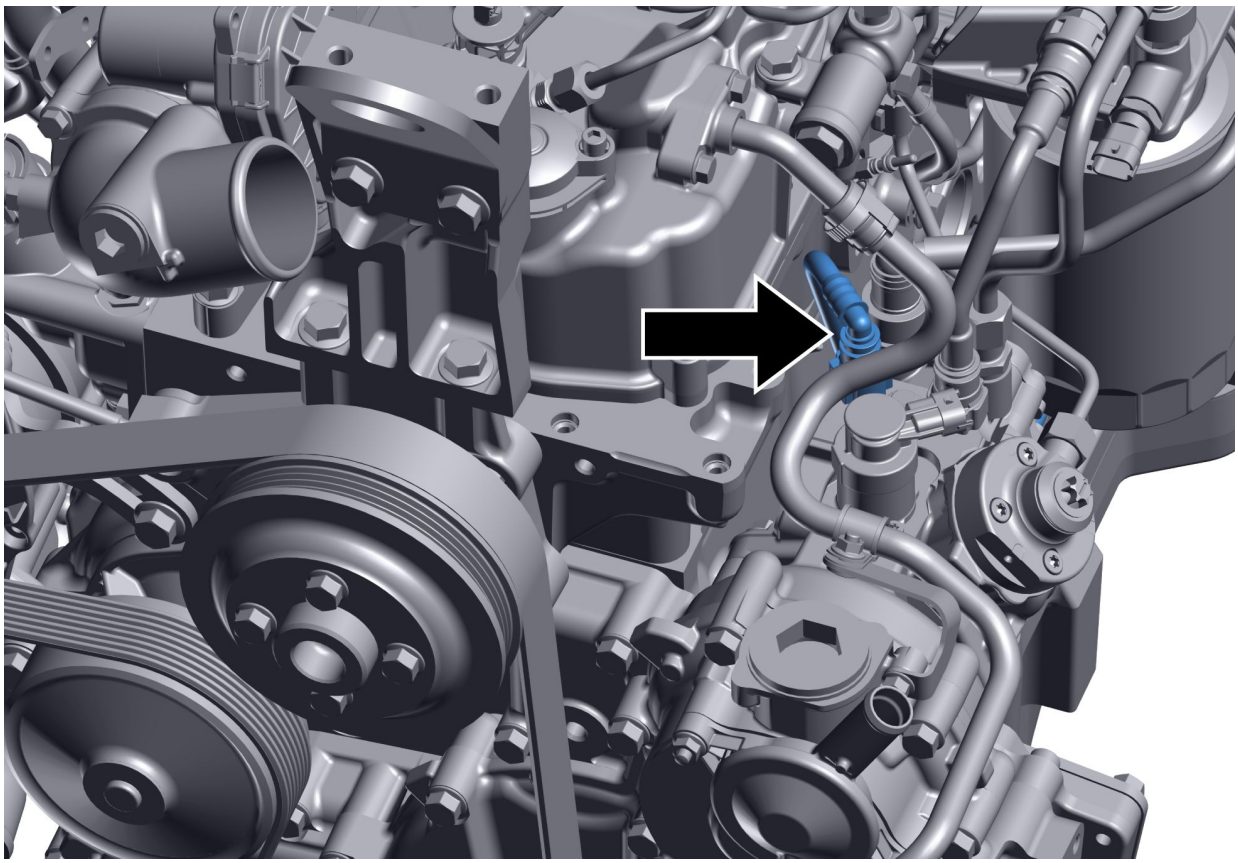
## Preparation

- Visually check all related components for any signs of leakage
- Disconnect the pipe between the backflow outlet of the high pressure pump
- Install a closing plug to prevent any leak from the high pressure pump backflow
- Connect the flexible tube with the high pressure pump backflow outlet
- Prepare the measuring cup and stopwatch
- To prepare for the operation, observe the figures below.




275048 1

| Ref. | Description |
|---|---|
| (1) | High pressure pump from main filter |
| (2) | Return to reservoir |
| (3) | Low pressure pump intake from pre-filter |
| (4) | Delivery from low pressure pump to main filter |



275049 2

**Location of the high pressure pump return**

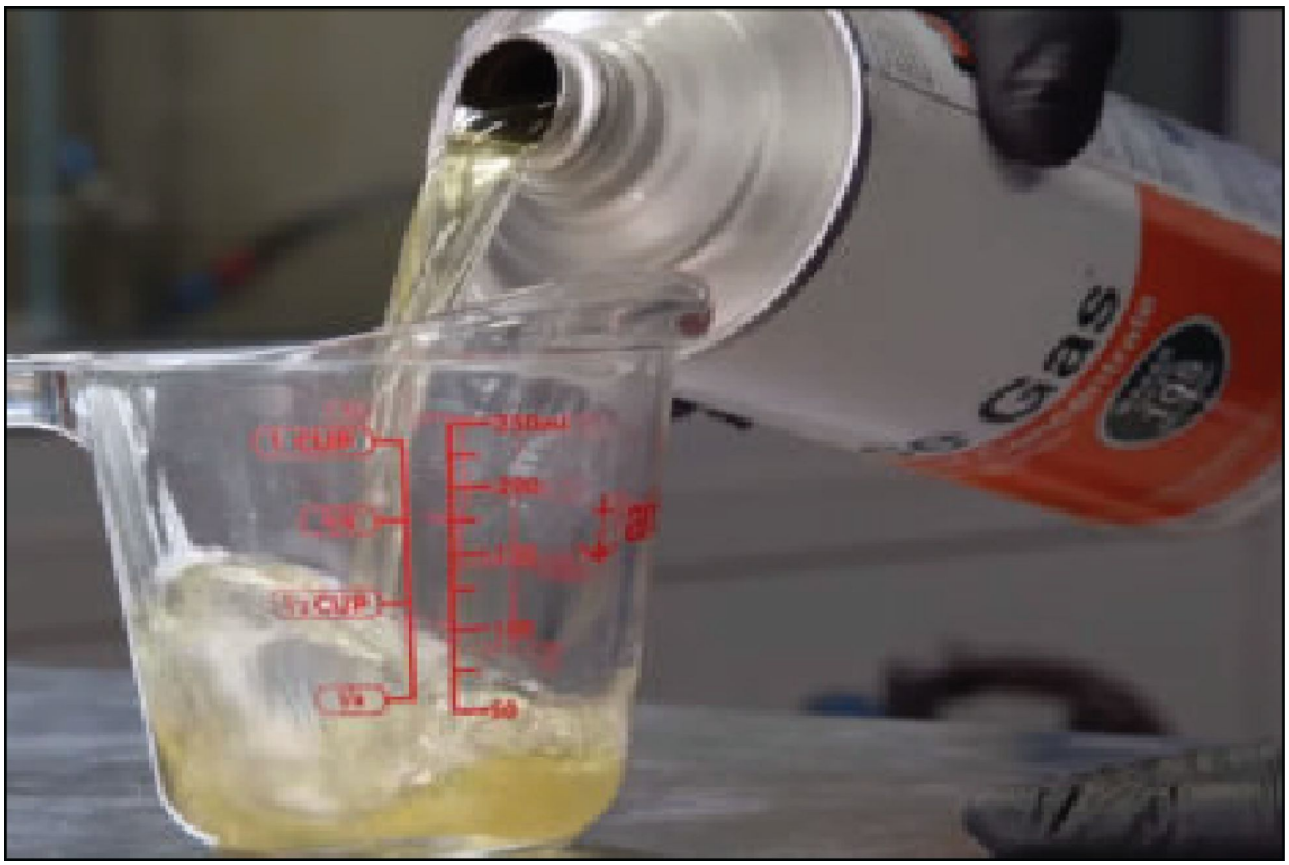
## Check

Offboard tools

- Measuring cup
  (minimum capacity **1,5 L**)
- Adaptors/blanking plug
- Hose
- Stopwatch

Check high pressure pump backflow rate

- Start engine until diesel runs out the flexible tube from pump
- In case of non-starter: crank until diesel runs out the flexible tube from pump
- Use empty measuring cup
- Start to fill the cup while the engine runs for specific time period
- In case of non-starter: crank multiple times (max **10 s** per cranking) until requested time period is reached
- Note the diesel volume of measuring cup
- See figure and table below for a list of expected results and go to **1**



271842 3

**Example of transfer diesel from collecting container to measurement cup**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than 10~12 seconds each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Volume mL | Remark |
|---|---|---|
| Idle **60 s** | **500 mL** - **800 mL** | At **850 RPM** |

1. Check if the volumes measured are in the range explained in the table above.
   A. If the expected results are OK, go to **3**
   B. If the expected results are NOT OK, go to **2**
2. Possible root cause (volume rate is noticeable too low)
   - Insufficient fuel
   - Check tightness of tubes and connectors. Any small defect in tightness will lead to a reduced suction pressure. Air will be sucked into the system and the diesel flow will be reduced. (Check that there are no air bubbles in the backflow from the pump)
   - Check tubes, connectors squeezed/damaged/wrong diameter. (If there are no bubble in the backflow, check the pipeline)
   - Main filter blocked. (If delta pressure over than **40 kPa**, replace main filter)
   - Tank ventilation is blocked or restricted. Open the tank cap, and listen to sucking sound

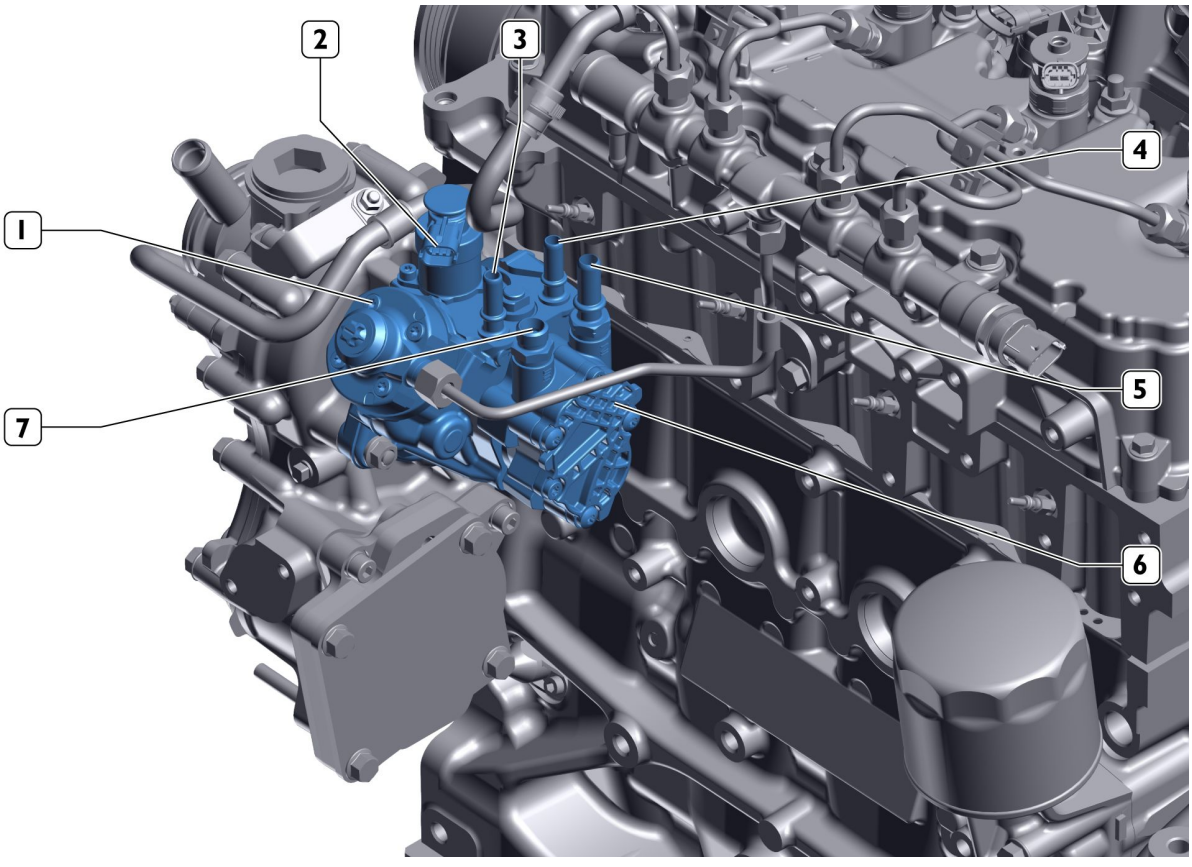
***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The high pressure pump works properly.

# 771010 INJECTION PUMP ASSY - Test Check high pressure system backflow rate

## Preparation

- Visually check the components to ensure there are no external fuel leaks
- Disconnect the backflow pipe to the tank from the high pressure pump
- Install second tube as a provisional backflow line from the high-pressure-pump backflow and the tank
- Fit the plug to close the backflow fitting to the tank from the high pressure pump
- Disconnect the total backflow pipe to the tank
- Connect a second hose between the total backflow line and the measuring cup
- Provide stop watch and measuring cup (minimum **250 mL**).
- To prepare for the operation, observe the figures below:

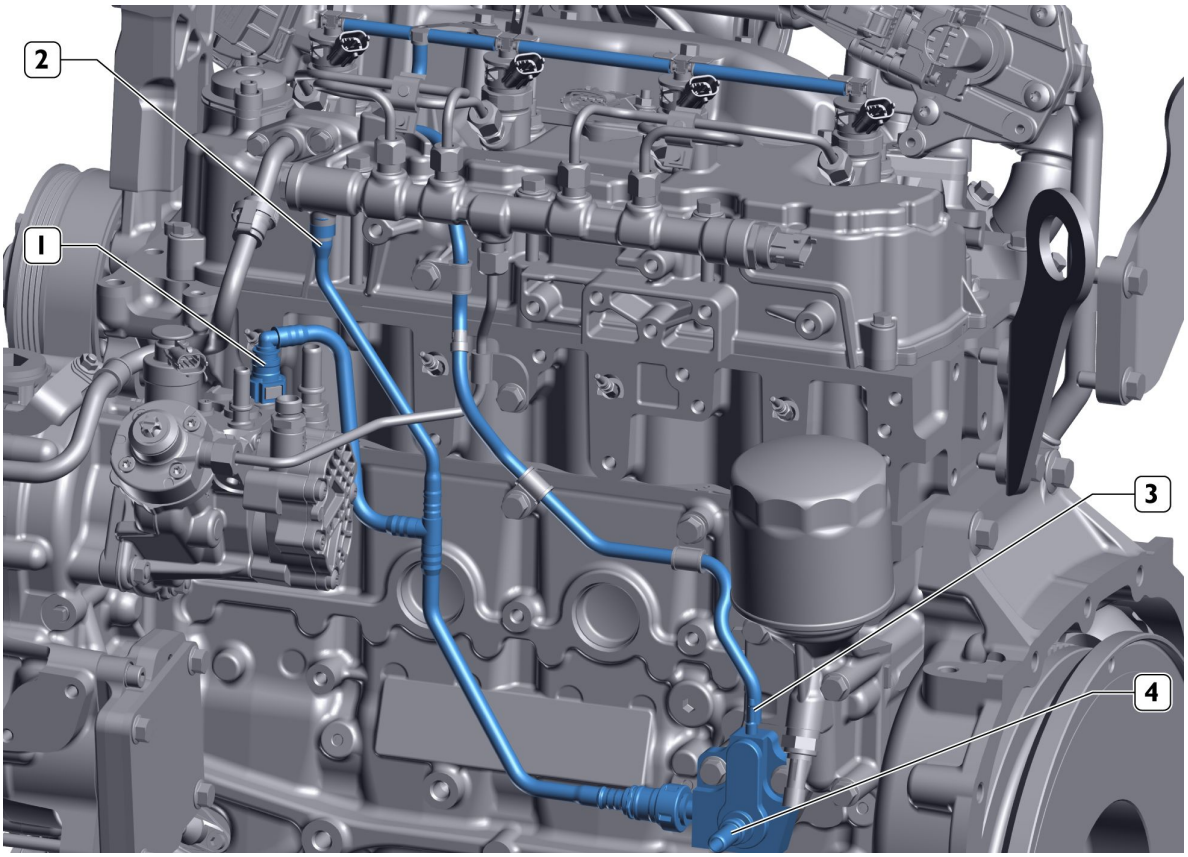



275054 1

**Location of the main components of the fuel pump**

| Ref. | Description |
|---|---|
| **(1)** | High-pressure pump |
| **(2)** | Pressure regulator valve (fuel metering unit) |
| **(3)** | High pressure pump from main filter |
| **(4)** | Return to reservoir |
| **(5)** | Low pressure pump intake from pre-filter |

| Ref. | Description |
|---|---|
| **(6)** | Gear low pressure pump |
| **(7)** | Delivery from low pressure pump to main filter |




276360 2

**Location of the backflow line**

| Ref. | Description |
|---|---|
| **(1)** | Backflow fitting to tank from high pressure pump |
| **(2)** | Pressure limiting valve backflow fitting |
| **(3)** | Injectors total backflow fitting |
| **(4)** | Total backflow to tank |

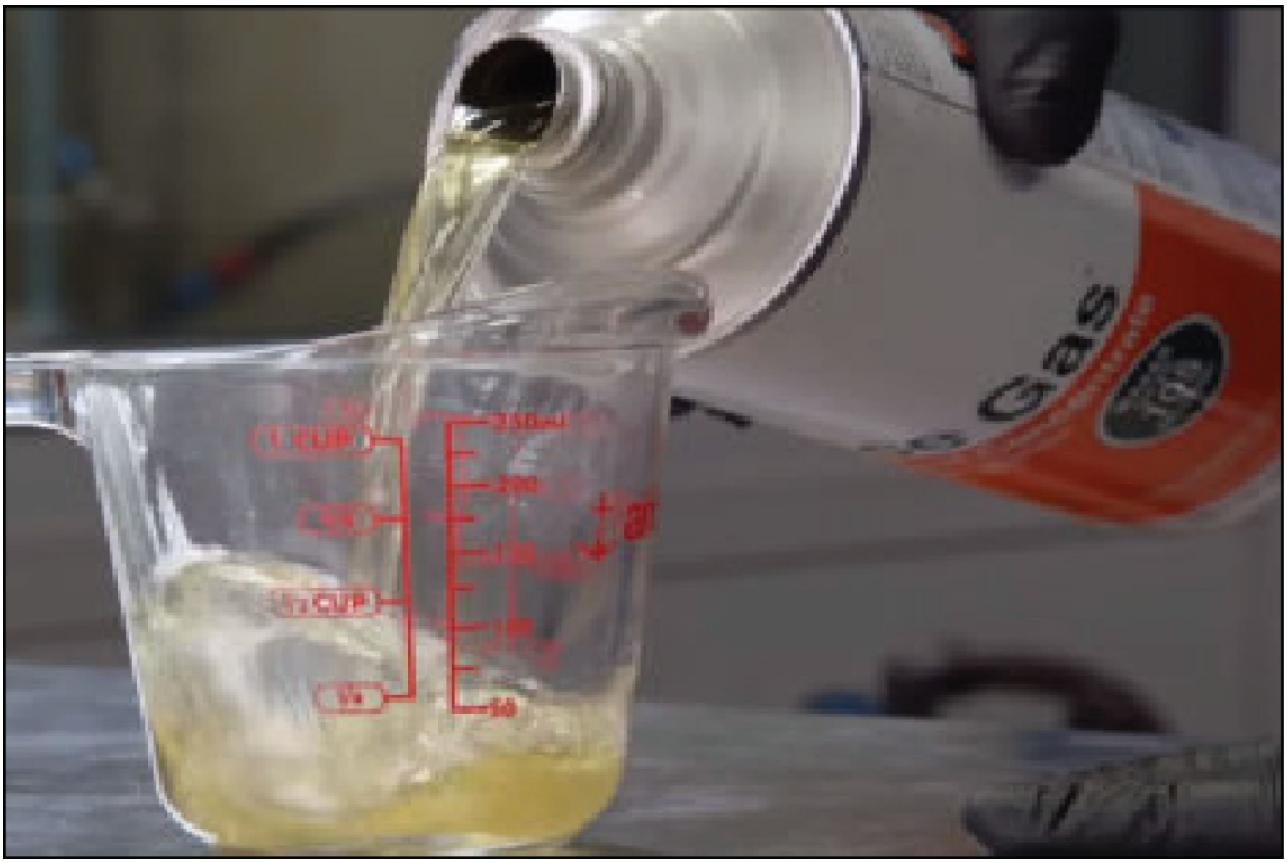
## Check

Offboard tools

- Flexible tube and adaptor to junction bolts
- Measuring cup (minimum **250 mL**)
- Stopwatch

Check high pressure system backflow rate.

- If possible run engine until coolant temperature of **65 °C** is reached
- Crank/start engine until diesel runs out the tube
- Use empty measuring cup
- Start engine and start the stop watch
- If case of non-starter: Crank engine multiple times (maximum **10 s** each) until specific time period is reached
- Start to fill the cup while the engine runs for specific time period.
- Note the total diesel volume of measuring cup
- See figure and table below for a list of expected results and go to **1**



271846 3

**Example of backflow fuel from container to measuring cup**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than* ***10 s ~ 12 s*** *each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Volume mL | Remark |
|---|---|---|
| Idle ( **60 s** ) | From **20,8 mL** to **31,2 mL** | At **850 RPM** (4-valve engine) |
| High idle ( **60 s** ) | From **44,0 mL** to **66,0 mL** | At **1500 RPM** (4-valve engine) |
| Idle ( **60 s** ) | From **70,4 mL** to **105,6 mL** | A **800 RPM** (2-valve engine) |
| High idle ( **60 s** ) | From **86,4 mL** to **129,6 mL** | At **1500 RPM** (2-valve engine) |

1. Check if the volumes measured are in the range explained in the table above.
   A. If the expected results are OK, go to **3**
   B. If the expected results are NOT OK, go to **2**
2. Possible root cause
   - Pressure limiting valve backflow leaky, check PLV backflow
   - Injector leaky, check backflow of each injector individually

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The high pressure system works properly.

# 771010 INJECTION PUMP ASSY - Pressure test Rail Pressure Adjustment check

## Preparation

General checks

- Battery voltage is sufficient.
- Vehicle fuses are OK.
- Connectors/plugs OK. No loose contact or corrosion.
- Offboard tool Diagnosis tester

## Rail Pressure Adjustment check

## Preparation

- Set the key to ON.
- Connect the diagnostic tester

## Check

- Modify the fuel pressure in the rail (pressure rail)
- The fuel pressure adjustment is possible in the range from **250 bar** to **1600 bar**.
- Go to **1**

1. Rail Pressure Adjustment check
   A. The fuel pressure in the rail is into specified pressure range
   B. If rail pressure adjustment is OK go to **3**.
   C. If rail pressure adjustment is not OK, go to **2** .
2. Possible root cause
   - Electrical defect of fuel system's components (e.g.: rail pressure sensor, fuel pump, fuel injector). Check wiring harness and component electrically.
   - Mechanical defect of fuel system's components (e.g.: faulty fuel pressure limiting valve).
   - Clogged fuel filters.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The injector works properly.

# 771010 INJECTION PUMP ASSY - Pressure test Check rail pressure during cranking

## Read parameters during cranking

Offboard tool

- Diagnosis tester.

## Preparation

- Set the key to ON.
- Connect the diagnostic tester
- Start active diagnosis: "Read Parameters"

## Check

- Crank the engine for **5 s**.
- Read out the rail pressure value.
- Go to **1**

1. Read parameters during cranking
   A. All values within specified range or similar to typical value!
   B. Rail pressure value larger **120 bar**.
   C. If parameters during cranking are OK go to **3**.
   D. If parameters during cranking are not OK, go to **2** .
2. Possible root cause
   - No sufficient low pressure fuel supply.
   - Fuel leakage at the high pressure system.

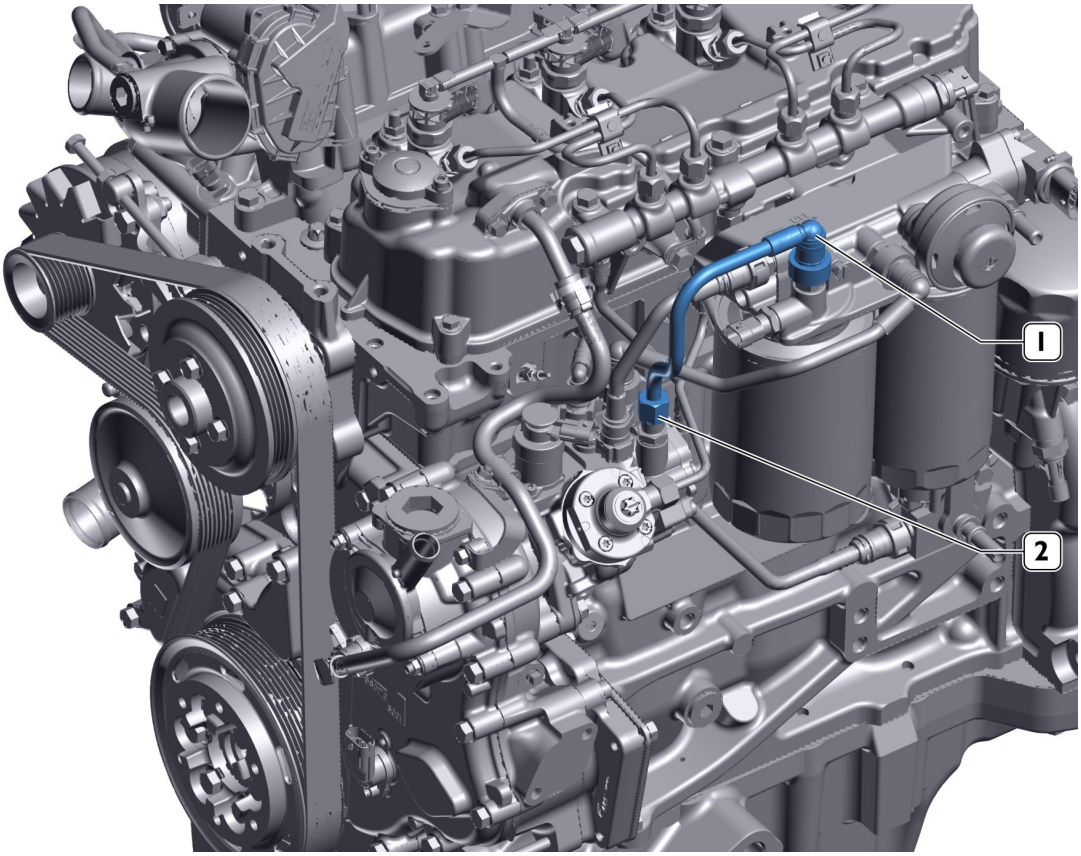
***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The injector works properly.

# 771013 CONTROL GEAR - Pressure test Check pressure between gear pump and main filter

## Preparation

- Visually check all related components for any signs of leakage
- Install the vacuum gauge between the gear pump and main filter

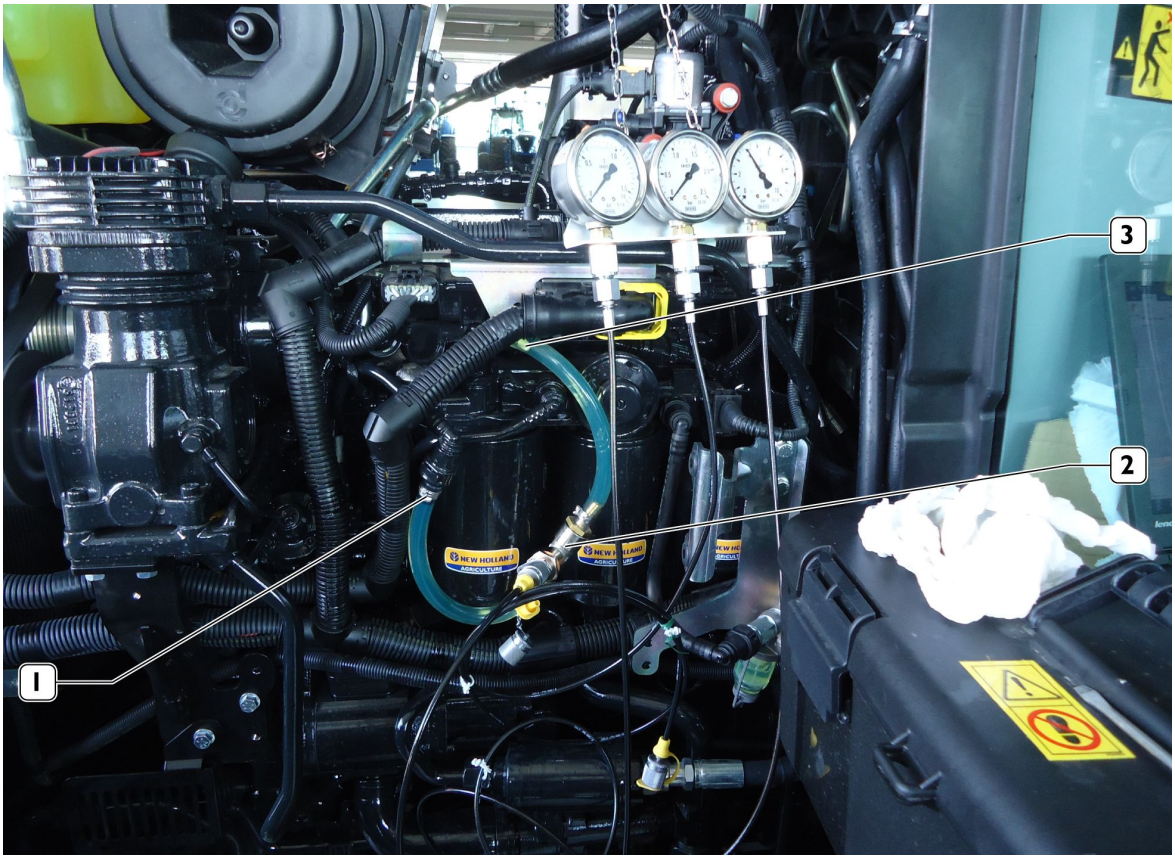



275044 1

**Location of pipe between gear pump and main filter**

| Ref. | Description |
|---|---|
| **(1)** | Main filter inlet |
| **(3)** | Gear pump outlet |

- Look figure below for preparation:




275045 2

**Gauge location (gear pump to main filter)**

| Ref. | Description |
|---|---|
| **(1)** | Gear pump outlet |
| **(2)** | T-connector gear pump outlet to main filter |
| **(3)** | Main filter inlet |

## Check pressure between gear pump and main filter

Offboard tools

- Low pressure vacuum gauge
- Adaptors
- Hose

Check pressure between gear pump and main filter

- Start or crank engine and let run for several minutes (please wait at least **30 s** while engine cranking sessions)
- Observe pressure built up in several engine conditions and note values
- See table below for a list of expected results and go to **1**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than* ***10 s ~ 12 s*** *each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Pressure value (rel.) bar | | Remark |
|---|---|---|---|
| | Minimum | Maximum | |
| Low idle speed | **3,0 bar** | **6,5 bar** | At **850 RPM** |
| High idle | **3,0 bar** | **6,5 bar** | At **1500 RPM** |

1. Check if the pressures measured are in the range explained in the table above
   A. If the expected results are OK, go to **4**
   B. If the expected results are NOT OK (Gear pump pressure too low, below minimum values), go to **2**
   C. If the expected results are NOT OK (Gear pump pressure too high, above maximum values), go to **3**
2. Possible root cause (Gear pump pressure too low, below minimum values)
   - Check tightness of tubes, connectors. Any small defect in tightness will lead to a reduced suction pressure. Air will be sucked into the system and the diesel flow will be reduced. (Check that there are no air bubbles in the backflow from the pump)
   - Tubes/connectors are damaged
   - Pre-filter blocked or damaged
   - Tank ventilation blocked/dirty (open tank cap, and listen to sucking sound)
   - Overflow-valve in high pressure pump sticking in open position (check the high pressure pump backflow rate)
   - Rare but possible: defective gear pump (exclude the possibility of other fuel delivery components before making this conclusion)
3. Possible root cause (Gear pump pressure too high, above maximum values)
   - Main filter blocked or damaged (check if the main filter blocked or damaged)
   - Tubes damaged/blocked (between gear pump to high pressure pump)
   - Inlet high pressure pump blocked (check the filter in the inlet bolt of the pump)
   - Backflow pipe blocked or damaged (check high pressure pump backflow pressure)
   - Overflow valve in high-pressure-pump blocked, dirty, sticking in closed position (check the high pressure pump backflow rate)

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The system works properly.

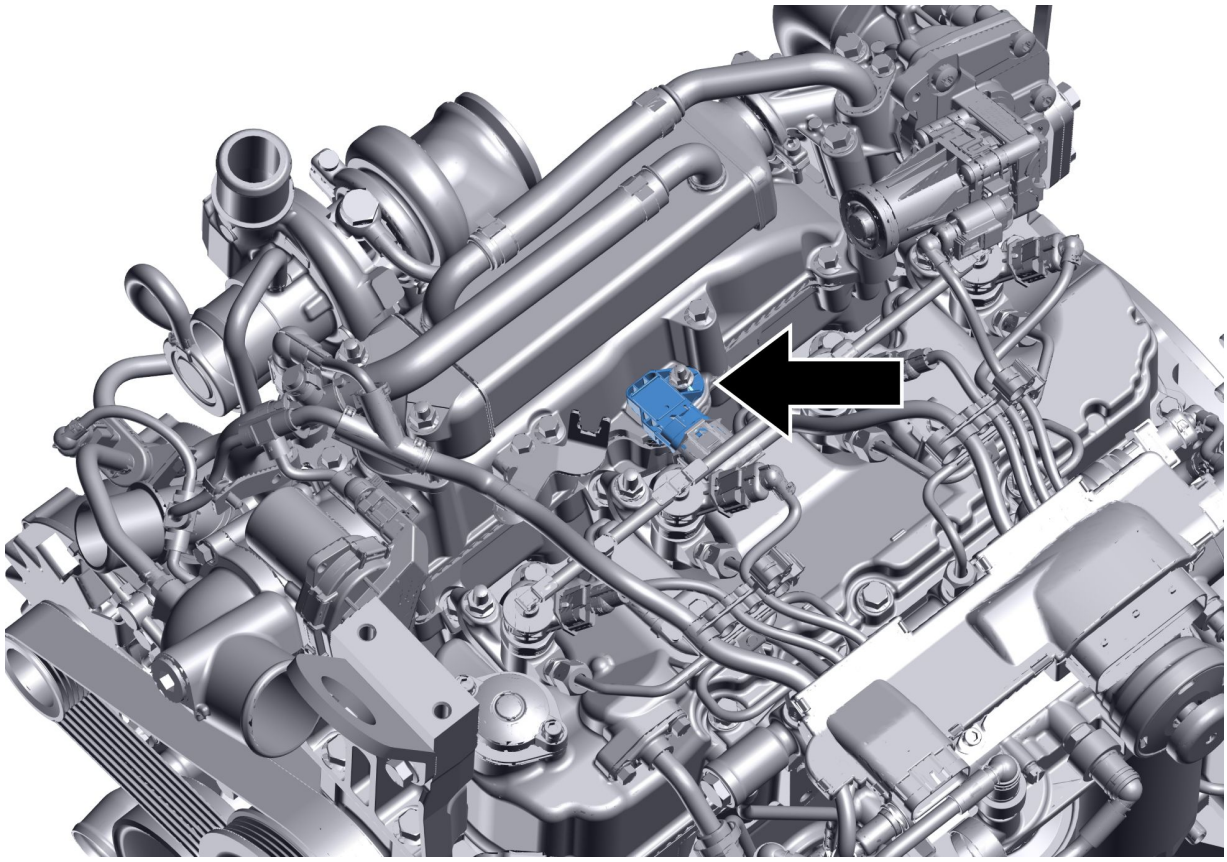
# 772647 AIR TEMPERATURE SENSOR - Test Check intake air pressure and temperature sensor

## Preparation

- Ignition switch set to OFF position.

## Visually check intake air pressure and temperature sensor

1. Visually check intake air pressure and temperature sensor
   - Visually check the connector of the sensor
   - Check if the sensor is installed correctly.
   - Check if the screw of the sensor is tight.
   - Check the sensor assembly to the intake air manifold.
   - See figure below for explanation and go to **2**



275032 1

**Location of intake air pressure and temperature sensor**

2. Check the intake manifold pressure and temperature sensor
   A. Connector of the sensor not damaged and not contaminated
   B. The sensor is mounted in the correct orientation
   C. The sensor is correctly fitted to the air intake manifold
   D. The screw is not loose
   E. If intake manifold pressure and temperature sensor is OK, go to **PreparationDiagnosis tester connected to vehicle.Ignition On.Engine Off.**
   F. If intake manifold pressure and temperature sensor is NOT OK, go to **3**
3. Possible root cause
   - Connector of the sensor damaged and/or contaminated
   - The sensor is not mounted in the correct orientation.
   - The sensor is loosely fitted to the air intake pipe.
   - Tighten the screw.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Read out intake air pressure sensor value

Preparation

- Diagnosis tester connected to vehicle.
- Ignition On.
- Engine Off.

## Read out intake air pressure sensor value

4. - Read out boost pressure value with diagnostic tester.
   - Go to **5**
5. Read out intake air pressure sensor value
   A. Boost pressure equal environment pressure (~ **1000 mbar**)
   B. If intake air pressure sensor valve is OK, go to **7**.
   C. If intake air pressure sensor valve is NOT OK, go to **6**.
6. Possible root cause
   - Offset error intake manifold pressure and temperature sensor

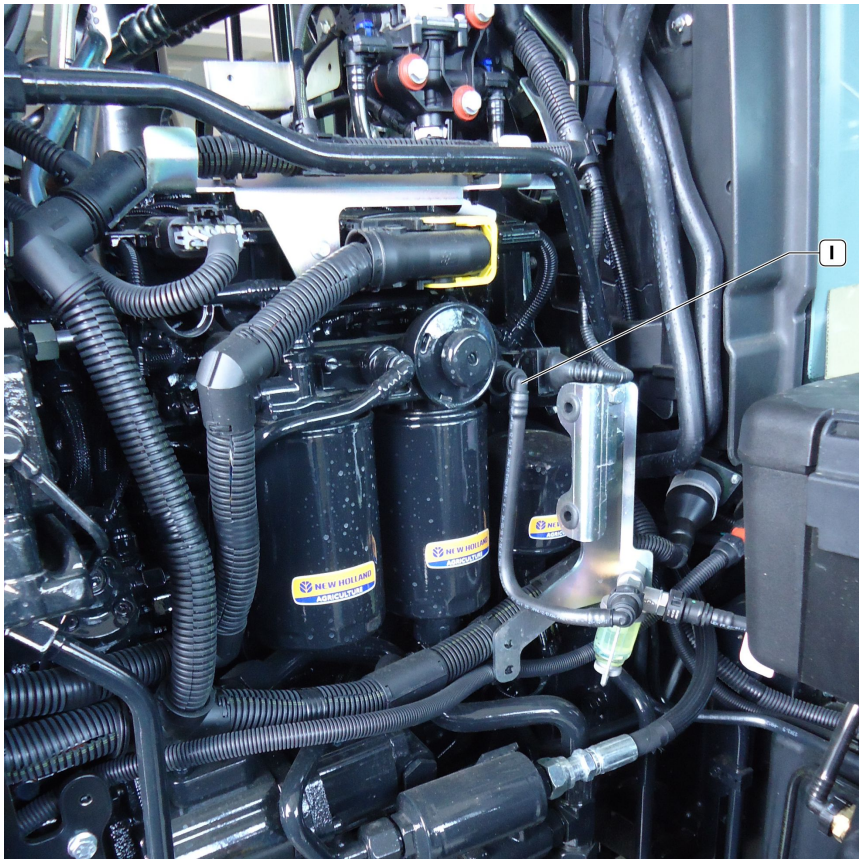
***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

7. The intake manifold pressure and temperature sensor works properly.

# 773110 FUEL PRE-FILTER - Pressure test Check suction pressure between tank and pre-filter

## Preparation

- Visually check all related components for any signs of leakage
- Disconnect the pre-filter supply
- Install the low pressure gauge between the fuel tank and pre-filter
- Tighten all connections to make sure that there is no possibility of leakage
- Look figure below for preparation:




275042

**Fuel Pre-filter**

| Ref. | Description |
|---|---|
| (1) | Pre-filter inlet |

## Check suction pressure between tank to pre-filter

Offboard tools

- Low pressure vacuum gauge
- Adaptors
- Hose

Check suction pressure between tank to pre-filter

- Start the engine (can be delayed) and let run for several minutes
- Observe suction pressure in several engine conditions. Check for leaks
- See table below for a list of expected results and go to **1**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than 10~12 seconds each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Pressure value (rel.) bar | Remark |
|---|---|---|
| Low idle speed | **-0,5 – 0,0 bar** | At **900 RPM** |
| High idle | **-0,5 – 0,0 bar** | At **1500 RPM** |

1. Check if the pressures measured are in the range explained in the table above
   A. If the expected results are OK, go to **4**
   B. If the expected results are NOT OK (Suction pressure too low, above maximum values), go to **2**
   C. If the expected results are NOT OK (Suction pressure too high, below minimum values), go to **3**
2. Possible root cause (Suction pressure too low, above maximum values):
   - Insufficient fuel
   - Check tightness of tubes, connectors. Any small defect in tightness will lead to a reduced suction pressure. Air will be sucked into the system and the diesel flow will be reduced (check that there are no air bubbles in the backflow from the pump)
   - Blocked or contaminated filters can reduce the suction pressure, check the pre-filter for blockage or damage and the main-filter blockage or damage
   - Rare but possible: defective gear pump (exclude the possibility of other fuel delivery component problems before making this conclusion)
3. Possible root cause (Suction pressure too high, below minimum values):
   - Blocked or damaged tube, dirt in tank/tube
   - Wrong diameter of the inlet pipe from tank to pre-filter
   - Tank ventilation blocked/dirty (open tank cap, and listen to sucking sound)

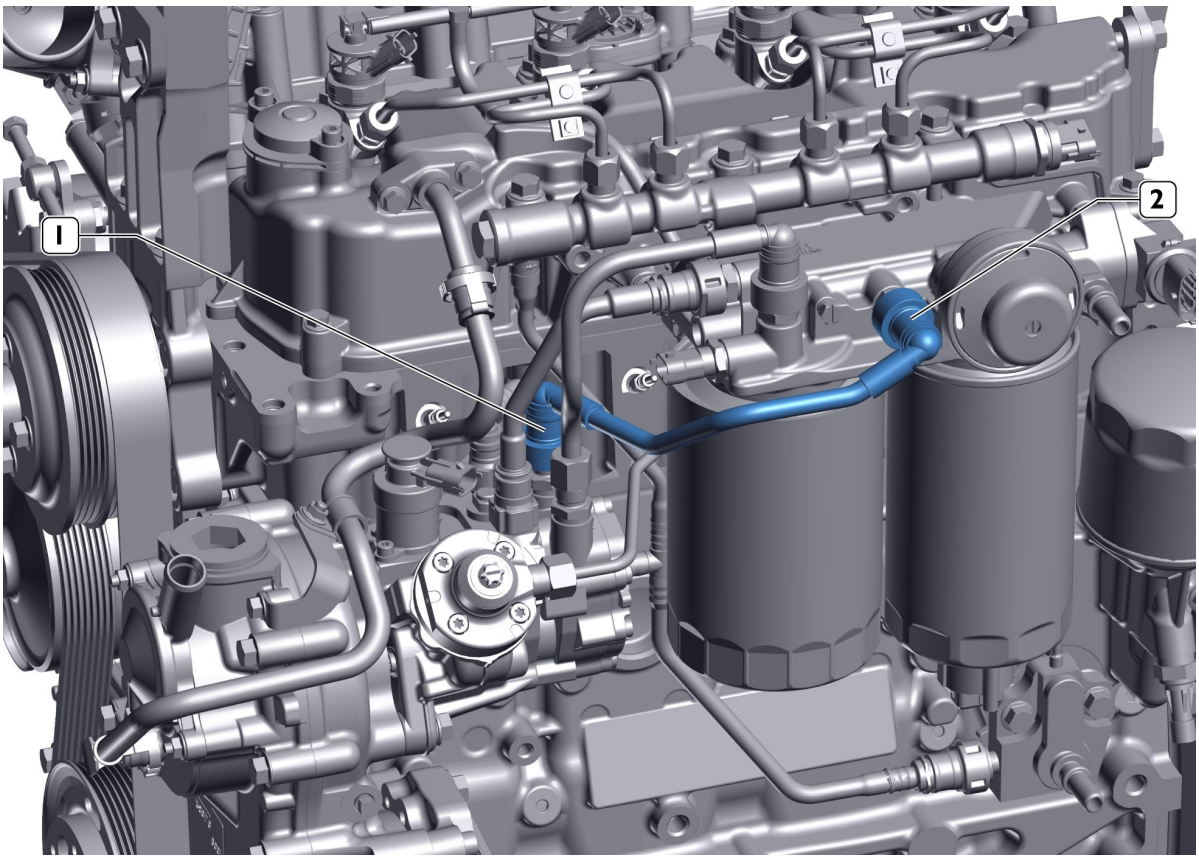
***NOTE:*** *After having eliminated the cause of the error, delete the fault memory and repeat the reading.*

4. The system works properly.

# 773110 FUEL PRE-FILTER - Pressure test Check suction pressure after pre-filter

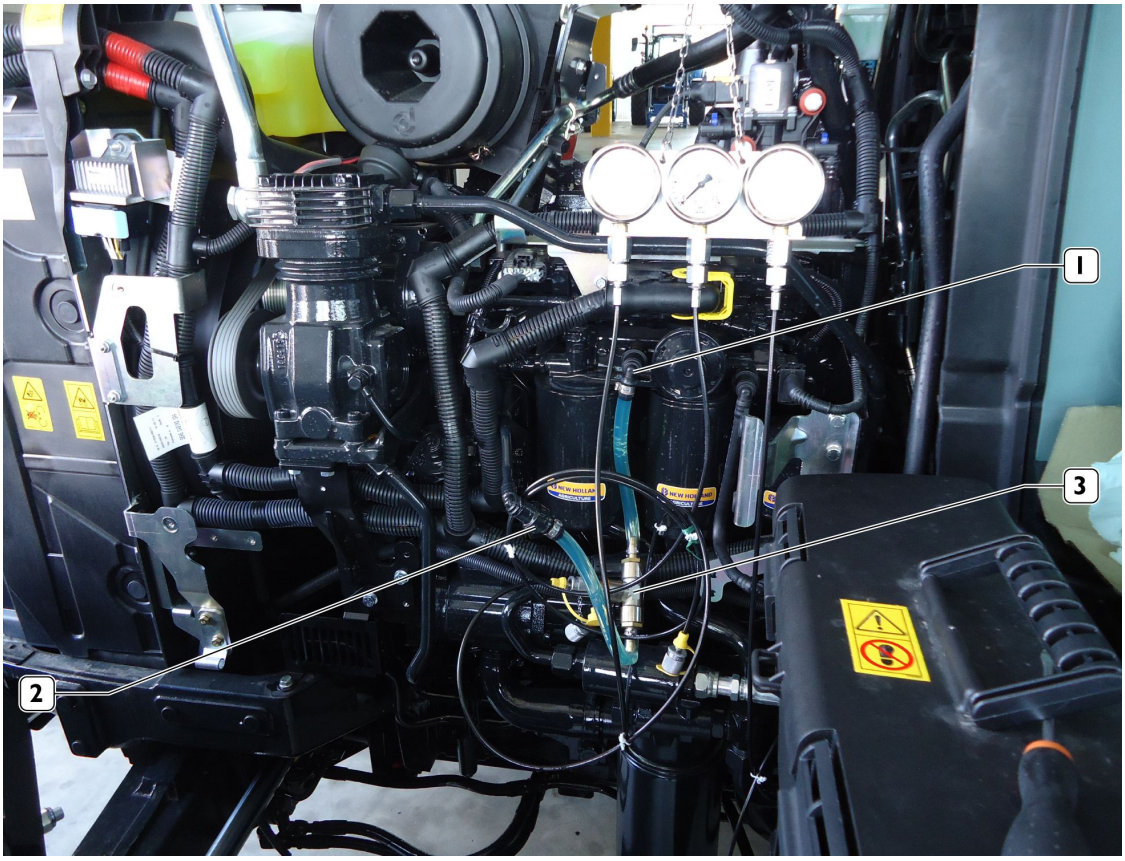
## Preparation

- Visually check all related components for any signs of leakage
- Install the low pressure gauge at the pre-filter outlet
- Look figure below for preparation:




276266 1

| Ref. | Description |
|---|---|
| (1) | Inlet fitting (low pressure pump) |
| (2) | Pre-filter outlet fitting |




275043 2

| Ref. | Description |
|---|---|
| **(1)** | Pre-filter outlet |
| **(2)** | Connecting hose to low pressure pump inlet |
| **(3)** | T-connector to manometer |

## Check suction pressure at pre-filter outlet

Offboard tools

- Low pressure vacuum gauge
- Adaptors
- Hose

Check suction pressure at pre-filter outlet

- Start the engine (can be delayed) and let run for several minutes
- Observe suction pressure in several engine conditions. Check for leaks
- See table below for a list of expected results and go to **1**

***NOTE:*** *For the hydraulic measurement of the FUEL system under cranking condition, crank the engine no longer than* ***10 s - 12 s*** *each time is recommended. The starter may be damaged if works continuously for a long time.*

| Engine condition | Pressure value (rel.) bar | Remark |
|---|---|---|
| Low idle speed | **<0.0 bar** | At **900 RPM** |
| High idle | **<0.0 bar** | At **1500 RPM** |

1. Check if the pressures measured are in the range explained in the table above.
   A. If the expected results are OK, go to **4**
   B. If the expected results are NOT OK (Suction pressure too low, above maximum values), go to **2**
   C. If the expected results are NOT OK (Suction pressure too high, below minimum values), go to **3**
2. Possible root cause (Suction pressure too low, above maximum values):
   - Check tightness of tubes, connectors. Any small defect in tightness will lead to a reduced suction pressure. Air will be sucked into the system and the diesel flow will be reduced. (Check that there are no air bubbles in the backflow from the pump)
   - Less diesel in tank
   - Pre-filter blocked or damaged
   - Rare but possible: defective gear pump (exclude the possibility of other hydraulic component before making this conclusion)
   - If present: electrical lift pump defect
3. Possible root cause (Suction pressure too high, below minimum values):
   - Pre-filter blocked or damaged
   - Tubes, connectors squeezed/damaged/wrong diameter
   - Tank system dirty
   - Tank ventilation blocked/dirty (open tank cap, and listen to sucking sound)

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The system works properly.

# 773115 WATER SIGNALLING SENSOR - Test Check water in fuel sensor plausibility

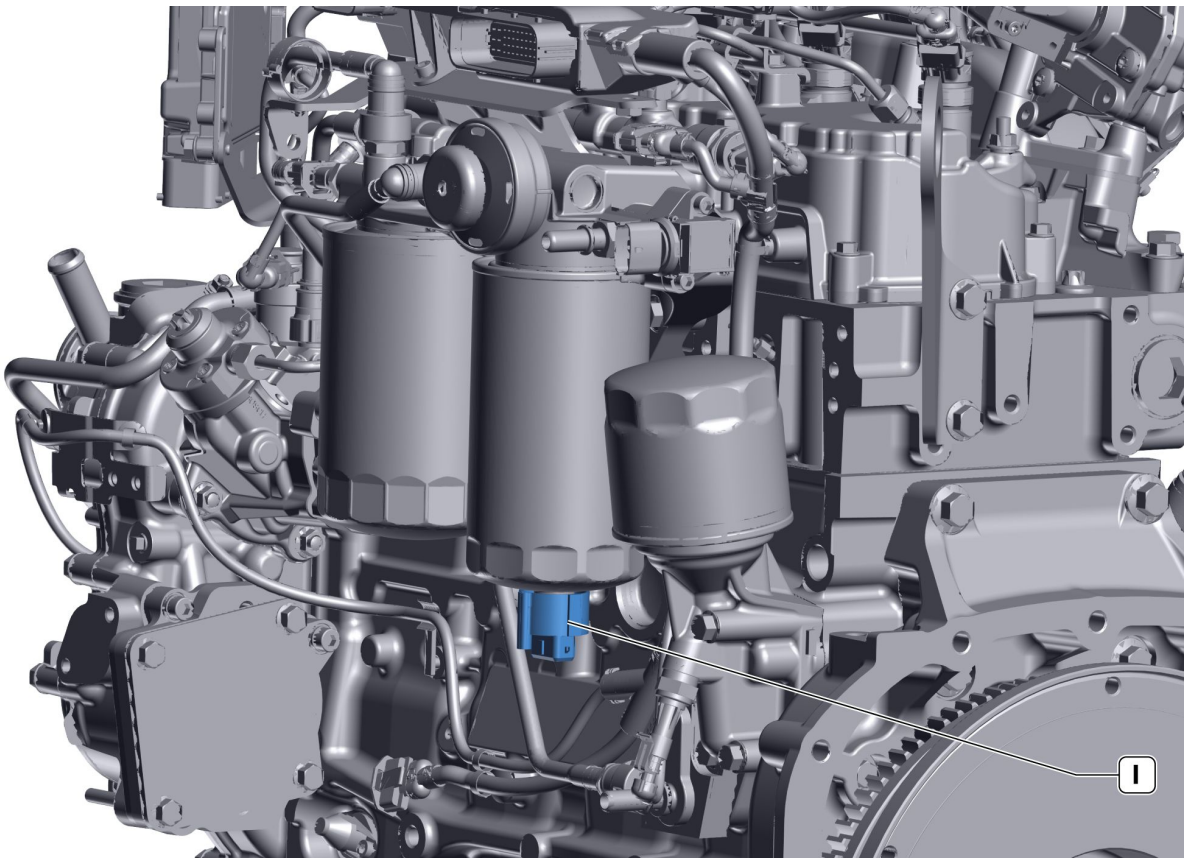
## Preparation

- No visible damage of fuel pre-filter

## Check

Check water in fuel sensor plausibility

- Read fault code memory from ECU
- Check amount of water at fuel pre-filter water in fuel sensor
- See figure and table below for explanation and go to **1**




275056 1

**Water in fuel sensor location at fuel pre-filter**

| Ref. | Description |
|---|---|
| (1) | Water in fuel sensor |

| Status ( ECM SYSTEM DIAGNOSTICS - Self-engage (29.54) ) | Water visible |
|---|---|
| Active | the |
| Not Active | no |

1. Check water in fuel sensor plausibility.
   A. If no water in fuel sensor, go to **3**.
   B. If there is water in the fuel sensor, go to **2**.

2. Possible root cause
   - Electrical defect of the water in fuel sensor.
   - Sensor defect, replace component.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The sensor works properly.

# 774510 HIGH PRESSURE ACCUMULATOR - Test Check external fuel leakage high pressure system

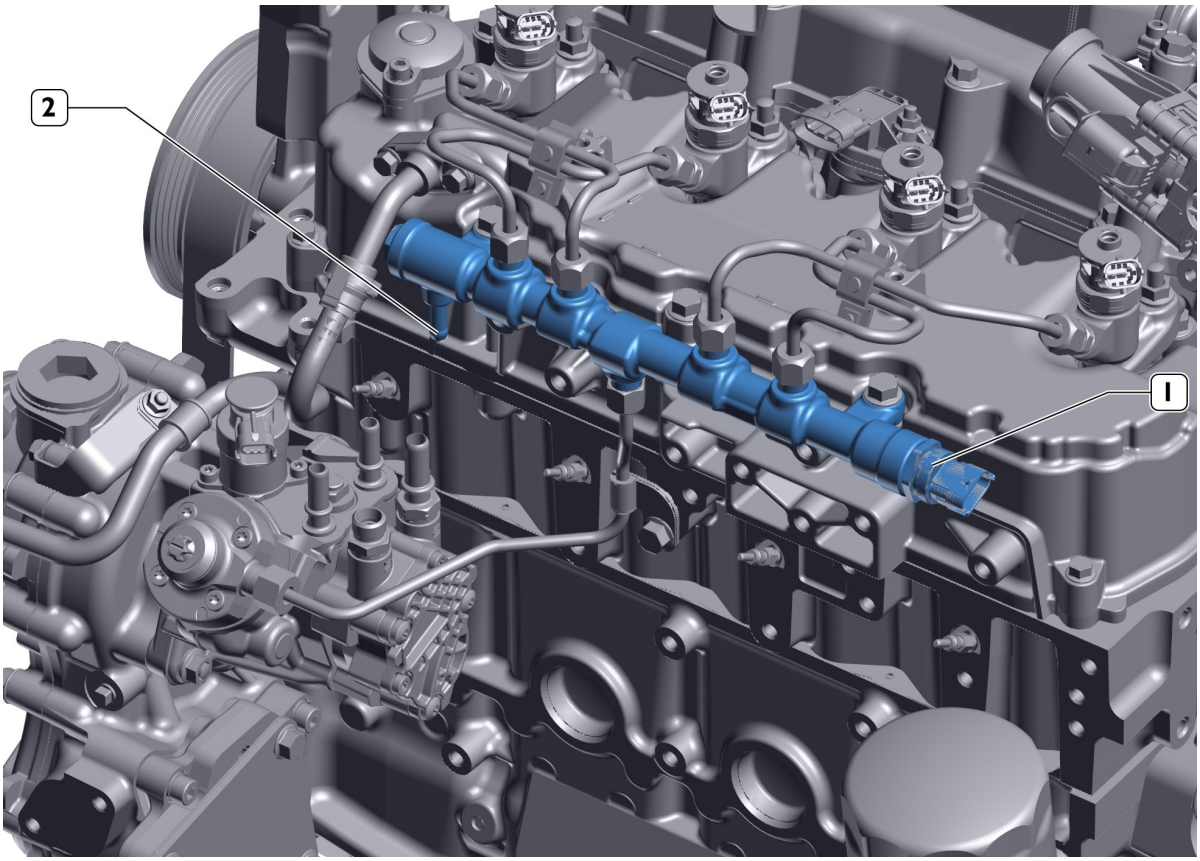
## Preparation

- Access the top part of the engine.

## Check

Check fuel leakage at rail and injectors

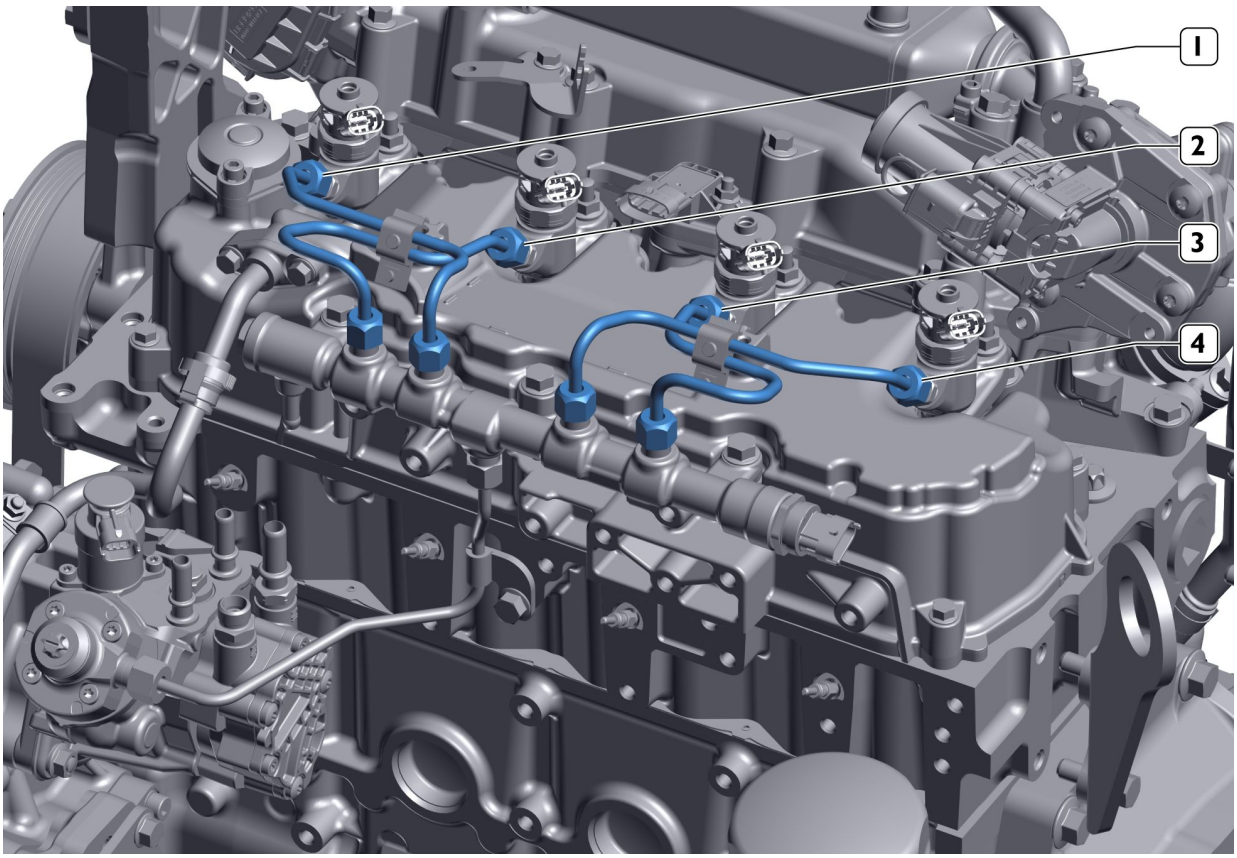
- Check the odours to identify any fuel contamination
- Visually check for any fuel contamination
- See the figures below, then go to **1**




275052 1

**Location of pressure sensor and limiting valve on the rail**

| Ref. | Description |
|---|---|
| **(1)** | Pressure sensor |
| **(2)** | Pressure limiting valve |




275051 2

**Location of the fuel rail and injectors**

| Ref. | Description |
|---|---|
| **(1–4)** | Injector high pressure inlets |

1. Check fuel leakage at rail and injectors
   A. No fuel odours are identified
   B. No visible fuel in the high-pressure connectors
   C. If there is no odour of fuel and no sign of any fuel at the connectors, go to **3**.
   D. If there is an odour of diesel and or signs of fuel at the high-pressure connectors, go to **2**.
2. Possible root cause
   - Damaged or leaking rail connectors.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

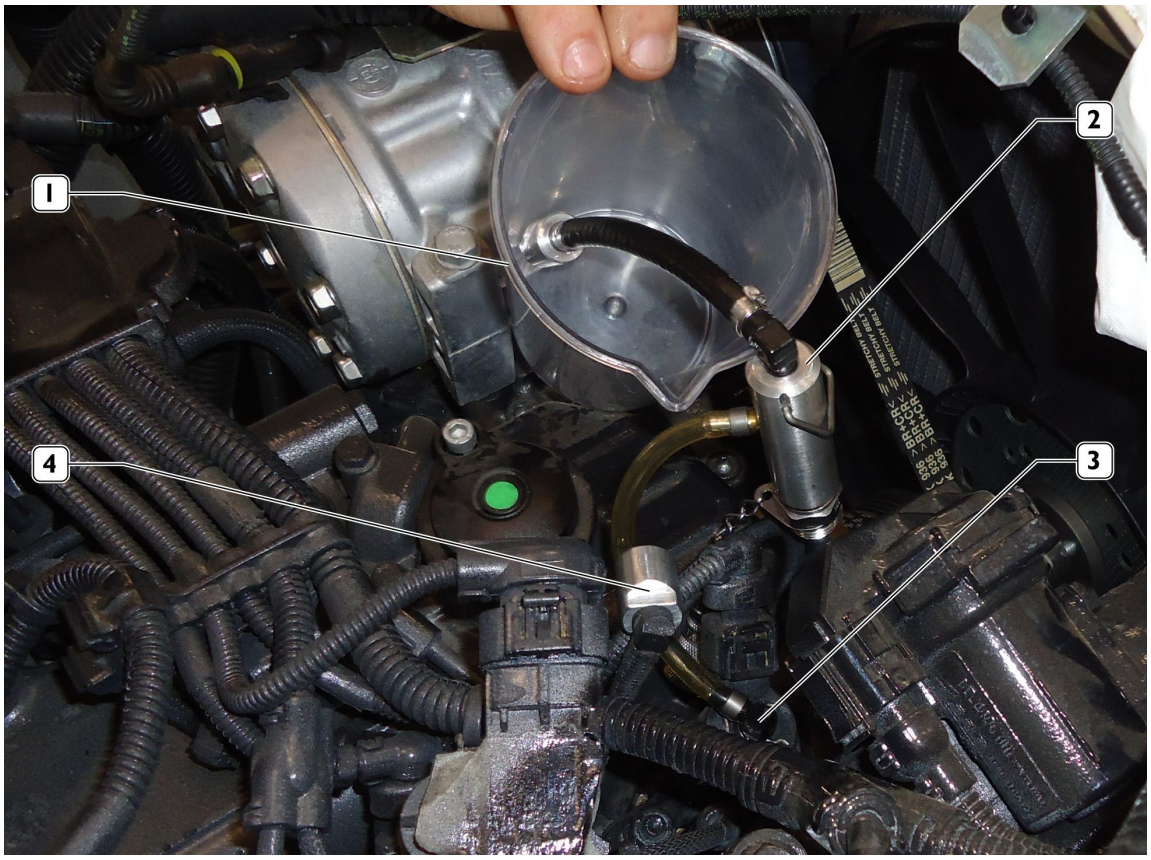
3. The fuel high pressure system works properly.

# 775010 INJECTOR - Test Check single injector backflow rate

## Preparation

If there is a strong suspicion for a too high injector backflow it is recommend to check all injectors individually.

- Visually check the components to ensure there are no external fuel leaks
- Disconnect the backflow hose on injector 1
- Plug the injectors backflow pipe
- Connect the pipe of the tool for measuring the injectors backflow pressure and flow rate on injector 1
- Prepare the stopwatch and measuring cup (min. **250 mL**)
- Insert the pipe from the tool for measuring the injectors flow rate and backflow pressure into the measuring cup
- Look the figures below for preparation:




276356 1

| Ref. | Description |
|---|---|
| (1) | Measuring cup |
| (2) | Equipment for measuring flow rate and injector backflow pressure |
| (3) | Injector backflow fitting |
| (4) | Plug |

## Check

Offboard tools

- Equipment for measuring flow rate and injector backflow pressure
- Measuring cup (min. **250 mL**)
- Stopwatch

Check single injector backflow rate

- If possible run engine until coolant temperature of **75 – 90 °C** is reached
- Crank/start engine until diesel runs out the tube
- Use empty measuring cup
- Leave the engine running, insert the pipe in the measuring device and start the stop watch
- Observe the diesel volume that runs into the measuring device. Use the same time period as in previous check of the high-pressure system backflow rate ( **60 s**)
- Note the injector individual diesel volume
- Repeat previous steps for every injector
- See figure and table below for a list of expected results and go to **1**

***NOTE:*** *Wait for approx.* ***1–2 min*** *between the measurement carried out on one injector and the next to allow the fuel flow to stabilise in the hose.*

| Engine condition | Volume mL / 60 s | | Remark |
|---|---|---|---|
| | Minimum | Maximum | |
| Idle | **4,0 mL** | **6,0 mL** | A **800 RPM** (4-valve engine) |
| High idle | **9,6 mL** | **14,4 mL** | At **1500 RPM** (4-valve engine) |
| Idle | **18,0 mL** | **24,0 mL** | At **850 RPM** (2-valve engine) |
| High idle | **20,0 mL** | **30,0 mL** | At **1500 RPM** (2-valve engine) |

1. Check if the volumes measured are in the range explained in the table above.
   A. If no large deviation of the single injector backflow rates between the single injectors, go to **3**
   B. If no individual injector backflow rate larger than three times the backflow rates of the injector with the smallest amount of backflow rate, go to **3**
   C. If the injectors backflow rate are NOT OK, go to **2**
2. Possible root cause (backflow rate too high)
   - If there are one/some injectors that shows a volume-rate above more than 3-times compared to the injector with the lowest rate, replace the injectors with this high volume rates

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The injector works properly.

# 775010 INJECTOR - Test Injector cut out activation check

## Preparation

General checks

- Battery voltage is sufficient.
- Vehicle fuses are OK.
- Connectors/plugs OK. No loose contact or corrosion.
- Offboard tool Diagnosis tester

## Injector cut out activation check

## Preparation

- Turn the ignition key to ON.
- Start the engine and set its required rpm.
- Connect the diagnostic tester.

## Check

- Deactivate a single injector, so the injector do no longer deliver fuel to the cylinder.




274377 1

- Observe change in system behaviour, such as changed of sound or increasing vibration.
- Repeat previous check with each cylinder.
- Go to **1**

1. Injector cut out activation check
   A. If an injector, which is not delivering sufficient quantity, is deactivated, the system behaviour should not change greatly.
   B. If a working injector is deactivated, the sound will change and the engine will shake noticeably.
   C. If Injector cut out activation is OK go to **3**.
   D. If Injector cut out activation is not OK, go to **2**.
2. Possible root cause
   - Electrical defect of the injector, check wiring harness and component electrically.
   - Mechanical defect of the injector, e.g. seized fuel injector.
   - Engine mechanical defect - Cylinder head gasket damaged - Valve control damaged.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

3. The injector works properly.

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# CHASSIS - 50


## [50.71] EXHAUST PIPES AND SILENCER ..... 50.1

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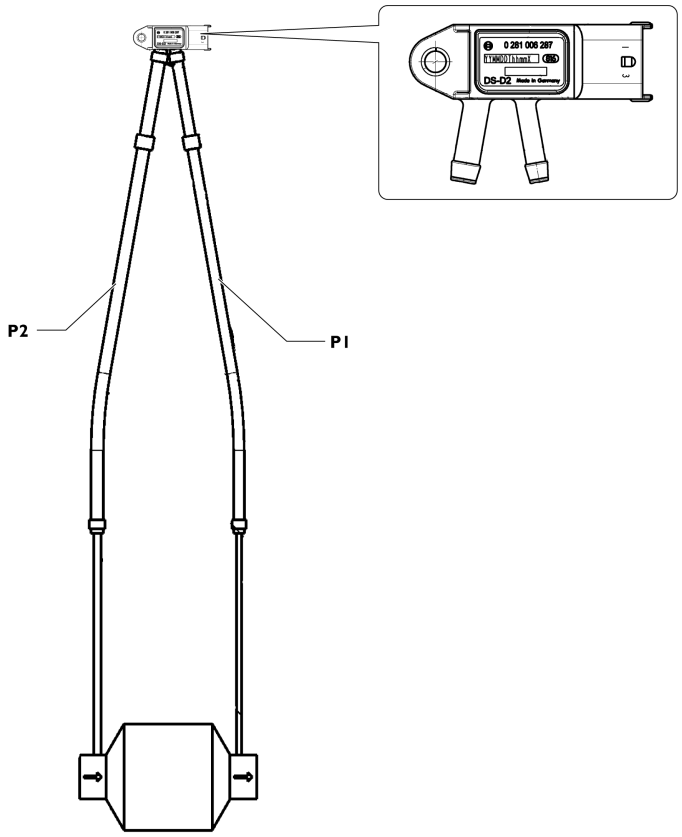
PRESSURE SENSOR
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## [50.74] AD-BLUE SYSTEM ..... 50.2

SERVICE

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# 507134 PRESSURE SENSOR - Test - Particulate matter catalyst differential pressure sensor




**(P1) Pressure downstream of particulate catalyst- (P2) Pressure upstream of particulate catalyst**

## Description

The differential pressure sensor **B-F34** is present in the exhaust gas post-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the difference in pressure between the particulate catalyst inlet and outlet. The differential pressure sensor consists of a piezo-resistive pressure sensor connected to a signal amplification circuit with integrated temperature compensation on a silicon chip. Pressure (P1) acts on the underside of the silicon diaphragm which is resistant to corrosion. The diaphragm is protected by a gel film which prevents any damage due to ice as well as possible signal errors due to accumulation of impurities. Pressure (P2) acts on the upper side of the silicon diaphragm. The top surface of the chip and the connection of the wire to the ceramic substrate are protected against corrosion by the anti-corrosive gel.

To refer to the technical data relating to the differential pressure sensor **B-F34**, see **PRESSURE SENSOR - Technical Data (50.71)**.

## Diagnostics procedure

1. Visually check that the pipes connected to the differential pressure sensor **B-F34** show no sign of restrictions and are not damaged.

A. If the pipes are restricted and/or damaged, replace them and continue with step **4**.

B. If the pipes are not restricted and/or damaged, continue with step **2**.

2. Visually check that the pipes connected to the differential pressure sensor **B-F34** show no sign of obstructions due to dust or other impurities.

   A. If the pipes are obstructed, clean them and continue with step **3**.

   B. If the pipes are not obstructed, continue with step **3**.

3. Visually check that the wiring harness is intact and that the connector of the differential pressure sensor **B-F34** shows no sign of oxidation.

   A. If any damage to the wiring harness or oxidation on the contacts of the connector is detected, replace the wiring harness and continue with step **4**.

   B. If you find no damage to the wiring harness or oxidation on the contacts of the connector, continue with step **4**.

4. Use a diagnostics instrument to check the parameters relating to the differential pressure sensor **B-F34** in the following conditions:

   - Start the engine and maintain idle speed for **15 s**
   - Accelerate to maximum speed for **15 s**
   - Go back to idle speed from **15 s**

   Analyse the graph relating to the pressure differential.

   A. If the pressure differential is positive, this indicates that the sensor is working correctly.Go to step **5**.

   B. If the pressure differential is negative, this indicates that the pipes are not connected correctly. Check the connection layout and repeat the test.

   C. If the pressure differential remains unchanged, it is possible that the component is not working correctly. Return to the fault identification procedure and then go to step **5**.

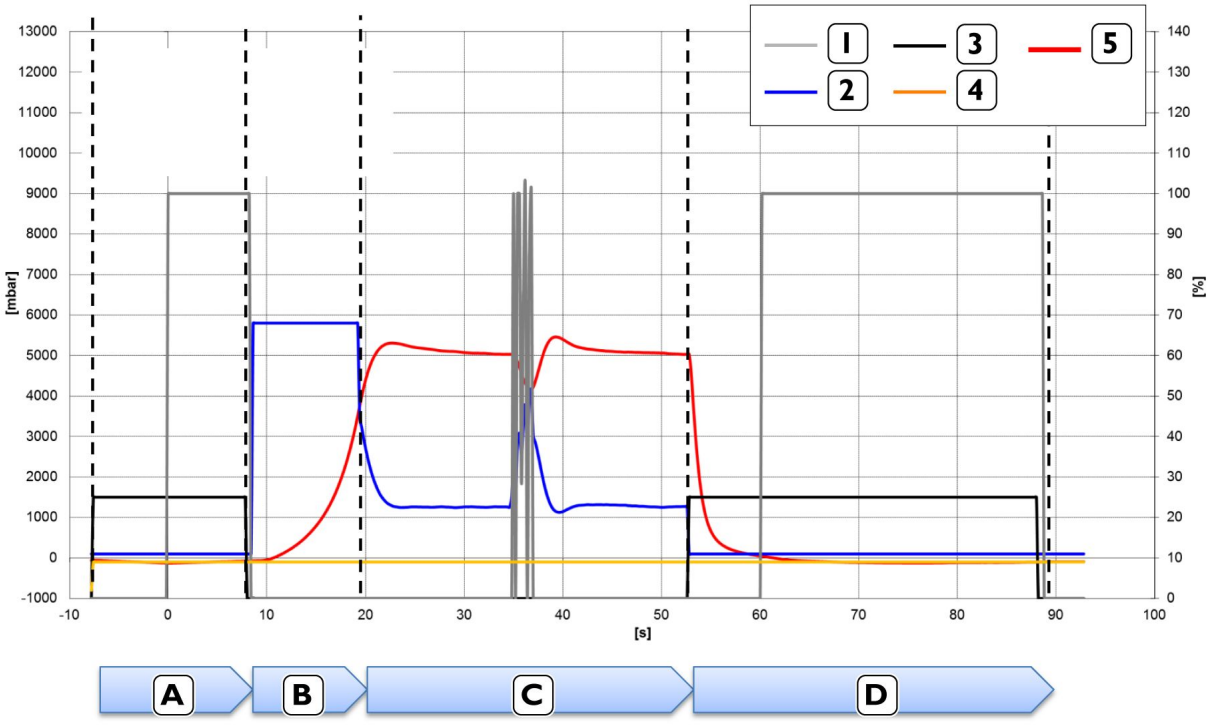
5. Use the diagnostic instrument to carry out a regeneration cycle of the particulate catalyst, disable and clear the fault codes, and check whether the error returns.

   A. If the fault code relating to the differential pressure sensor is not active, carry out a functional test to check correct vehicle operation. Diagnostics can be considered terminated if there are no faults relating to the differential pressure sensor.

   B. If the fault code relating to the differential pressure sensor is active, go back to the fault identification procedure.

# 5074 AD-BLUE SYSTEM - Test - Urea Dosing System Check (UDST) Bosch 6.5 and Bosch 3.3

The Urea-Dosing-System-Test (UDST) is a test procedure carried out by the diagnostic instrument, and which allows the correct installation and operation of the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** dosing components to be checked.



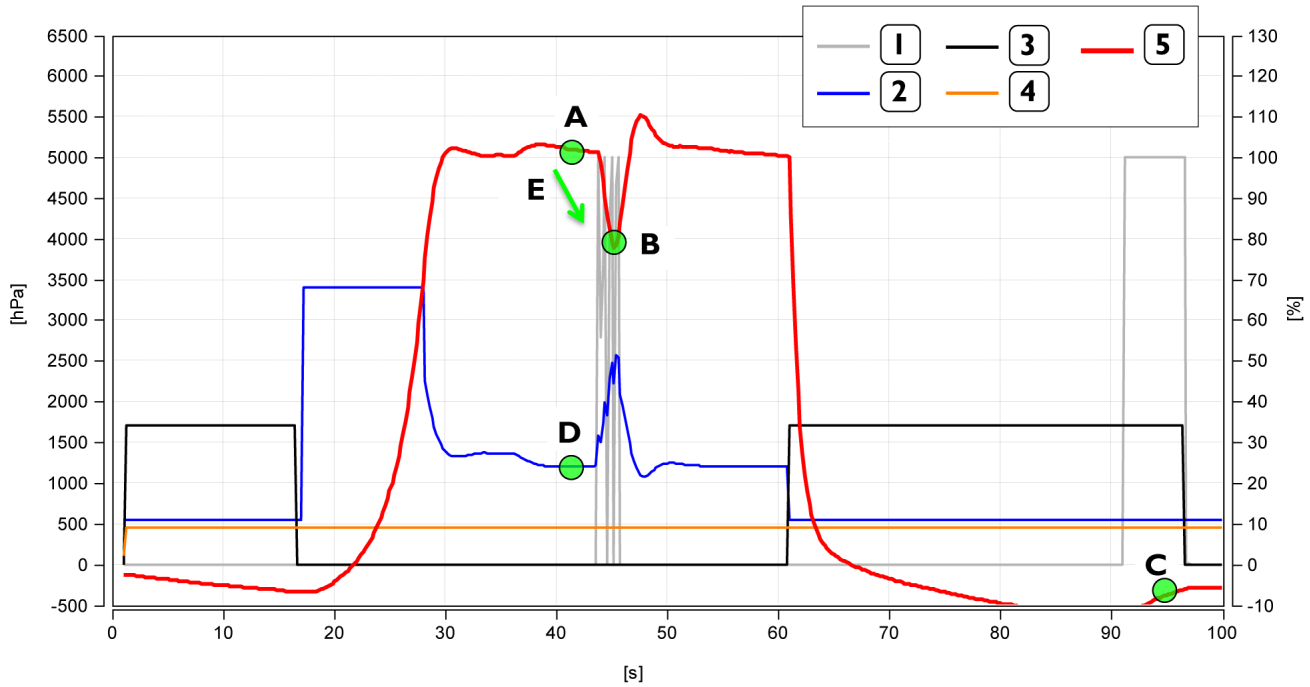

268102 1

**(1) DC dosing module — (2) DC pump — (3) DC return pump — (4) SCR status — (5) Pressure ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**

## Main sections of the UDST test procedure

| | Section | Description |
|---|---|---|
| A | Pressure reduction | Brief emptying stage to bring the system to a specific start phase of the procedure |
| B | Pressure filling and increase | Filling the system following an increase in pressure until the nominal threshold **5 bar** is reached |
| C | Stabilising pressure and injection | Stabilising phase of the pressure following a short injection |
| D | Evacuation | Emptying phase of the lines, the dosing module and the supply module |

## Assessment of the UDST test procedure




268103-01 2

**(1) DC dosing module — (2) DC pump — (3)DC return pump — (4) SCR status — (5) Pressure AdBlue fluid level. Meets the requirements of ISO 22241. Qualification IVECO Standard 18-1852**

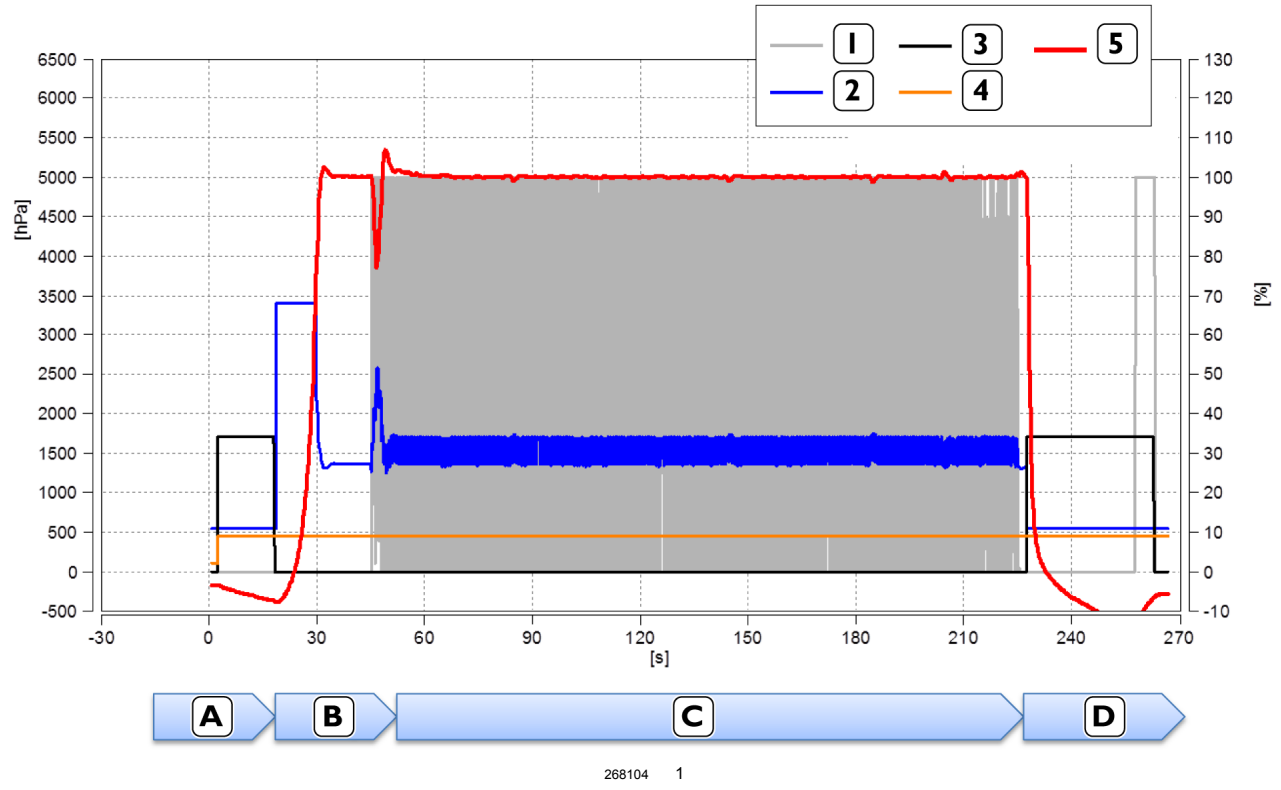
| Assessment point | Type | Upper limit | Lower limit |
|---|---|---|---|
| A | Operating pressure | **5300 mbar** | **4700 mbar** |
| B | Pressure on injection | No limit applied, data used to calculate the drop in pressure during injection | |
| C | Pressure on emptying | **0 mbar** | **–1000 mbar** |
| D | Pump working cycle | **28%** | **18%** |
| E | Pressure drop during injection | **- mbar** | **250 mbar** |

# 5074 AD-BLUE SYSTEM - Test - Urea Dosing Valve Check (UDVC) Bosch 6.5 and Bosch 3.3

The Urea-Dosing-Valve-Check (UDVC) is a test procedure carried out by the diagnostic instrument, which allows the correct amount of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injected by the dosing module to be checked. The procedure involves removing the dosing module and checking the amount injected using a graded container.

During the procedure, a flow rate of **2000 g/h** and an injection amount of **100 g** is considered. The amount of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injected must be between **± 10%** of the nominal value.

| Test | Flow Rate | Amount injected | Test duration | Lower limit of injected amount | Upper limit of injected amount |
|---|---|---|---|---|---|
| UDVC | **2000 g/h** | **100 g** | **270 s** | **90 g** | **110 g** |




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**(1) DC dosing module — (2) DC pump — (3) DC return pump — (4) SCR status — (5) Pressure ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**

## Main sections of the UDVC test procedure

The UDVC procedure can be divided into 4 sequential sections:

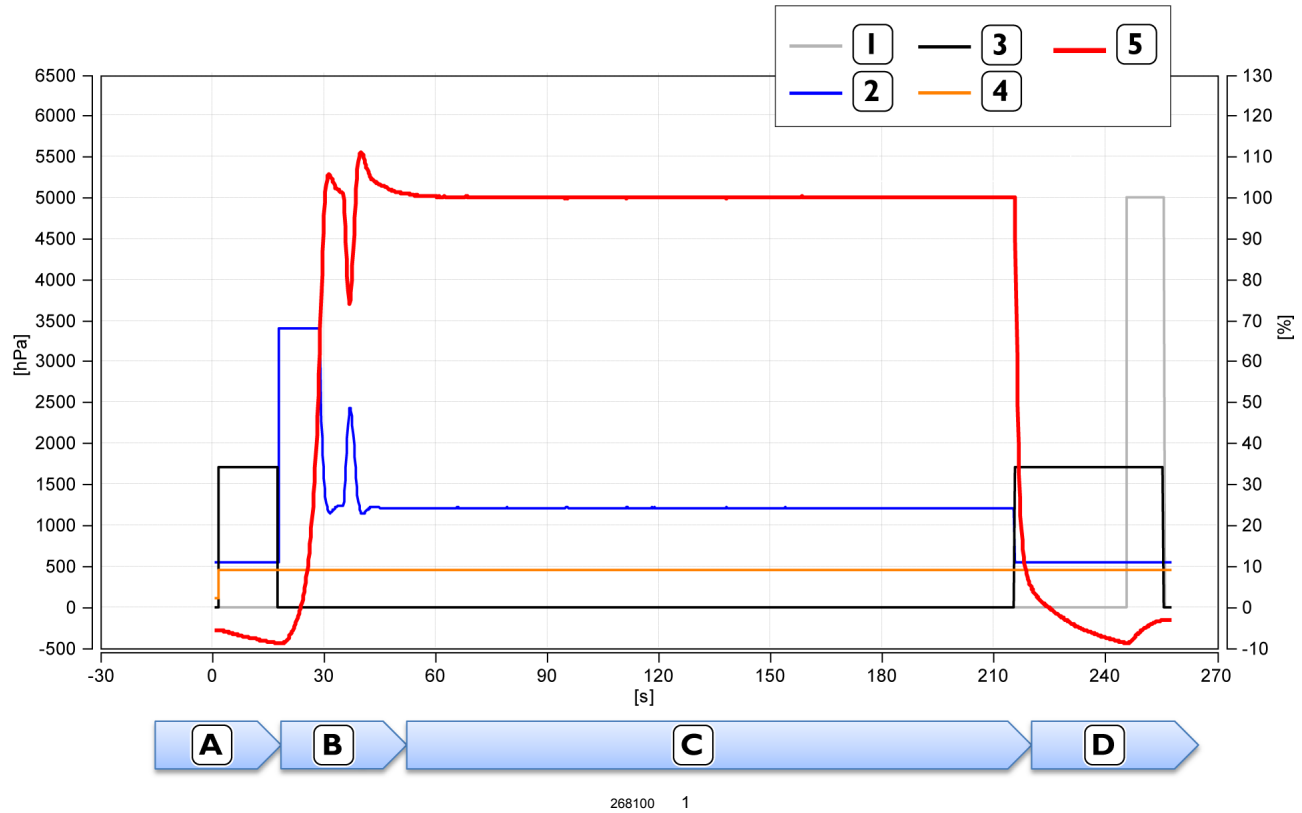
| | Section | Description |
|---|---|---|
| A | Pressure reduction | Brief emptying stage to bring the system to a specific start phase of the procedure |
| B | Pressure filling and increase | Refilling the system after an increase in pressure |
| C | Stabilising pressure and injection | Pressure stabilisation phase followed by injection |

| | | |
|---|---|---|
| D | Evacuation | Emptying phase of the lines, the dosing module and the supply module |

# 5074 AD-BLUE SYSTEM - Test - Urea Dosing Leakage Check (UDLC) Bosch 6.5 and Bosch 3.3

The Urea-Dosing-Leakage-Check (UDLC) is a test procedure carried out by the diagnostic instrument, which allows verification of an **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** leak by pressurising the system for a specific length of time. **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** is not injected during the test.

| Test | Flow Rate | Amount injected | Test duration | Criteria of acceptability |
|---|---|---|---|---|
| UDLC | **0 g/h** | **0 g** | **250 s** | No **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** leak |




**(1) DC dosing module — (2) DC pump — (3) DC return pump — (4) SCR status — (5) Pressure ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**

## Main sections of the UDLC test procedure

The UDLC procedure can be divided into 4 sequential sections:

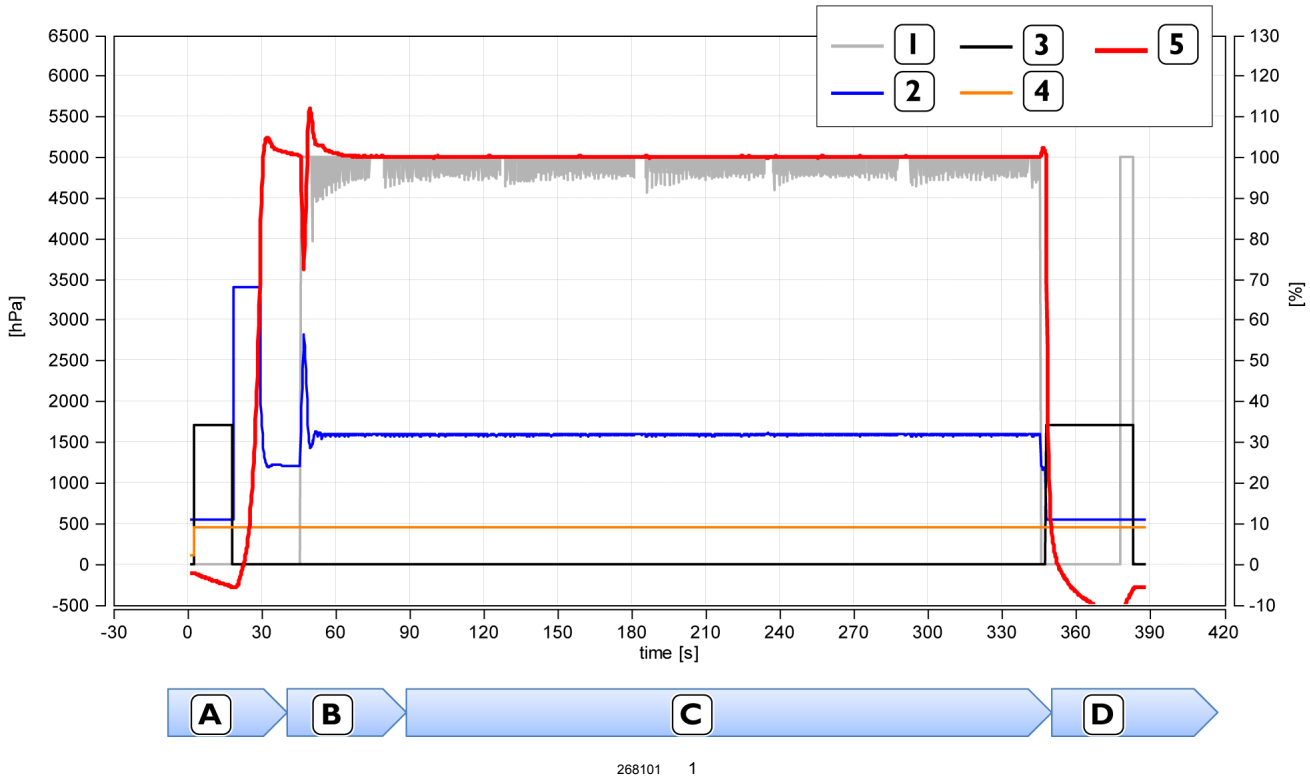
| | Section | Description |
|---|---|---|
| A | Pressure reduction | Brief emptying stage to bring the system to a specific start phase of the procedure |
| B | Pressure filling and increase | Refilling the system after an increase in pressure |
| C | Pressure stabilisation | Pressure stabilisation phase |
| D | Evacuation | Emptying phase of the lines, the dosing module and the supply module |

# 5074 AD-BLUE SYSTEM - Test - Urea Dosing Pump Check (UDPC) Bosch 6.5 and Bosch 3.3

The Urea-Dosing-Pump-Check (UDVC) is a test procedure carried out by the diagnostic instrument, which allows the correct amount of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injected by the dosing module to be checked. The procedure involves removing the dosing module and checking the amount injected using a graded container.

During the procedure, a flow rate of **3120 g/h** and an injection amount of **260 g** is considered for a period of **390 s**

| Test | Flow Rate | Amount injected | Test duration | Criteria of acceptability |
|---|---|---|---|---|
| UDPC | **3120 g/h** | **260 g** | **390 s** | Stable pressure during the entire test |




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**(1) DC dosing module — (2) DC pump — (3) DC return pump — (4) SCR status — (5) Pressure ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**

## Main sections of the UDPC test procedure

The UDPC procedure can be divided into 4 sequential sections:

| | Section | Description |
|---|---|---|
| A | Pressure reduction | Brief emptying stage to bring the system to a specific start phase of the procedure |
| B | Pressure filling and increase | Refilling the system after an increase in pressure |
| C | Stabilising pressure and injection | Stabilising phase of the pressure followed by an injection equal to the maximum flow rate deliverable |
| D | Evacuation | Emptying phase of the lines, the dosing module and the supply module |

# 5074 AD-BLUE SYSTEM - Test - Bosch 6.5 supply module and Bosch 3.3 dosing module

## Description

The **M-F42A** supply module in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** serves basically to take the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** from the tank and send it under pressure to the dosing module **Y-F44A**.

The supply module **M-F42A** consists basically of a diaphragm pump which takes the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** from the tank and sends it to the dosing module **Y-F44A**. It is equipped with a circuit connected to the engine cooling system which, in the case of low temperature, prevents the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** from freezing. The amount of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** sent to the dosing module **Y-F44A** and the injection pressure are both controlled by the engine control unit and are based on the engine operating conditions and the signals sent by the sensors. To prevent damage to the pump and the dosing module, the supply module has a filter inside which cleans the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** of any impurities.

To refer to the technical data relating to the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** supply module **M-F42A**, see **AD-BLUE UNIT PUMP MODULE - Technical Data (50.74)**.

To refer to the technical data relating to the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852 Y-F44A** dosing module, see **AD-BLUE METERING DEV MODU - Technical Data (50.74)**.

## Troubleshooting

1. Use the diagnostic instrument to carry out the Urea Dosing System Test (UDST) **AD-BLUE SYSTEM - Test (50.74)** .
2. On the basis of the system conditions, the test will return the following fault modes:

| Fault Mode | Description | connection |
|---|---|---|
| EM-0 | No fault and/or anomaly present. System responds correctly | - |
| EM-1 | Obstruction on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** return line | **ERROR MODE – 1** |
| EM-2 | **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** leak from the delivery line | **ERROR MODE – 2** |
| EM-3 | Operating pressure too low | **ERROR MODE – 3** |
| EM-4 | Pressurised line blocked | **ERROR MODE – 4** |

| | | |
|---|---|---|
| EM-5 | Fault relating to return valve | **ERROR MODE – 5** |
| EM-99 | Theoretical anomaly or fault, not foreseeable | **ERROR MODE – 99** |

ERROR MODE – 1

If the UDST tests returns EM-1 mode, proceed as follows:

A: Obstruction on the return line.

1. Visually check that there are no obstructions or crushed sections on the lines relating to the return line.
2. Clean or replace the damaged lines.
3. Repeat the UDST test and check that the fault has been resolved.

B: Valve clogged or non-return valve blocked (does not open).

1. Check that the **AdBlue fluid level. Meets the requirements of ISO 22241. Qualification IVECO Standard 18-1852** returns correctly.
2. Disconnect the return line connector from the supply module and start the UDST procedure. Visually check that there is a constant flow of **AdBlue fluid level. Meets the requirements of ISO 22241. Qualification IVECO Standard 18-1852**. If the flow is not constant, go back to the fault identification procedure.
3. Repeat the UDST test and check that the fault has been resolved.

C: Impurities in the return line filter.

1. Go back to the fault identification procedure.
2. Repeat the UDST test and check that the fault has been resolved.

D: Pump malfunction.

1. Go back to the fault identification procedure.

Repeat the UDST procedure and check that the fault has been resolved.

ERROR MODE – 2

If the UDST tests returns EM-2 mode, proceed as follows:

A: **AdBlue fluid level. Meets the requirements of ISO 22241. Qualification IVECO Standard 18-1852** leak from the delivery line.

1. Visually check that there are no leaks from the lines. Repair or replace the damaged line.
2. Visually check there are no leaks from the connections on the dosing module. Repair or replace the damaged component (if present).
3. Visually check there are no leaks from the connections on the supply module (delivery). Repair or replace the damaged component (if present).
4. Repeat the UDST test and check that the fault has been resolved.

B: Obstruction on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** suction line.

1. Visually check that there are no obstructions or crushed sections on the lines relating to the suction line. Repair or replace the damaged line.
2. Repeat the UDST test and check that the fault has been resolved.

C: Clogging of the supply module pre-filter.

1. Make sure that the supply module pre-filter is not clogged. Replace the supply module pre-filter if necessary.

Carry out the Urea Dosing Leakage Check (UDLC) procedure **AD-BLUE SYSTEM - Test (50.74)** .
During the UDLC test, the supply module brings the system up to pressure and keeps it pressurised for a given period of time. During the test, **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injection is not activated. This is useful for checking for the presence of leaks or gaps.
Repeat the UDST procedure and check that the fault has been resolved.

ERROR MODE – 3

If the UDST tests returns EM-3 mode, proceed as follows:

A: Operating pressure too low - **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank empty.

1. Check the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** level in the tank. Restore the correct level of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**.

B: Incorrect connection of the inlet and outlet lines on the supply module or on the tank.

1. Check that the inlet and outlet lines are both connected correctly. Pay careful attention to the indications on the supply module.

C: Serious **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** leak from the pressurised components.

1. Visually check that there are no leaks from the lines. Repair or replace the damaged line.
2. Repeat the UDST test and check that the fault has been resolved.

D: Obstruction in the aeration line of the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank.

1. Check that the aeration line of the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank is not obstructed by crystallised Urea or a restricted section. Clean / repair or replace the damaged line.

E: Obstruction on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** suction line.

1. Visually check that there are no obstructions or crushed sections on the lines relating to the suction line. Repair or replace the damaged line.

F: Clogging of the supply module pre-filter.

1. Make sure that the supply module pre-filter is not clogged. Replace the supply module pre-filter if necessary.

G: Leak on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** suction line.

1. Visually check that there are no leaks relating to the suction line. Repair or replace the damaged line.

***NOTE:*** *Leaks relating to the suction line are extremely difficult to detect. There are no clear leaks outwards but the air is being sucked in.*
*In you are in any doubt, carry out a test using a new suction line and supply the pump module from a separate tank filled with* ***ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852****.*

1. Visually check that the O-rings on the connections of the supply module and the tank are not damaged. Replace the damaged O-rings.
2. Check that the suction line from the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank is not damaged. If necessary, replace the suction line from the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank.

H: Supply module fault (faulty diaphragm pump, faulty return valve…).

1. Go back to the fault identification procedure.

I: Drift of values returned from the pressure sensor.

1. Go back to the fault identification procedure.

Carry out the Urea Dosing Valve Check (UDVC) procedure **AD-BLUE SYSTEM - Test (50.74)**. During the UDVC test, it is possible to evaluate the volume of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** supplied by the injector. The verification is possible by disassembling the injector and delivering into a graded container.

Carry out the Urea Dosing Pump Check (UDPC) procedure **AD-BLUE SYSTEM - Test (50.74)**. During the UDPC test it is possible to evaluate the maximum flow rate of the supply module pump. The verification is possible by disassembling the injector and delivering into a graded container.

The pressure must remain stable during the entire test.

Carry out the UDLC procedure **AD-BLUE SYSTEM - Test (50.74)**. During the UDLC test, the supply module brings the system up to pressure and keeps it pressurised for a given period of time. During the test, **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injection is not activated. This is useful for checking for the presence of leaks or gaps.

Repeat the UDST procedure and check that the fault has been resolved.

ERROR MODE – 4

If the UDST tests returns EM-4 mode, proceed as follows:

A: Dosing valve blocked (in both the open and the closed position).

- Repeat the UDST test twice. The first time to release the system and the second time to verify the presence of operating conditions.

***NOTE:*** *The **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injector may block due to deposits of crystallised Urea. The condition can often be resolved by repeating the test or dissolving the deposits with **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**.*

- If the second test also gives a negative result, go back to the fault identification procedure.

***NOTE:*** *The dosing module must be replaced if it has been subjected to thermal damage resulting from exposure to excessively high temperatures. The **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** injector may block due to deposits of crystallised Urea. The condition can often be resolved by repeating the test or dissolving the deposits with **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852**.*

B: Serious obstruction on the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** delivery line.

1. Visually check that there are no obstructions or crushed sections on the lines relating to the delivery line. Repair or replace the damaged line.
2. Check that the delivery line is not clogged with solid particles. Clean or replace the line as necessary.

Carry out the UDVC procedure **AD-BLUE SYSTEM - Test (50.74)** . During the UDVC test, it is possible to evaluate the volume of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** supplied by the injector. The verification is possible by disassembling the injector and delivering into a graded container.

Carry out the UDPC procedure **AD-BLUE SYSTEM - Test (50.74)** . During the UDPC test it is possible to evaluate the maximum flow rate of the supply module pump. The verification is possible by disassembling the injector and delivering into a graded container.

The pressure must remain stable during the entire test.

Repeat the UDST procedure and check that the fault has been resolved.

ERROR MODE – 5

If the UDST tests returns EM-5 mode, proceed as follows:

A: Fault relating to the purging pump

1. Check operation of the purging pump and, if it is not working correctly, go back to the fault identification procedure.

Carry out the UDPC procedure **AD-BLUE SYSTEM - Test (50.74)**. During the UDPC test it is possible to evaluate the maximum flow rate of the supply module pump. The verification is possible by disassembling the injector and delivering into a graded container.

The pressure must remain stable during the entire test.

Repeat the UDST procedure and check that the fault has been resolved.

ERROR MODE – 99

If the UDST tests returns EM-99 mode, proceed as follows:

A: Theoretical anomaly or fault, not foreseeable.

1. Fault which has not occurred before. Repeat the UDST test
2. If the UDST test confirms error EM-99, contact the Technical Help Desk.

# 507424 AD-BLUE INDICATOR - Test - AdBlue level and temperature sensor

The DEF/AdBlue® quality, level and temperature sensor **B-F43-46**is present in the exhaust gas after treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** temperature, level and quality inside the tank.

To refer to the technical data relating to the DEF/AdBlue® temperature and level sensor **B-F43-46**, see **AD-BLUE INDICATOR - Technical Data (50.74)**.

## Diagnostics procedure

1. Use the diagnostic instrument to acquire the data relating to the temperature of the fluid in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank. Use a digital thermometer with a probe to acquire the temperature data relating to the fluid in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank. Compare the data provided by the diagnostic instrument with the data acquired directly using the digital thermometer.
   A. If the temperature values match, this indicates that the temperature read by the sensor is correct. Go to step **2**.
   B. If the temperature values do not coincide, this indicates that the sensor might not be working correctly. Go back to the fault identification procedure.

2. Use the diagnostic instrument to acquire the data relating to the level of liquid present in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank in the following conditions:
   - **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank completely empty ( **0%**).
   - **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank full to **50%**, use the capacity data to determine the exact amount of liquid to be introduced.
   - **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank completely empty ( **100%**)

   Analyse the three sets of data provided by the diagnostic instrument, checking that they are consistent with the three different test conditions.

   A. If the values related to the level sensor are consistent, this indicates that the sensor is working correctly. Continue with the troubleshooting procedure.

   B. If the values relating to the level sensor are not consistent, check the efficiency of the electrical wiring and carry out the fault identification procedure.

# 507433 CROSSOVER VALVE - Test - DEF/AdBlue® tank heating valve

## Description:

The heating valve of the DEF/AdBlue® tank **Y-F60** is present in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and has the dual purpose of preventing the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** from freezing and also preventing the dosing module from overheating. The switching valve is a 2 position/3-way solenoid valve. Depending on the temperatures detected by the NTC sensor, the switching valve will close or open the passage of the engine coolant in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank heating coil. The cooling circuit of the dosing module will always remain open. The first position allows cooling of the dosing module, the second position allows heating of the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank and relative pipes.

To refer to the technical data relating to the DEF/AdBlue® **Y-F60** heating valve, see **CROSSOVER VALVE - Technical Data (50.74)** .

## Diagnostics procedure

1. Check the internal resistor of the DEF/Ad-blue® tank heating valve **Y-F60**. Proceed as follows:
   - Use a multimeter to check that the resistance recorded between the two pins of the connector of the valve **Y-F60** is between **30 – 34 Ω** and **25 °C** for version **24 V** and **20 – 24 Ω** and **25 °C** for version **12 V**.
     A. If the resistance measured is between **30 – 34 Ω** and **25 °C** for the **24 V** version and **20 – 24 Ω** and **25 °C** for the **12 V** version, go to step **2**.
     B. If the measured resistance is not between **30 – 34 Ω** at **25 °C** for the version **24 V**and **20 – 24 Ω** at **25 °C** for the version **12 V**, the component may not work correctly. Return to the troubleshooting procedure.

2. Start the engine and bring it to a stabilised operating temperature. Power the valve **Y-F60** and use a designated digital thermometer with a probe to check that the temperature of the liquid in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank rises.
   A. If there is an increase in the temperature of the liquid in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank, go to step **3**.
   B. If there is no increase in the temperature of the liquid in the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** tank, this indicates that the component might not be working correctly. Go back to the fault identification procedure.
3. Use a diagnostics tool to disable and clear the fault code. Restore the operating conditions of the vehicle and check that the fault code relating to the DEF/AdBlue® **Y-F60** tank heating valve does not activate.
   A. If the fault code relating to the DEF/AdBlue® tank heating valve is not active, this indicates that the sensor is operating correctly. Continue with the fault identification procedure.
   B. If the fault code relating to the DEF/AdBlue® tank heating valve is active, check the efficiency of the wiring and continue with the fault identification procedure.

# 507434 TEMPERATURE SENSOR - Test - Exhaust gas temperature sensor downstream of the SCR

## Description

The exhaust gas temperature sensor downstream of the SCR **B-F39** is present in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the outlet temperature at the catalyst. The exhaust gas temperature sensor downstream of the SCR **B-F39** is positioned in the after-treatment system downstream of the SCR catalyst. It consists of an internal platinum resistance crossed by a **5 V** voltage which allows indirect measurement of the resistance as the temperature changes. The sensor allows the electronic engine control unit (ECU) **A-F02** to constantly adjust the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** input according to the emissions.

To refer to the technical data relating to the exhaust gas temperature sensor downstream of SCR **B-F39** see **TEMPERATURE SENSOR - Technical Data (50.74)** .

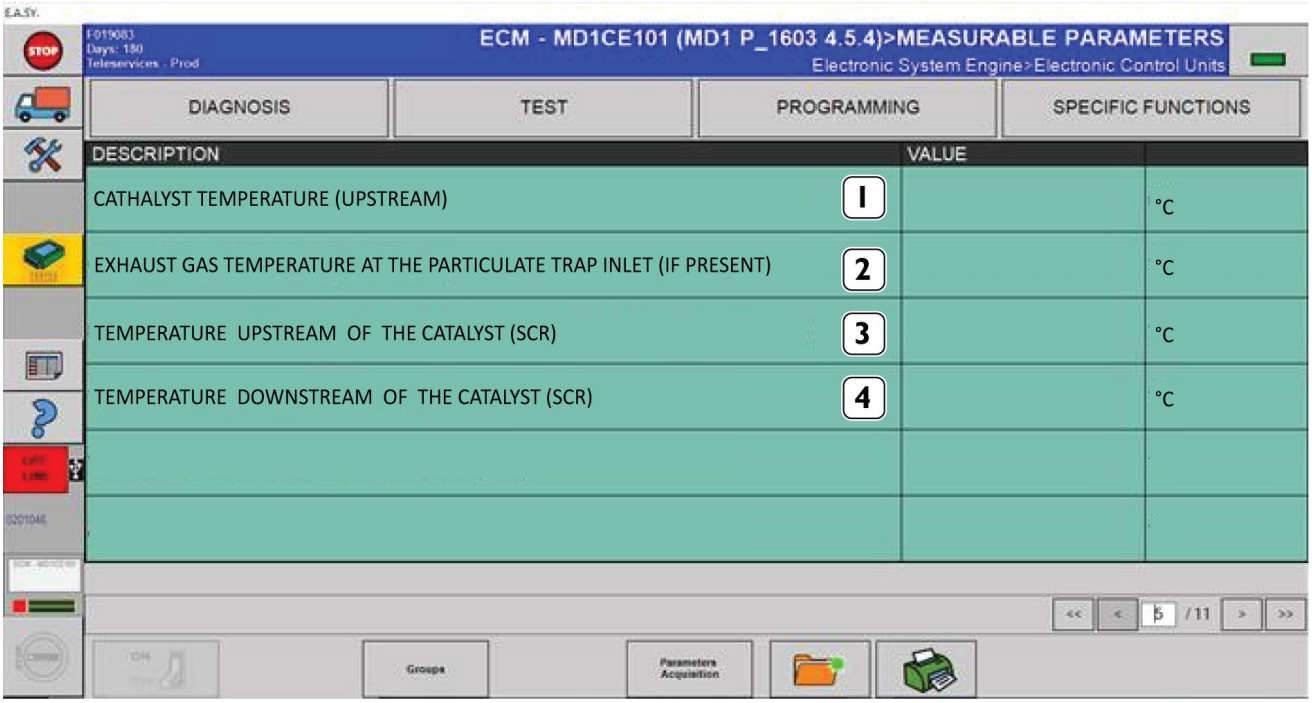
***NOTE:*** *The error codes relating to the exhaust gas temperature sensor downstream of the SCR **B-F39** immediately become inactive when the SCR outlet temperature drops below the threshold value. With the vehicle in the workshop it is likely that the error code will be inactive.*

## Diagnostics procedure

1. Check that the temperature sensors on the exhaust gas treatment system (ATS) are installed correctly and in the specified positions.
2. Use the diagnostic instrument to check that when the engine is cold, the values of the temperature sensors on the ATS system are all aligned and coincide with the ambient temperature.

   The sensors to be checked are the following:

   1. Exhaust gas temperature sensor upstream of DOC **B-F32**
   2. Exhaust gas temperature sensor downstream of the DOC **B-F113**
   3. Exhaust gas temperature sensor upstream of SCR **B-F38**
   4. Exhaust gas temperature sensor downstream of SCR **B-F39**




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Any misalignment of the temperature value can indicate a fault in a sensor or in the relative electrical circuit.

A. If the temperature values of the sensors examined are in line with each other, thermally regulate the engine following the instructions in the step **3** then go to step **4**.

B. If the temperature values relating to the sensors in question are not aligned, identify the sensor with the fault and continue with step **8**.

3. Ensure that the engine is operating at the correct temperature acting as follows:
   1. Keep the ignition switch set to “ON” for **15 s**.
   2. Start the engine and maintain idle speed for **15 s**
   3. Keep the engine running at **2000 RPM** for **30 s**
   4. Keep the engine running at **1600 RPM** for **30 s** with the shutter valve at the exhaust closed **90%**
   5. Keep the engine running at idle speed for **15 s**
4. Use the diagnostic instrument to check that the temperature sensors on the exhaust gas after-treatment system (ATS) show a decreasing temperature, starting from the sensor closest to the engine and moving towards the one furthest away in the exhaust.

   The test should last approx. **300 s** with a sampling frequency of **200 ms**.

***NOTE:*** *When using the diagnostic instrument to detect the parameters, make sure that the vehicle is not in a start-up condition.*

The sensors to be checked with a decreasing temperature sequence are:

1. Exhaust gas temperature sensor upstream of DOC **B-F32**
2. Exhaust gas temperature sensor downstream of the DOC **B-F113**
3. Exhaust gas temperature sensor upstream of SCR **B-F38**
4. Exhaust gas temperature sensor downstream of SCR **B-F39**

5. If the decreasing temperature trend is not observed, this indicates a malfunction of a sensor or the relative electric circuit.

   A. If the temperature values relating to the sensors in question do observe the decreasing temperature trend, continue with step **6**.

   B. If the temperature values relating to the sensors in question do not observe the decreasing temperature trend, this indicates a malfunction in a sensor or the relative electrical circuit. Go to step **8**.

6. Check that the sensors in question return resistance values which are compatible with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

7. Proceed as follow:

   1. Disconnect sensor from wiring harness.
   2. Remove the sensor from the after-treatment system.
   3. Place the sensor in a pipe which is of the same diameter and material as the one on the vehicle.
   4. Heat the sensor using a digital hot air blower.



Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury

- Use a thermal probe to check the temperature.
- Use a precision multimeter to read the resistance values between pin 1 and pin 2 of the temperature sensor in question and compare them with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

A. If the resistance values are correct, the sensor is working correctly. Continue with the fault identification procedure.

B. If the resistance values are incorrect, continue with step. **8**.

8. Check the efficiency of the electrical wiring and carry out the fault identification procedure.

# 507434 TEMPERATURE SENSOR - Test - Exhaust gas temperature sensor upstream of the SCR

## Description

The exhaust gas temperature sensor upstream of the SCR **B-F38** is present in the exhaust gas post-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the inlet temperature at the catalyst. The exhaust gas temperature sensor upstream of the SCR **B-F38** is positioned in the after-treatment system, between the DOC module and the SCR catalyst. It consists of an internal platinum resistor crossed by a voltage **5 V** which allows the indirect measurement of the resistance as the temperature changes. The sensor allows the electronic engine control unit (ECU) **A-F02** to constantly adjust **AdBlue fluid level. Meets the requirements of ISO 22241. Qualification IVECO Standard 18-1852** input according to the emissions.

To refer to the technical data relating to the temperature sensor of the exhaust gas upstream of the SCR **B-F38**, see **TEMPERATURE SENSOR - Technical Data (50.74)** .

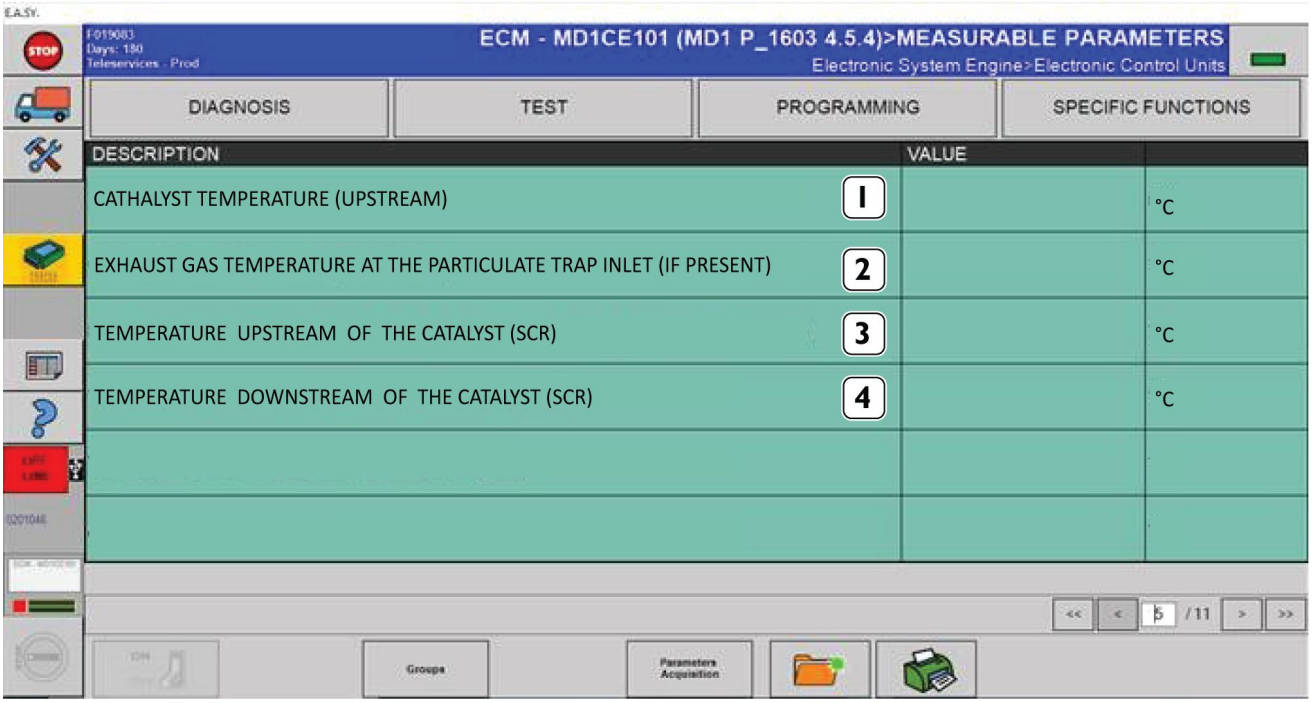
***NOTE:*** *The error codes relating to the exhaust gas temperature sensor upstream of the SCR **B-F38** immediately become inactive when the SCR inlet temperature drops below the threshold value. With the vehicle in the workshop it is likely that the error code will be inactive.*

## Diagnostics procedure

1. Check that the temperature sensors on the exhaust gas treatment system (ATS) are installed correctly and in the specified positions.
2. Use the diagnostic instrument to check that when the engine is cold, the values of the temperature sensors on the ATS system are all aligned and coincide with the ambient temperature.

   The sensors to be checked are the following:

   1. Exhaust gas temperature sensor upstream of DOC **B-F32**
   2. Exhaust gas temperature sensor downstream of the DOC **B-F113**
   3. Exhaust gas temperature sensor upstream of SCR **B-F38**
   4. Exhaust gas temperature sensor downstream of SCR **B-F39**




289656-01 1

Any misalignment of the temperature value can indicate a fault in a sensor or in the relative electrical circuit.

A. If the temperature values of the sensors examined are in line with each other, thermally regulate the engine following the instructions in the step **3** then go to step **4**.

B. If the temperature values relating to the sensors in question are not aligned, identify the sensor with the fault and continue with step **8**.

3. Ensure that the engine is operating at the correct temperature acting as follows:
   1. Keep the ignition switch set to “ON” for **15 s**.
   2. Start the engine and maintain idle speed for **15 s**
   3. Keep the engine running at **2000 RPM** for **30 s**
   4. Keep the engine running at **1600 RPM** for **30 s** with the shutter valve at the exhaust closed **90%**
   5. Keep the engine running at idle speed for **15 s**
4. Use the diagnostic instrument to check that the temperature sensors on the exhaust gas after-treatment system (ATS) show a decreasing temperature, starting from the sensor closest to the engine and moving towards the one furthest away in the exhaust.

   The test should last approx. **300 s** with a sampling frequency of **200 ms**.

***NOTE:*** *When using the diagnostic instrument to detect the parameters, make sure that the vehicle is not in a start-up condition.*

The sensors to be checked with a decreasing temperature sequence are:

1. Exhaust gas temperature sensor upstream of DOC **B-F32**
2. Exhaust gas temperature sensor downstream of the DOC **B-F113**
3. Exhaust gas temperature sensor upstream of SCR **B-F38**
4. Exhaust gas temperature sensor downstream of SCR **B-F39**

5. If the decreasing temperature trend is not observed, this indicates a malfunction of a sensor or the relative electric circuit.

   A. If the temperature values relating to the sensors in question do observe the decreasing temperature trend, continue with step **6**.

   B. If the temperature values relating to the sensors in question do not observe the decreasing temperature trend, this indicates a malfunction in a sensor or the relative electrical circuit. Go to step **8**.

6. Check that the sensors in question return resistance values which are compatible with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

7. Proceed as follow:

   1. Disconnect sensor from wiring harness.
   2. Remove the sensor from the after-treatment system.
   3. Place the sensor in a pipe which is of the same diameter and material as the one on the vehicle.
   4. Heat the sensor using a digital hot air blower.



Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury

- Use a thermal probe to check the temperature.
- Use a precision multimeter to read the resistance values between pin 1 and pin 2 of the temperature sensor in question and compare them with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

A. If the resistance values are correct, the sensor is working correctly. Continue with the fault identification procedure.

B. If the resistance values are incorrect, continue with step. **8**.

8. Check the efficiency of the electrical wiring and carry out the fault identification procedure.

# 507434 TEMPERATURE SENSOR - Test - Exhaust gas temperature sensor upstream of the DOC

## Description

The temperature sensor relating to the Diesel Oxidation Catalyst (DOC) **B-F32** is present in the exhaust gas after treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the temperature entering and leaving the catalyst. The sensor consists of an internal platinum resistor through which a **5 V** voltage passes allowing the indirect measurement of the resistor as the temperature changes. The sensor allows the Engine Control Unit (ECU) **A-F02** to constantly adjust the introduction of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** at engine load conditions.

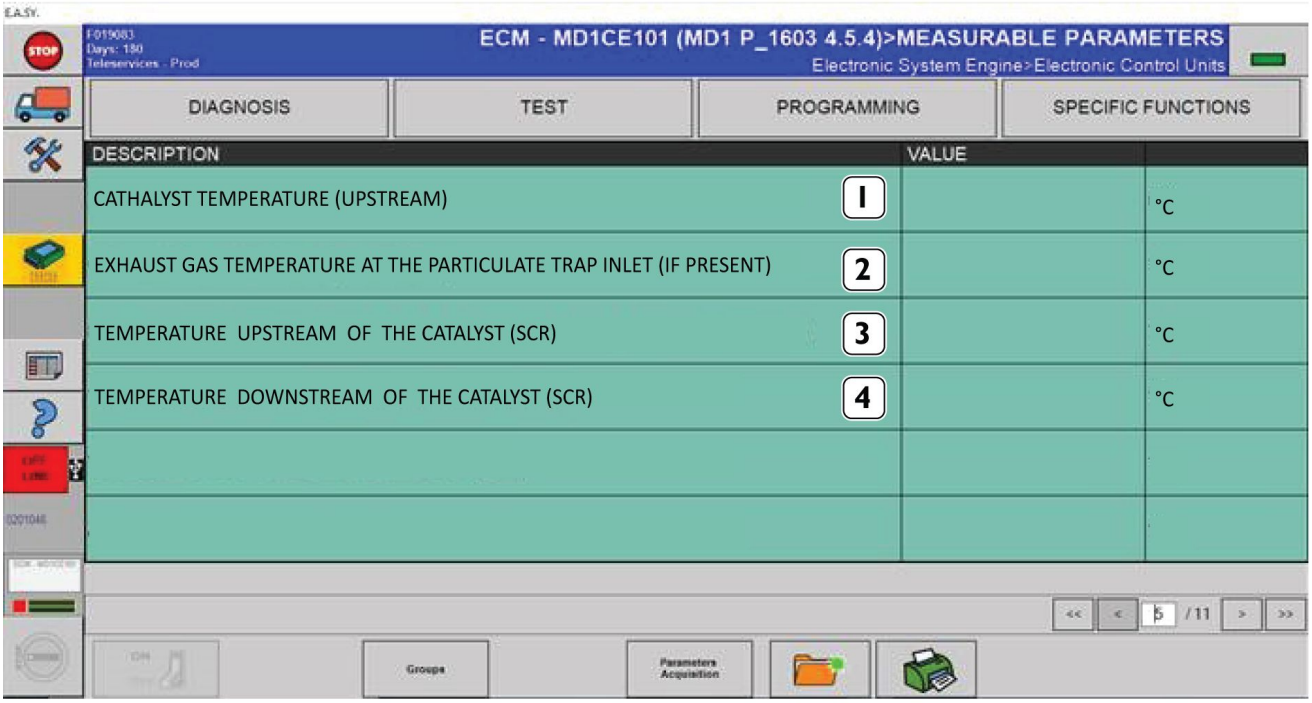
To refer to the technical data relating to the Diesel Oxidation Catalyst (DOC) module **B-F32** temperature sensor, see **TEMPERATURE SENSOR - Technical Data (50.74)** .

## Diagnostics procedure

1. Check that the temperature sensors on the exhaust gas treatment system (ATS) are installed correctly and in the specified positions.
2. Use the diagnostic instrument to check that when the engine is cold, the values of the temperature sensors on the exhaust gas after-treatment system (ATS) are all aligned and coincide with the ambient temperature.

   The sensors to be checked are the following:

   1. Exhaust gas temperature sensor upstream of DOC **B-F32**
   2. Exhaust gas temperature sensor downstream of the DOC **B-F113**
   3. Exhaust gas temperature sensor upstream of SCR **B-F38**
   4. Exhaust gas temperature sensor downstream of SCR **B-F39**




289656-01 1

Any misalignment of the temperature value can indicate a fault in a sensor or in the relative electrical circuit.

A. If the temperature values of the sensors examined are in line with each other, thermally regulate the engine following the instructions in the step **3** then go to step **4**.

B. If the temperature values relating to the sensors in question are not aligned, identify the sensor with the fault and continue with step **8**.

3. Ensure that the engine is operating at the correct temperature acting as follows:
   1. Keep the ignition switch set to “ON” for **15 s**.
   2. Start the engine and maintain idle speed for **15 s**
   3. Keep the engine running at **2000 RPM** for **30 s**
   4. Keep the engine running at **1600 RPM** for **30 s** with the shutter valve at the exhaust closed **90%**
   5. Keep the engine running at idle speed for **15 s**
4. Use the diagnostic instrument to check that the temperature sensors on the exhaust gas after-treatment system (ATS) show a decreasing temperature, starting from the sensor closest to the engine and moving towards the one furthest away in the exhaust.

   The test should last approx. **300 s** with a sampling frequency of **200 ms**.

***NOTE:*** *When using the diagnostic instrument to detect the parameters, make sure that the vehicle is not in a start-up condition.*

The sensors to be checked with a decreasing temperature sequence are:

1. Exhaust gas temperature sensor upstream of DOC **B-F32**
2. Exhaust gas temperature sensor downstream of the DOC **B-F113**
3. Exhaust gas temperature sensor upstream of SCR **B-F38**
4. Exhaust gas temperature sensor downstream of SCR **B-F39**

5. If the decreasing temperature trend is not observed, this indicates a malfunction of a sensor or the relative electric circuit.

   A. If the temperature values relating to the sensors in question do observe the decreasing temperature trend, continue with step **6**.

   B. If the temperature values relating to the sensors in question do not observe the decreasing temperature trend, this indicates a malfunction in a sensor or the relative electrical circuit. Go to step **8**.

6. Check that the sensors in question return resistance values which are compatible with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

7. Proceed as follow:

   1. Disconnect sensor from wiring harness.
   2. Remove the sensor from the after-treatment system.
   3. Place the sensor in a pipe which is of the same diameter and material as the one on the vehicle.
   4. Heat the sensor using a digital hot air blower.



Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury

- Use a thermal probe to check the temperature.
- Use a precision multimeter to read the resistance values between pin 1 and pin 2 of the temperature sensor in question and compare them with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

A. If the resistance values are correct, the sensor is working correctly. Continue with the fault identification procedure.

B. If the resistance values are incorrect, continue with step. **8**.

8. Check the efficiency of the electrical wiring and carry out the fault identification procedure.

# 507434 TEMPERATURE SENSOR - Test - Exhaust gas temperature sensor downstream of the DOC

## Description

The temperature sensor relating to the Diesel Oxidation Catalyst (DOC) **B-F113** is in the exhaust gas after treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the temperature leaving the catalyst. The sensor consists of an internal platinum resistor through which a **5 V** voltage passes allowing the indirect measurement of the resistor as the temperature changes. The sensor allows the Engine Control Unit (ECU) **A-F02** to constantly adjust the introduction of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** at engine load conditions.

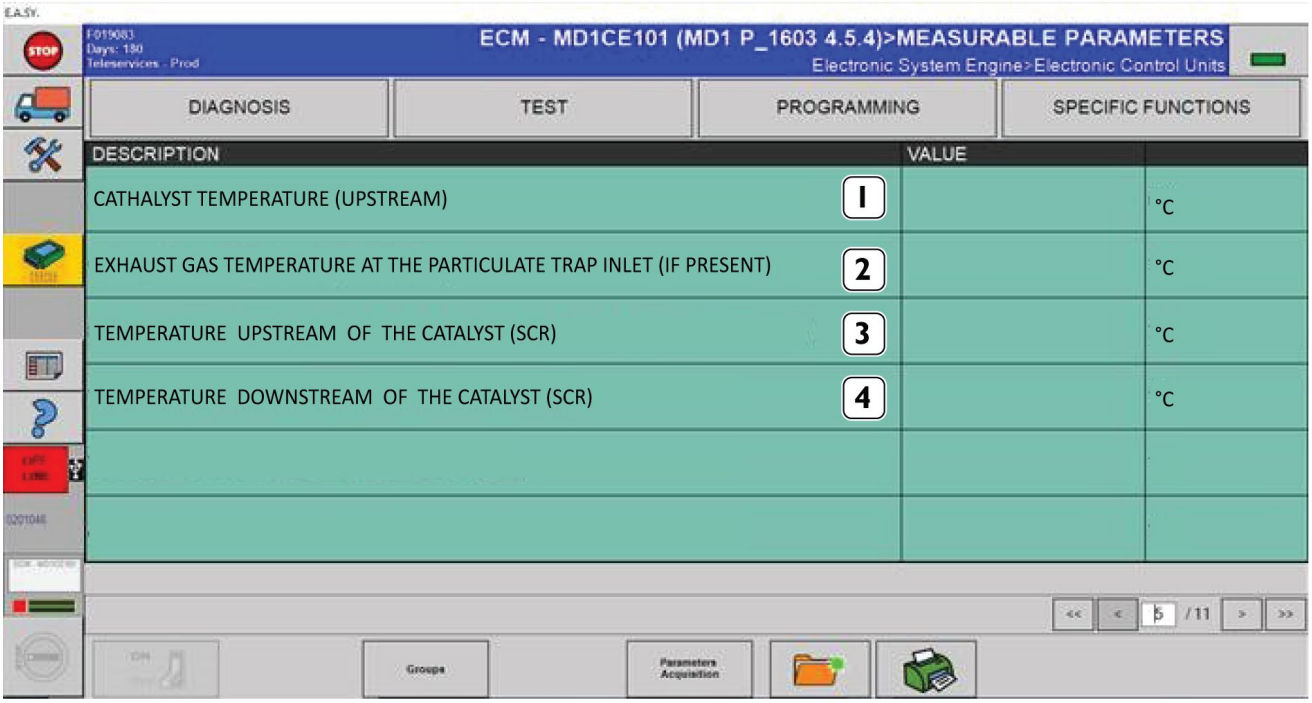
To refer to the technical data relating to the Diesel Oxidation Catalyst (DOC) module **B-F113** temperature sensor, see **TEMPERATURE SENSOR - Technical Data (50.74)** .

## Troubleshooting procedure

1. Check that the temperature sensors on the exhaust gas treatment system (ATS) are installed correctly and in the specified positions.
2. Use the diagnostic instrument to check that when the engine is cold, the values of the temperature sensors on the exhaust gas after-treatment system (ATS) are all aligned and coincide with the ambient temperature.

   The sensors to be checked are the following:

   1. Exhaust gas temperature sensor upstream of DOC **B-F32**
   2. Exhaust gas temperature sensor downstream of DOC **B-F113**
   3. Exhaust gas temperature sensor upstream of SCR **B-F38**
   4. Exhaust gas temperature sensor downstream of SCR **B-F39**




289656-01 1

Any misalignment of the temperature value can indicate a fault in a sensor or in the relative electrical circuit.

A. If the temperature values corresponding to the sensors detected are in-line, adjust the temperature of the engine by following the instructions in step **3** and then go to step **4**.

B. If the temperature values relating to the sensors in question are not aligned, identify the sensor with the fault and continue with step **8**.

3. Adjust the temperature of the engine as follows:
   1. Keep the ignition switch in the “ON” position for **15 s**.
   2. Start the engine and maintain idle speed for **15 s**
   3. Keep the engine at **2000 RPM** for **30 s**
   4. Keep the engine at **1600 RPM** for **30 s** with the exhaust choking valve closed at **90%**
   5. Keep the engine at idle speed for **15 s**
4. Use the diagnostic instrument to check that the temperature sensors on the exhaust gas after-treatment system (ATS) show a decreasing temperature, starting from the sensor closest to the engine and moving towards the one furthest away in the exhaust.

   The test should last approx. **300 s** with a sampling frequency of **200 ms**.

***NOTE:*** *When using the diagnostic instrument to detect the parameters, make sure that the vehicle is not in a start-up condition.*

The sensors to be checked with a decreasing temperature sequence are:

1. Exhaust gas temperature sensor upstream of DOC **B-F32**
2. Exhaust gas temperature sensor downstream of DOC **B-F113**
3. Exhaust gas temperature sensor upstream of SCR **B-F38**
4. Exhaust gas temperature sensor downstream of SCR **B-F39**

5. If the decreasing temperature trend is not observed, this indicates a malfunction of a sensor or the relative electric circuit.

   A. If the temperature values relating to the sensors in question do observe the decreasing temperature trend, continue with step **6**.

   B. If the temperature values relating to the sensors in question do not observe the decreasing temperature trend, this indicates a malfunction in a sensor or the relative electrical circuit. Go to step **8**.

6. Check that the sensors in question return resistance values which are compatible with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

7. Proceed as follow:

   1. Disconnect sensor from wiring harness.
   2. Remove the sensor from the after-treatment system.
   3. Place the sensor in a pipe which is of the same diameter and material as the one on the vehicle.
   4. Heat the sensor using a digital hot air blower.



Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury

- Use a thermal probe to check the temperature.
- Use a precision multimeter to read the resistance values between pin 1 and pin 2 of the temperature sensor in question and compare them with those listed in the table "Characteristics and correlation of sensor resistance and temperature" see **TEMPERATURE SENSOR - Technical Data (50.74)**.

A. If the resistance values are correct, the sensor is working correctly. Continue with the fault identification procedure.

B. If the resistance values are incorrect, continue with step. **8**.

8. Check the efficiency of the electrical wiring and carry out the fault identification procedure.

# 507435 NOX DETECTION SENSOR - Test - NOx sensor downstream of the SCR

## Description

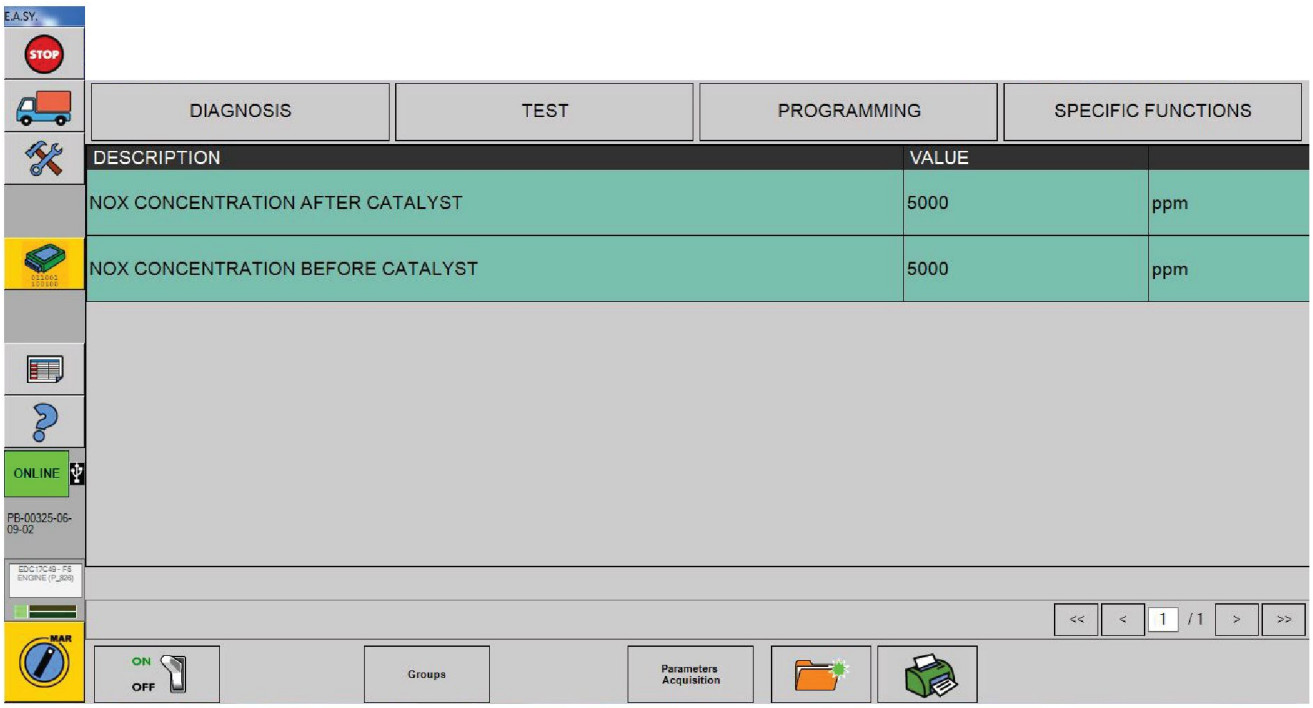
The NOx sensor **B-F49** is downstream of the Selective Catalytic Reduction (SCR) and is in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)**. The NOx sensor **B-F49** consists of two parts: an electronic module and the sensor body, connected by wiring. The two components are inseparable. The NOx **B-F49** outlet sensor detects the amount of nitrogen oxide leaving the SCR system and, via the CAN network, it allows the Engine Control Unit **A-F02** to constantly adjust the supply of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** according to the emissions.

To consult the technical data relating to the NOx sensor **B-F49** see **NOX DETECTION SENSOR - Technical Data (50.74)**.

***NOTE:*** *The electronic control unit activates the sensor only when the temperature inside the exhaust duct is sufficiently high to prevent the presence of condensate, otherwise the sensor could be damaged.*

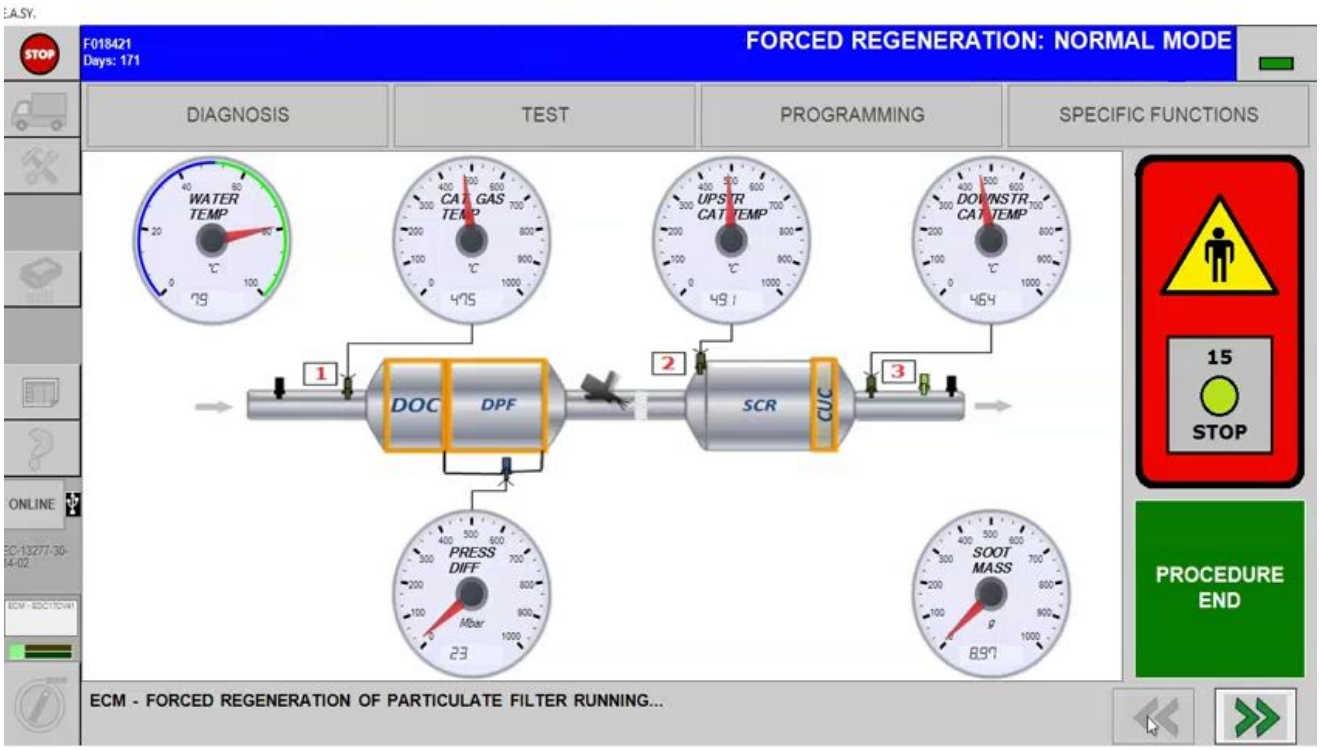
## Diagnostics procedure

1. Use the diagnostic instrument to monitor the values relating to the following sensors:
   - Upstream Nox sensor **B-F67** of the Selective Catalytic Reduction (SCR)
   - NOx sensor downstream **B-F49** of the Selective Catalytic Reduction (SCR)



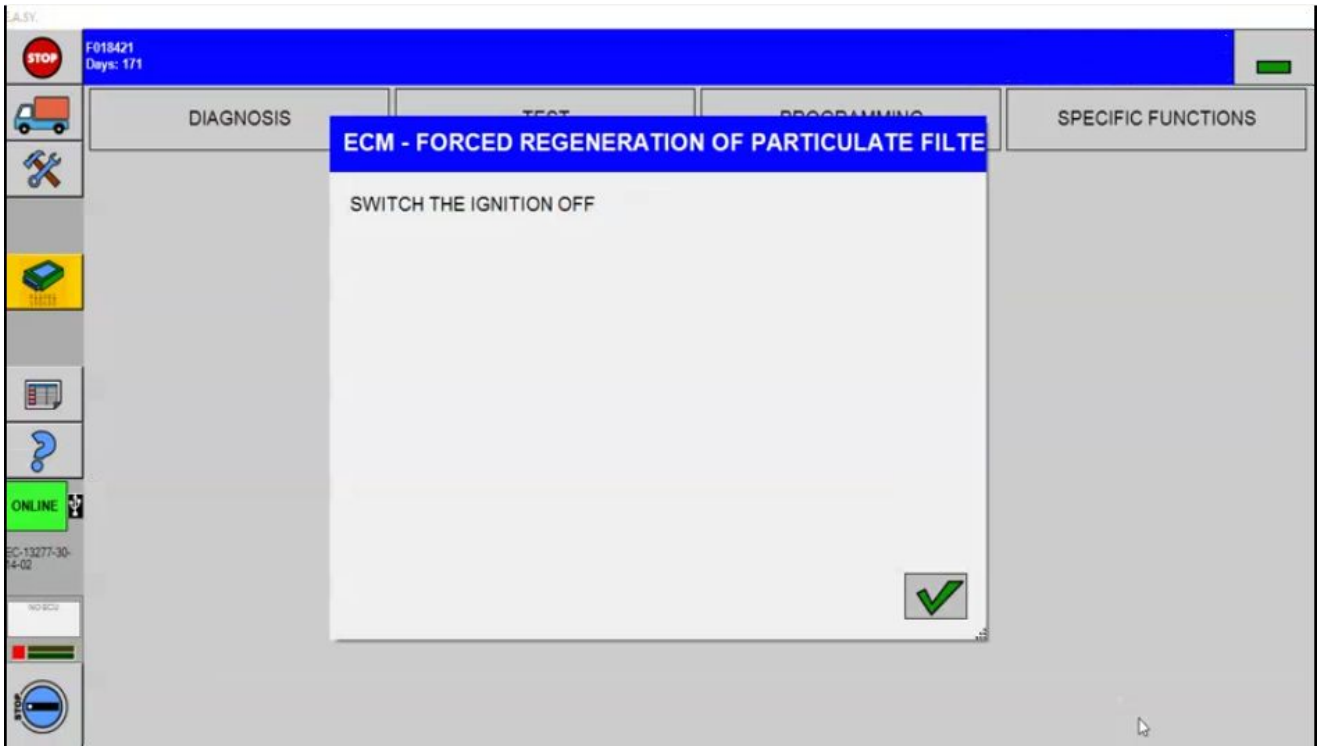

266051 1

2. Using the diagnostic tool, start the forced regeneration procedure of the DPF filter



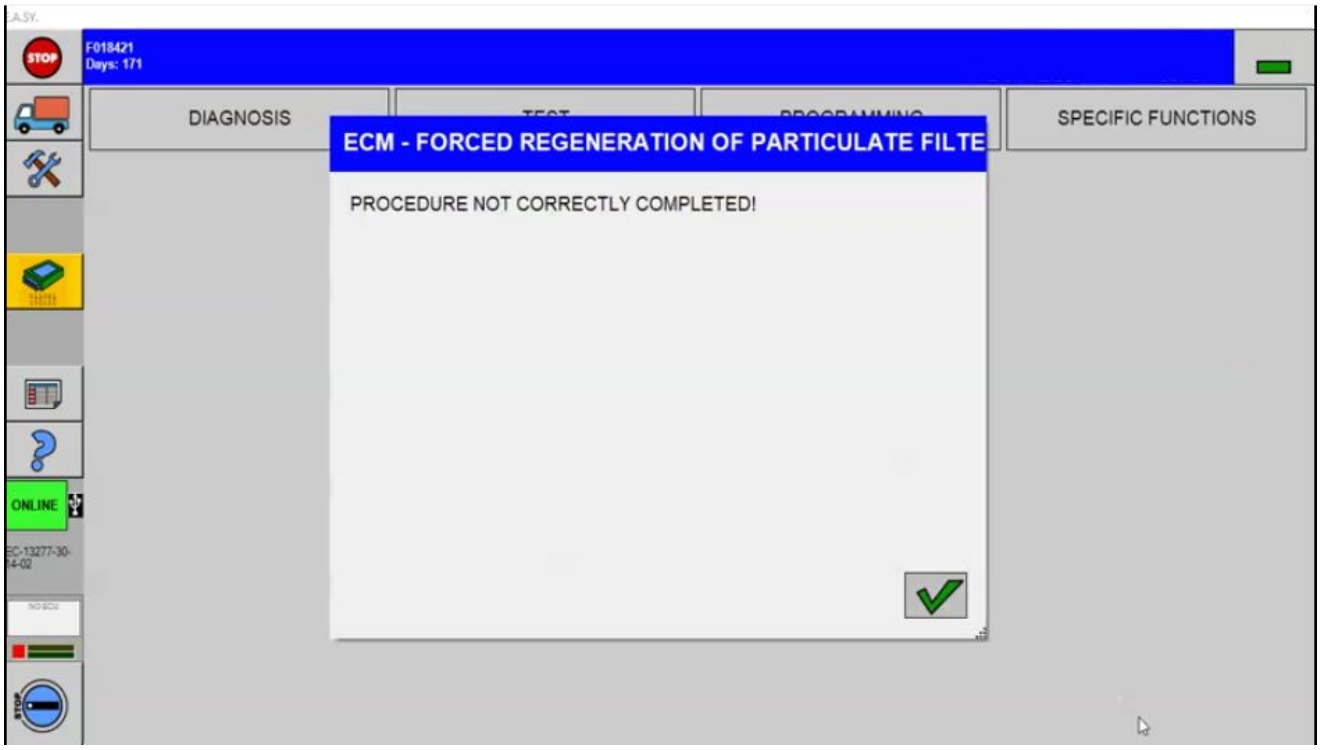

290081 2

3. Stop the forced regeneration procedure of the DPF filter before the cooling phase in order to obtain high temperatures in the exhaust gas after treatment system



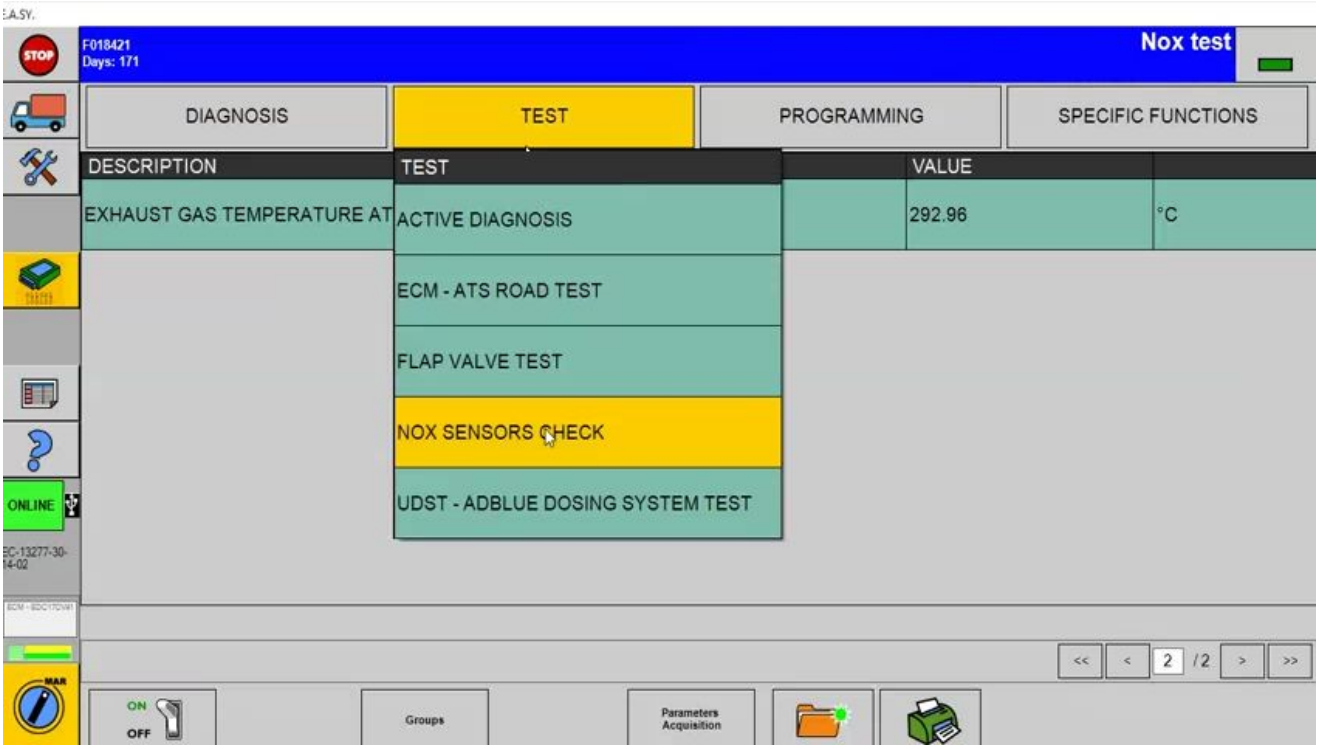

290085 3

4. The interruption of the forced regeneration procedure of the DPF filter will automatically stop the engine




290086 4

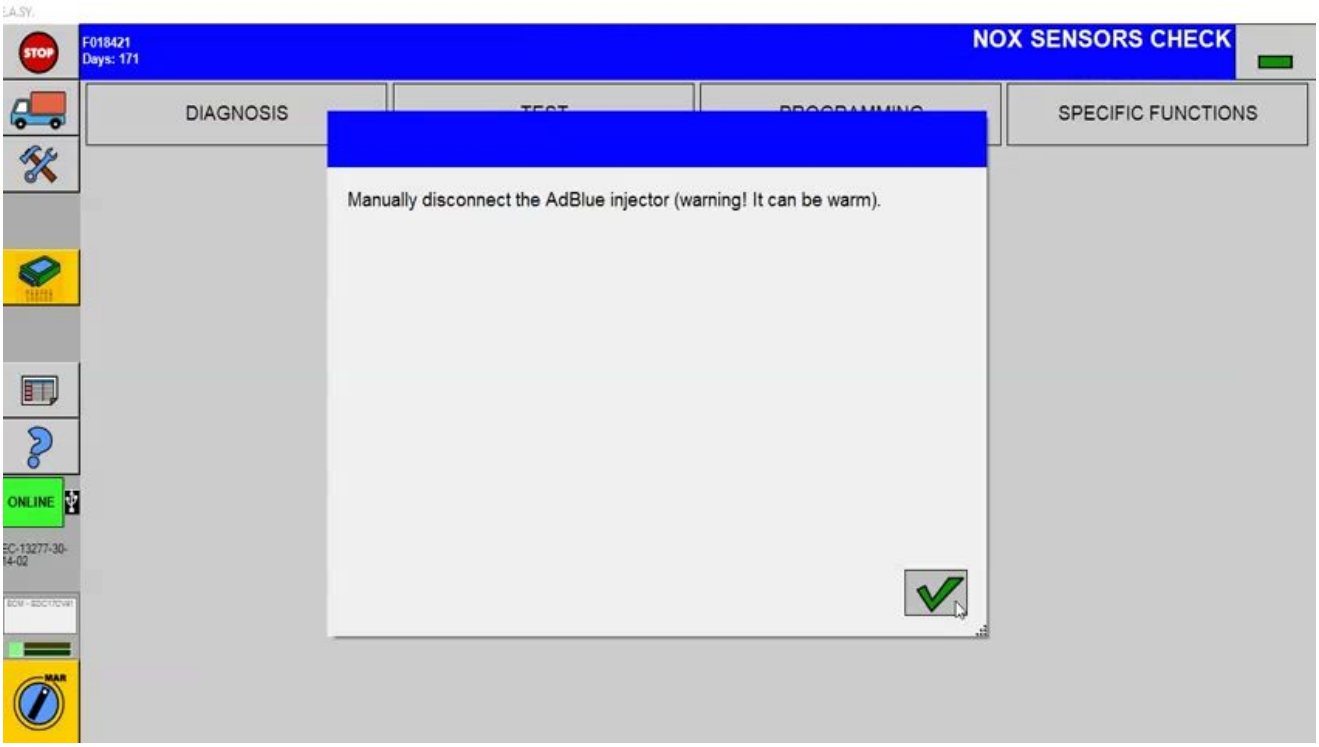
5. Using the diagnostic tool, start the active diagnosis of the NOx sensors




290087 5

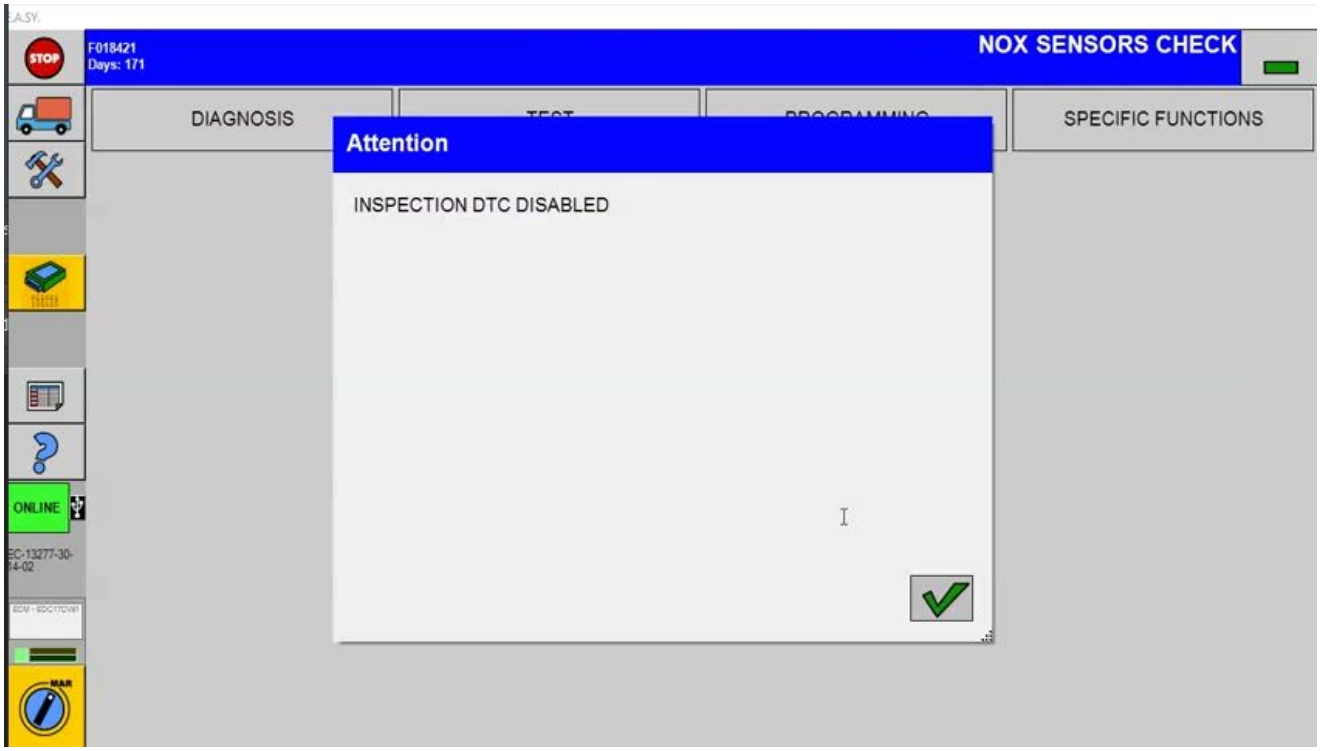
6. Manually disconnect the connector of the dosing module **X-F44** / **X-F44A**

Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury



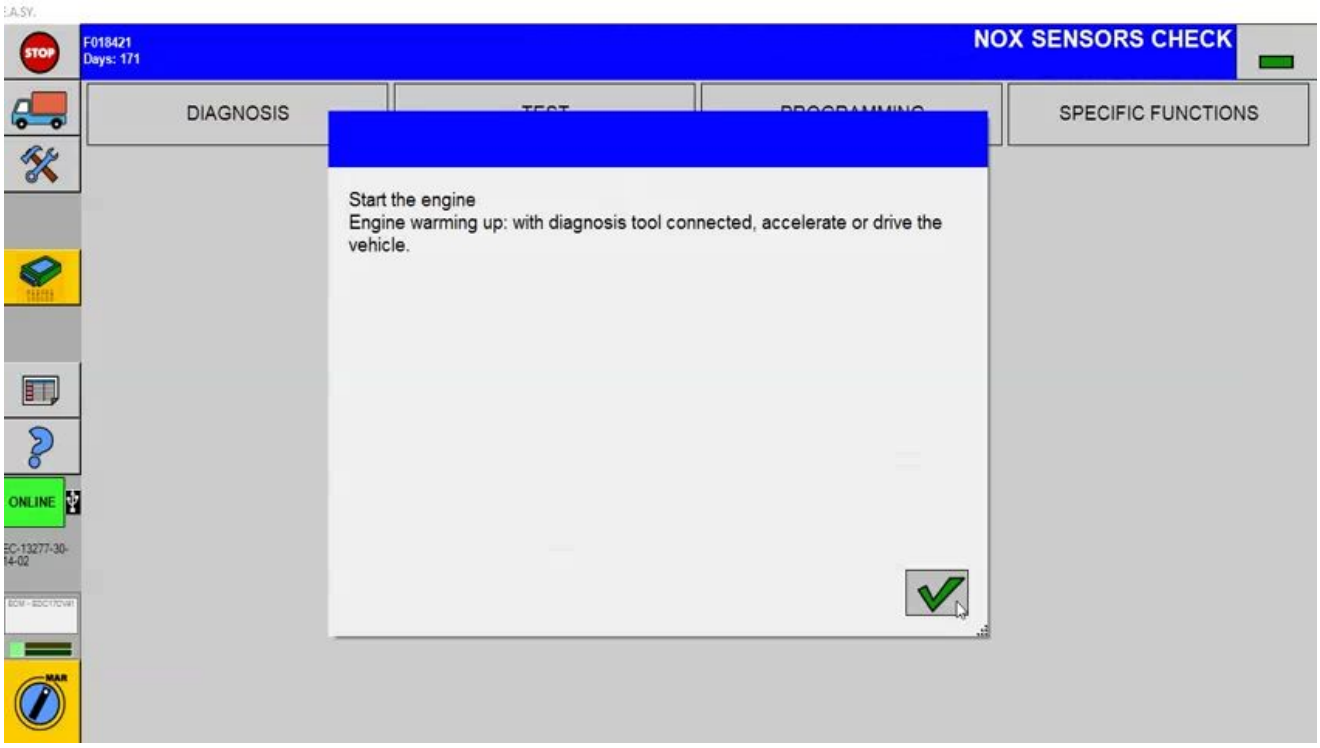

290089 6

7. Active diagnosis relating to NOx sensors will inhibit the errors setting



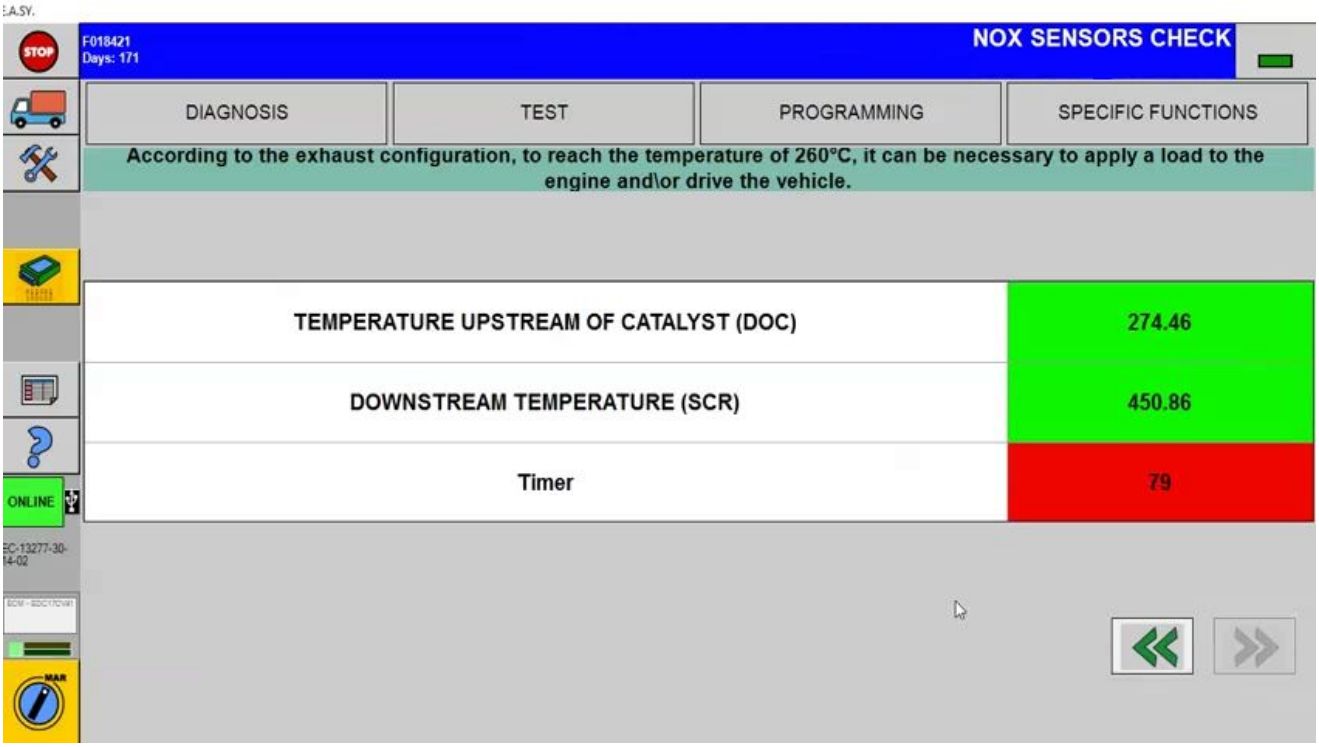

290088 7

8. Start the engine again and run it at a speed close to **1600 RPM** in order to maintain high temperatures in the exhaust gas after treatment system



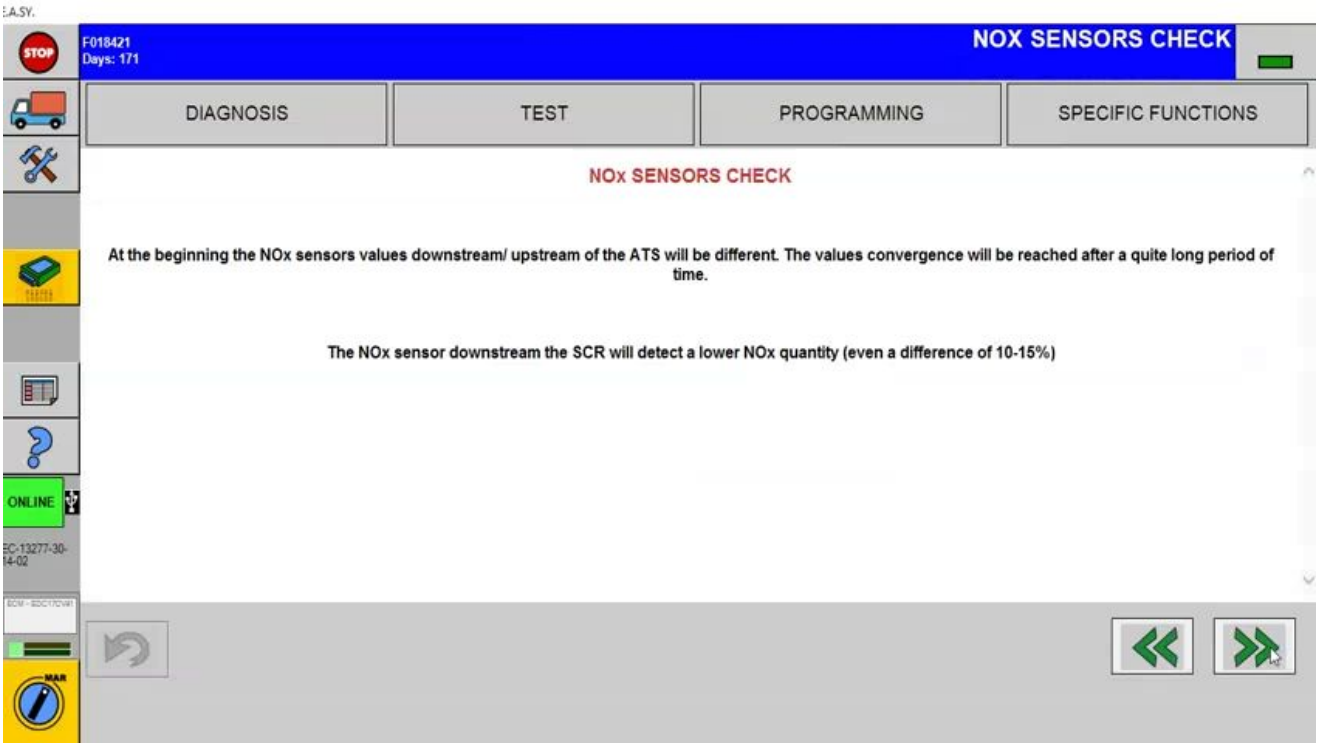

290090 8

9. Wait for the temperature to reach the indicated threshold and for the timer to finish the count.



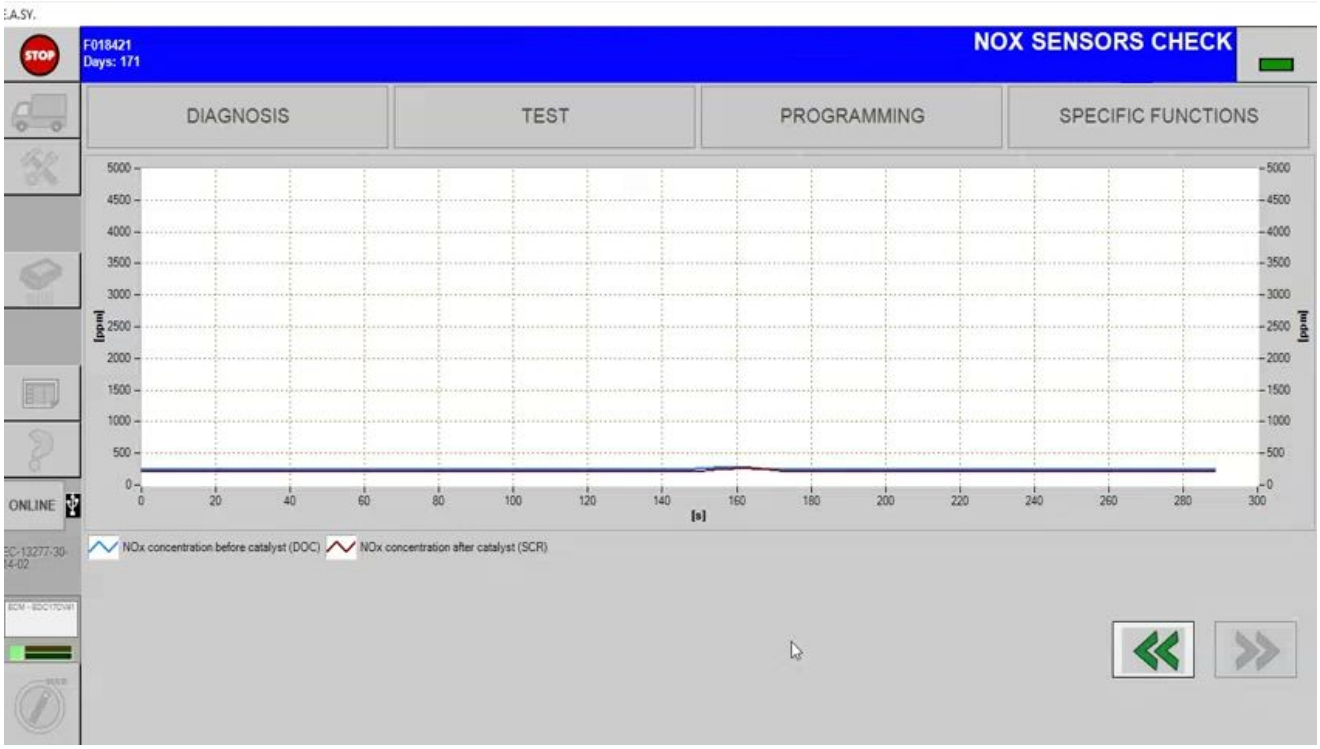

290091 9

10. Wait until the values regarding the sensors **B-F67** and **B-F49** converge. In this phase the residues of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** inside the exhaust system pipes are gradually drained.




290092 10

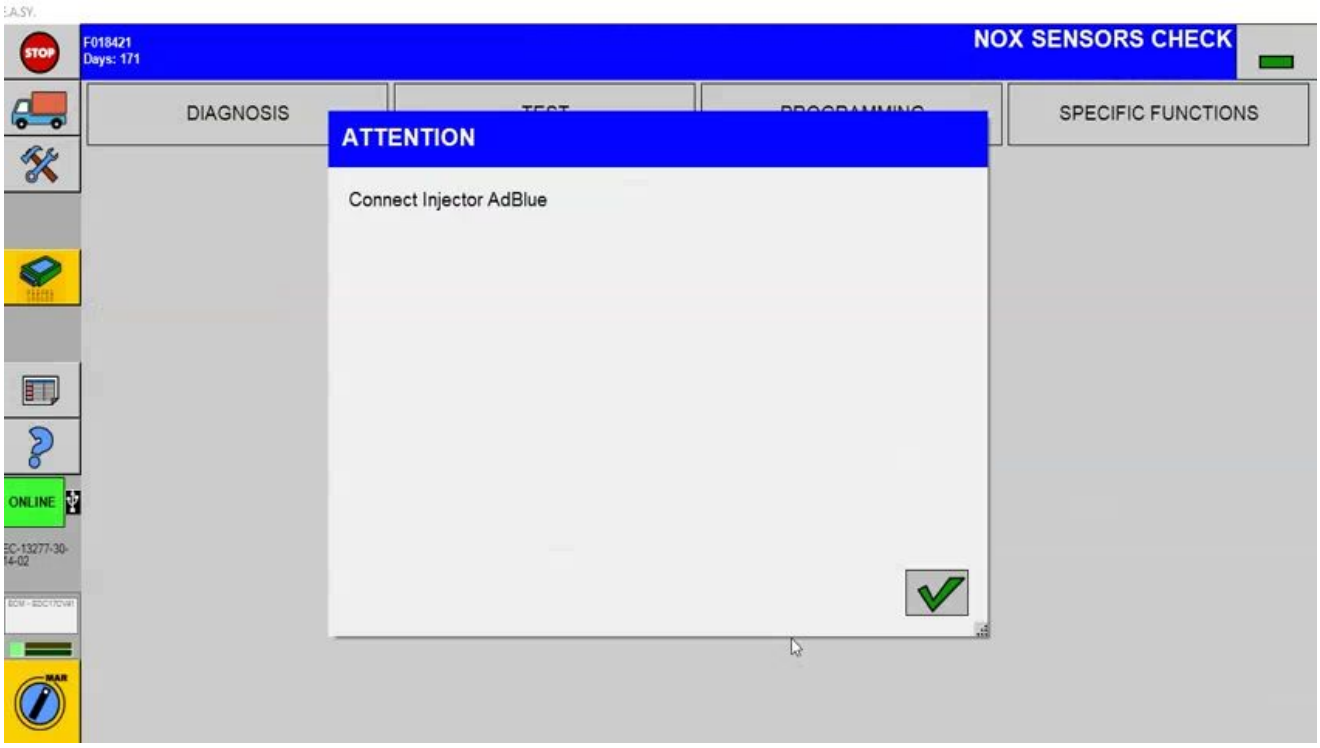
11. continue by selecting the “>>” key to wait for the graph to be completed




290093 11

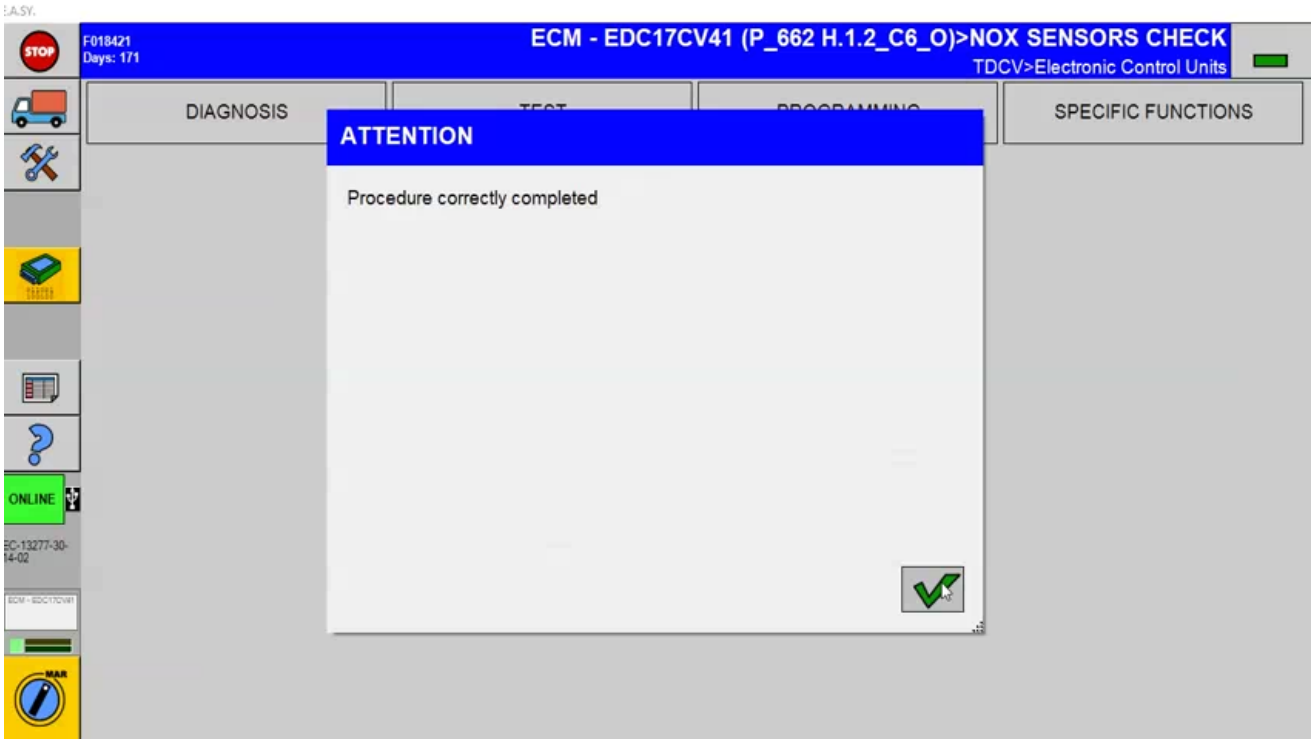
12. Reconnect the connector of the dosing module **X-F44 / X-F44A**

Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury




290094 12

13. The procedure is complete, clear the fault memory and go to the step **14**




290095 13

14. The procedure allows correct operation and plausibility of the sensors to be checked upstream and downstream of the Selective Catalytic Reduction (SCR).

    A. If both sensors return a similar value to each other, then the procedure is verified. Return to the troubleshooting procedure.

    B. If the sensors do not return similar values, there could be a malfunction on one of the two components. Return to the fault identification procedure.

# 507435 NOX DETECTION SENSOR - Test - NOx sensor upstream of the SCR

## Description

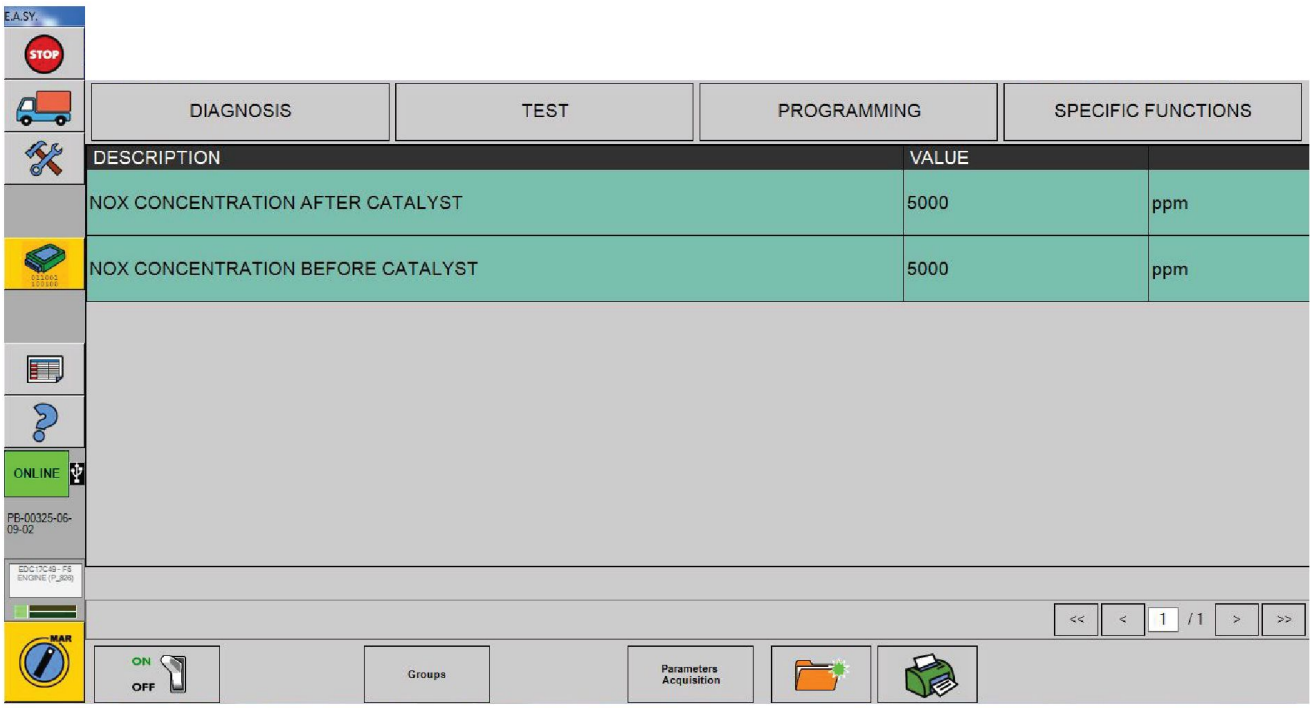
The NOx sensor **B-F67** is present in the exhaust gas after-treatment system **AD-BLUE SYSTEM - Overview (50.74)** and is located after the turbocharger at the inlet of the Diesel Oxidation Catalyst (DOC). The NOx sensor **B-F67** is made up of two parts: an electronic module connected via wiring to the sensor body. The two components cannot be separated. The NOx inlet sensor **B-F67** detects the amount of nitrogen oxide entering the DOC and, via the CAN network, it allows the Engine Control Unit **A-F02** to constantly adjust the introduction of **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** on the basis of the emissions.

To refer to the technical data relating to the NOx sensor **B-F67**, see **NOX DETECTION SENSOR - Technical Data (50.74)**.

***NOTE:*** *The electronic control unit activates the sensor only when the temperature inside the exhaust duct is sufficiently high to prevent the presence of condensate, otherwise the sensor could be damaged.*

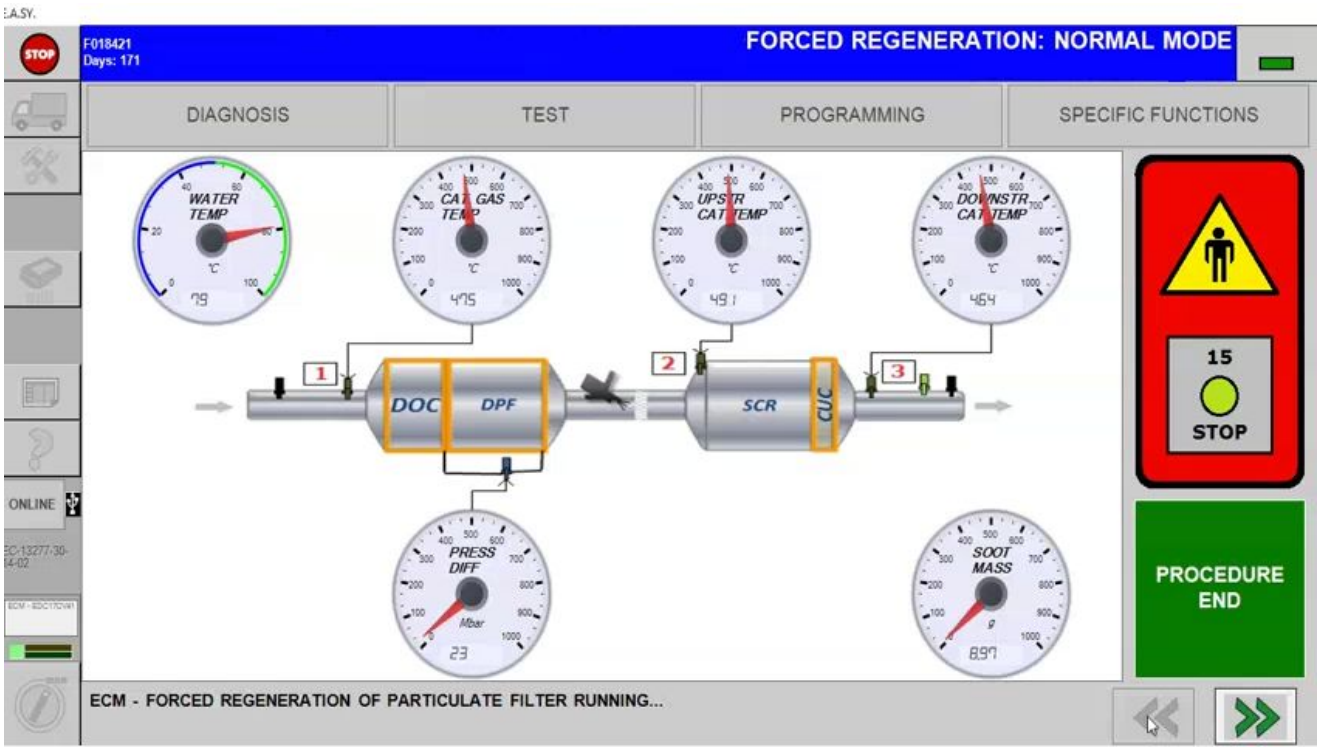
## Diagnostics procedure

1. Use the diagnostic instrument to monitor the values relating to the following sensors:
   - NOx sensor upstream **B-F67** of the Selective Catalytic Reduction catalyst (SCR)
   - NOx sensor downstream **B-F49** of the Selective Catalytic Reduction catalyst (SCR)



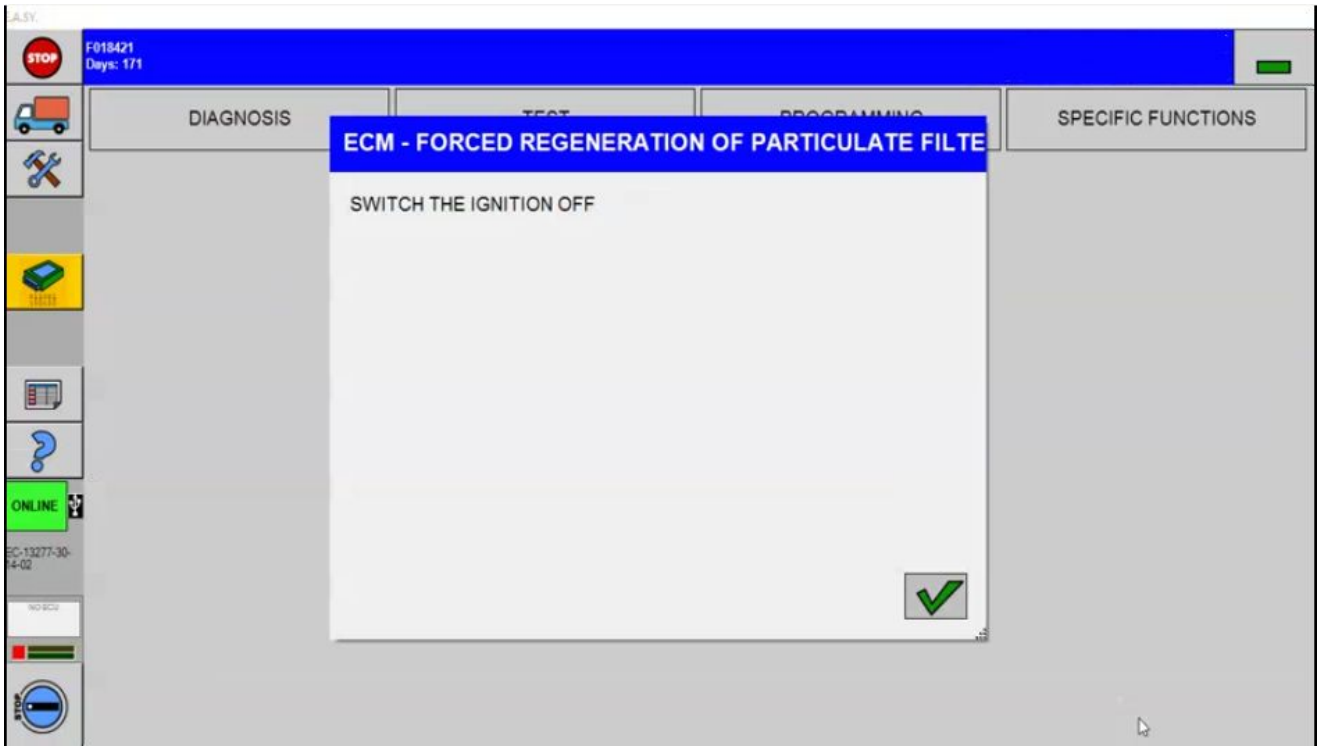

266051 1

2. Using the diagnostic tool, start the forced regeneration procedure of the DPF filter



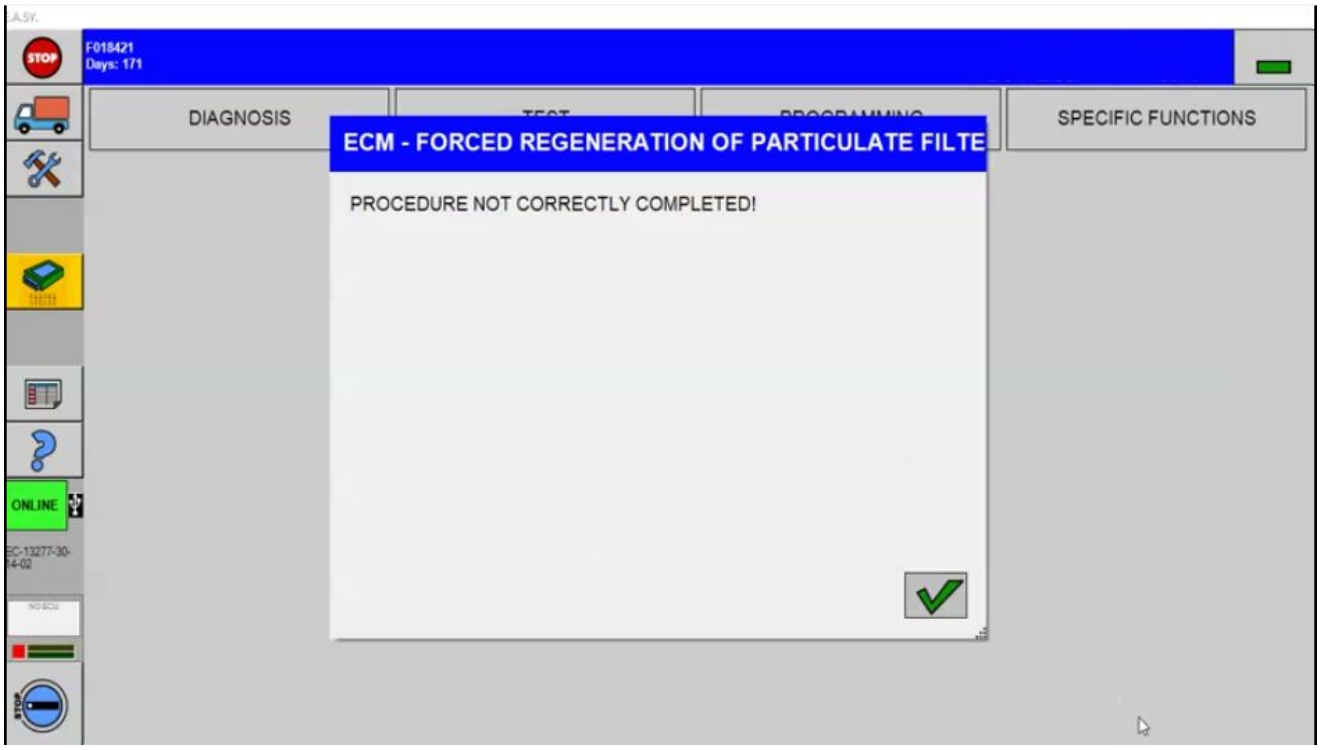

290081 2

3. Stop the forced regeneration procedure of the DPF filter before the cooling phase in order to obtain high temperatures in the exhaust gas after treatment system



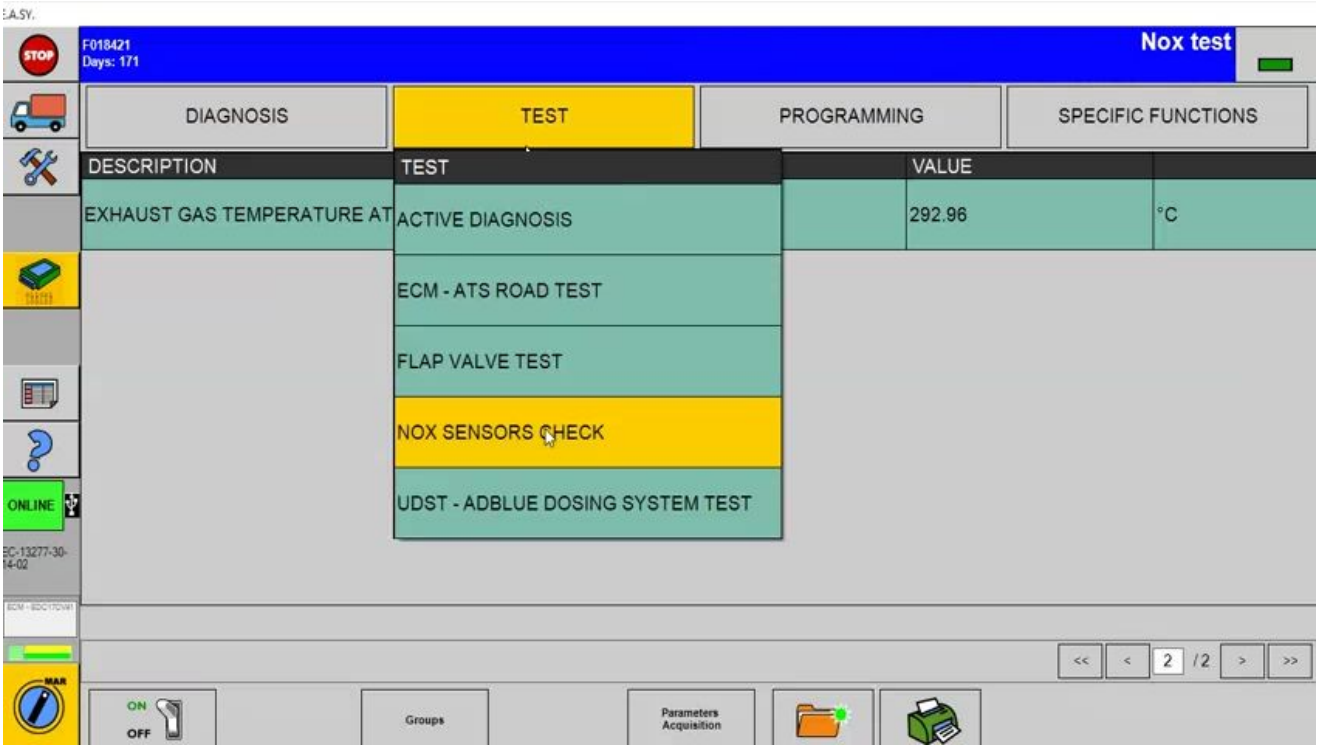

290085 3

4. The interruption of the forced regeneration procedure of the DPF filter will automatically stop the engine




290086 4

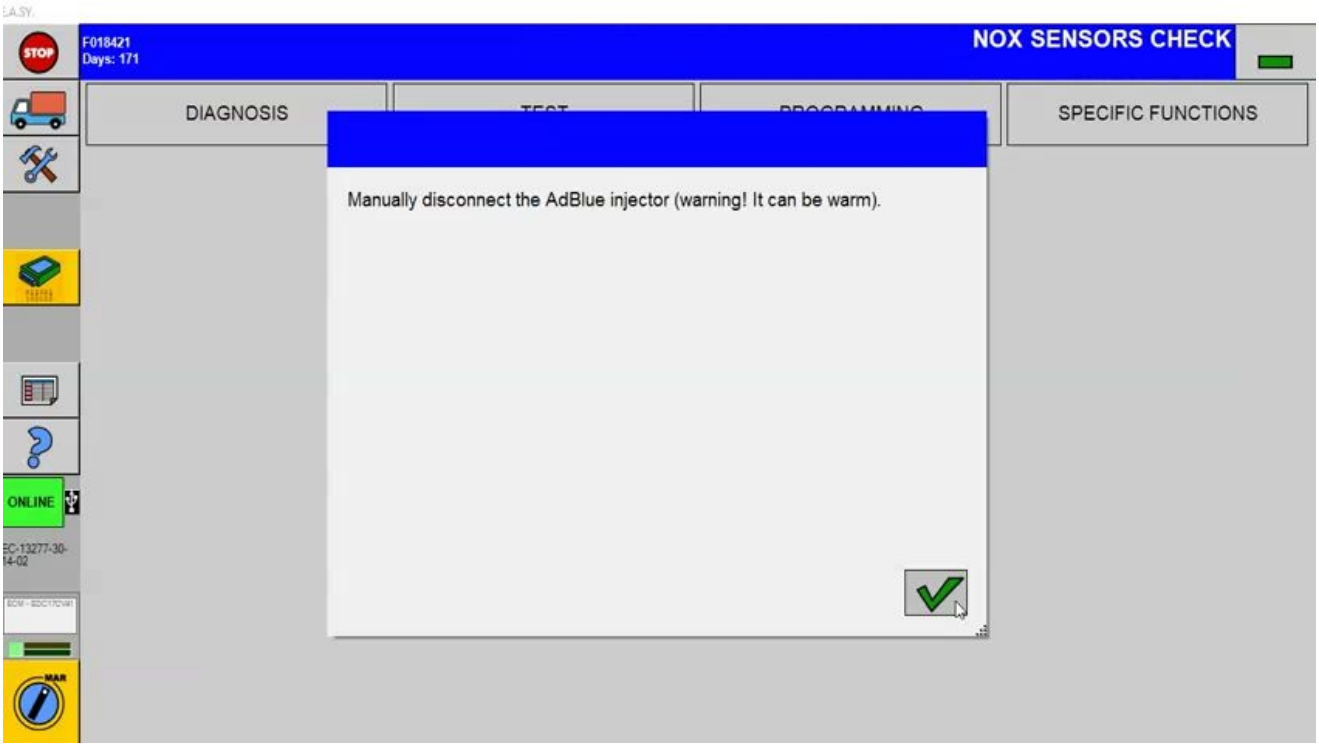
5. Using the diagnostic tool, start the active diagnosis of the NOx sensors




290087 5

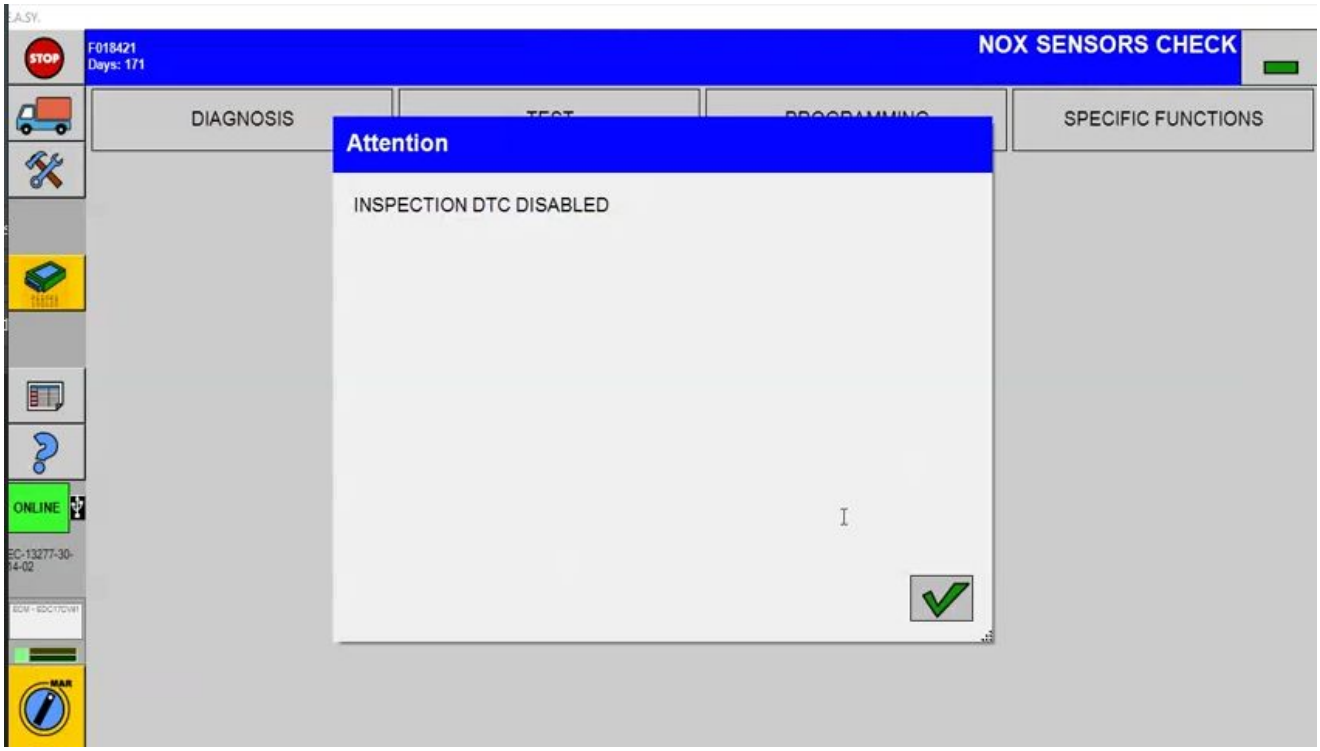
6. Manually disconnect the connector of the dosing module **X-F44** / **X-F44A**

Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury



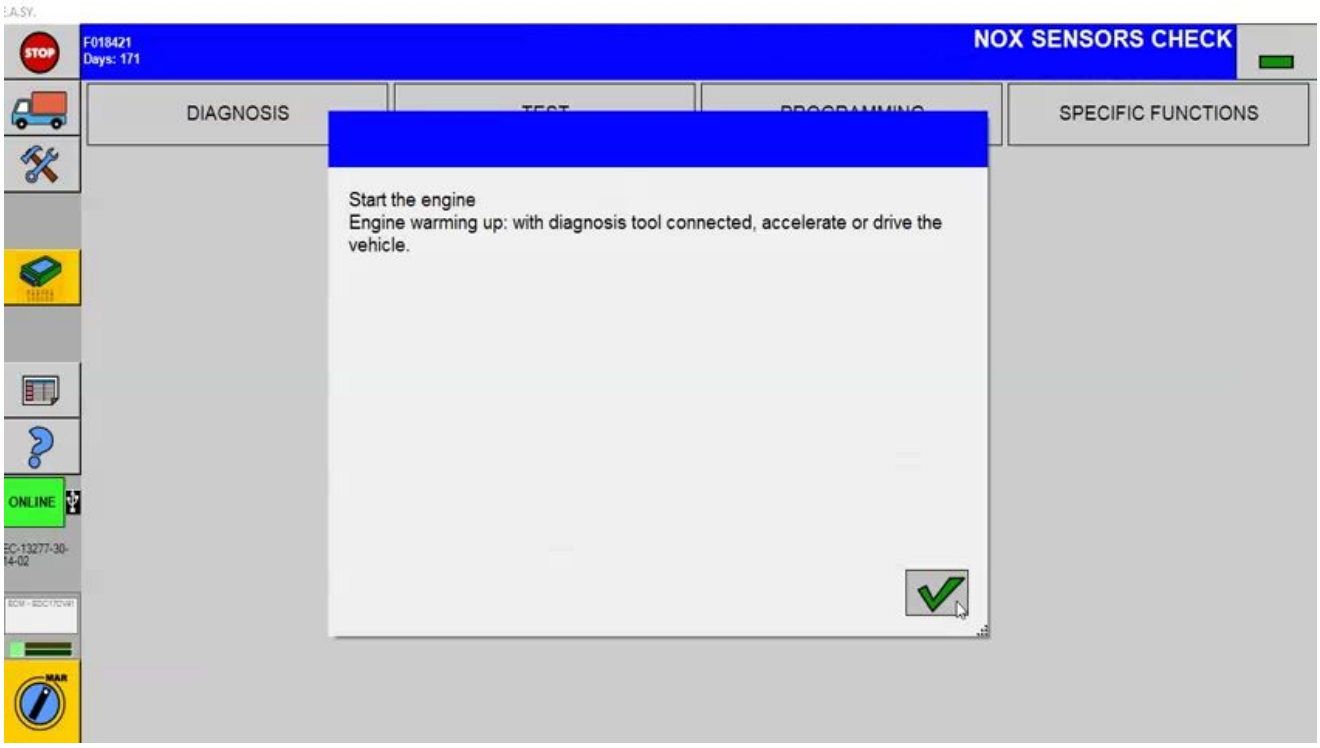

290089 6

7. Active diagnosis relating to NOx sensors will inhibit the errors setting



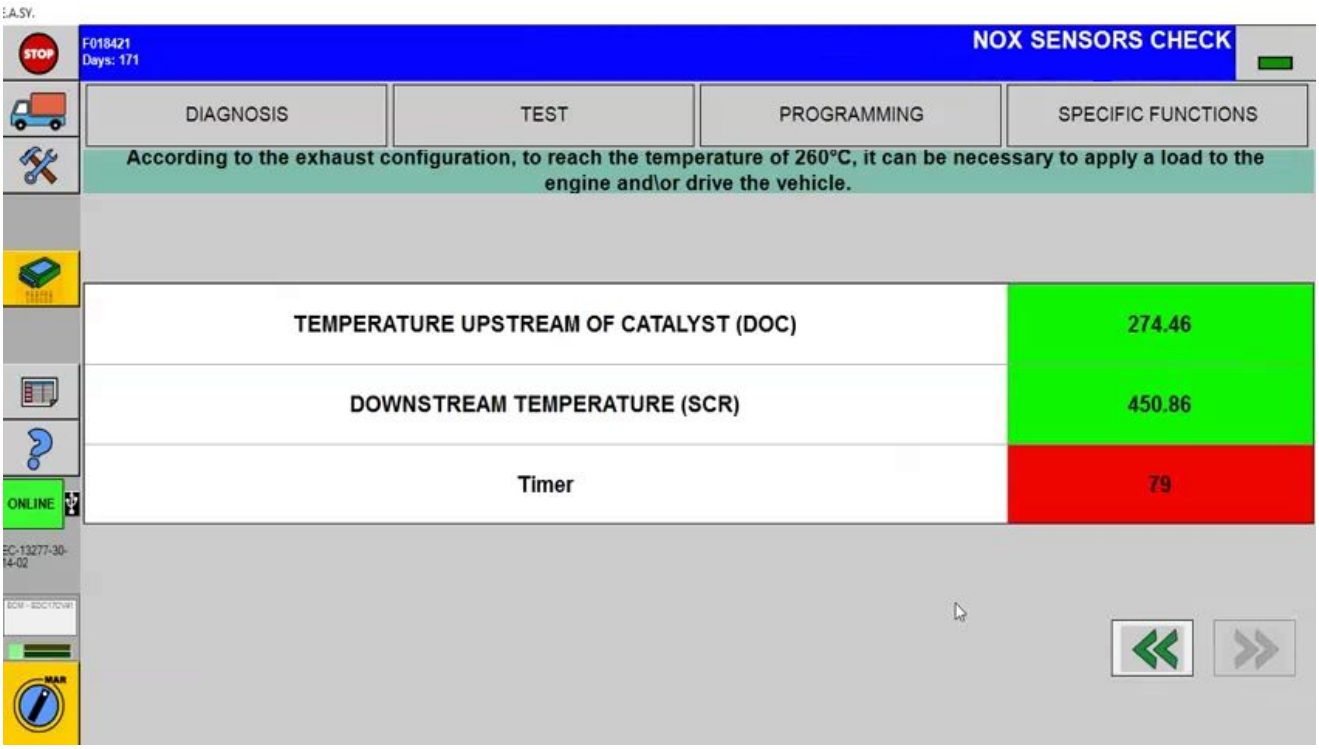

290088 7

8. Start the engine again and run it at a speed close to **1600 RPM** in order to maintain high temperatures in the exhaust gas after treatment system



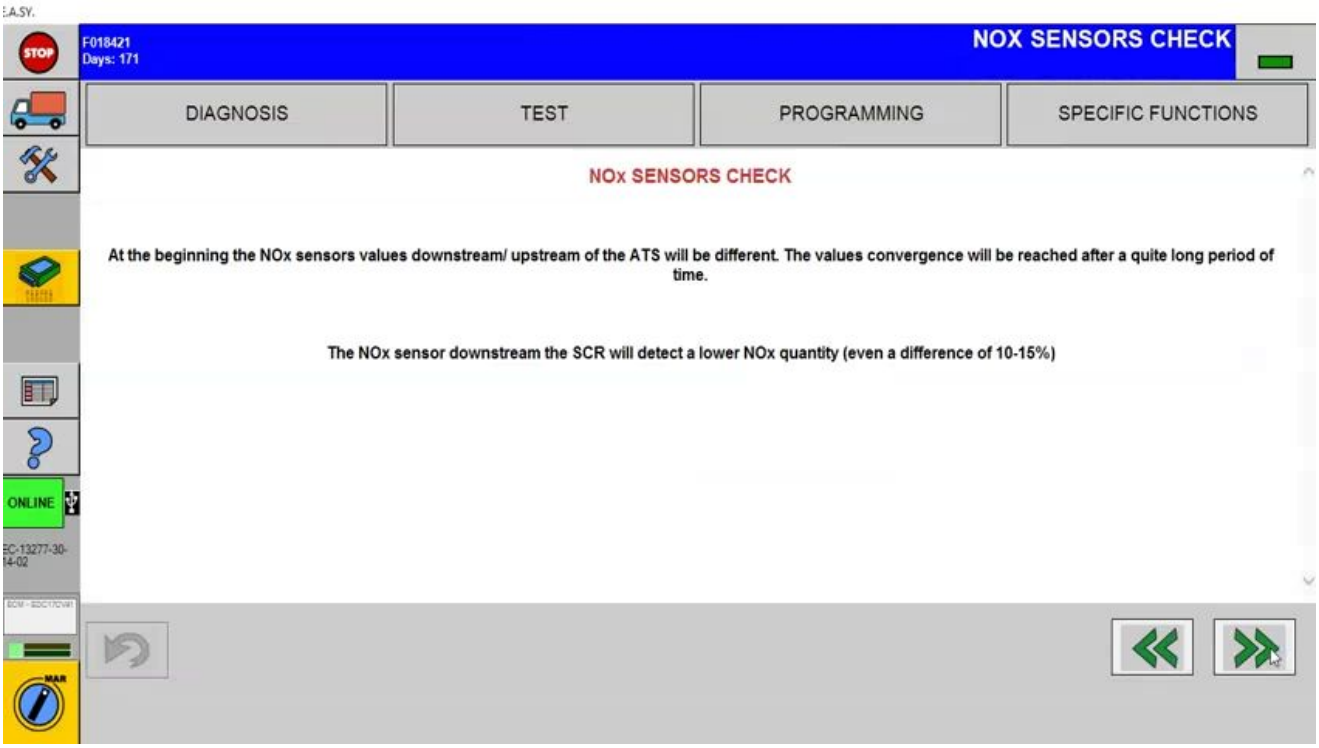

290090 8

9. Wait for the temperature to reach the indicated threshold and for the timer to finish the count.



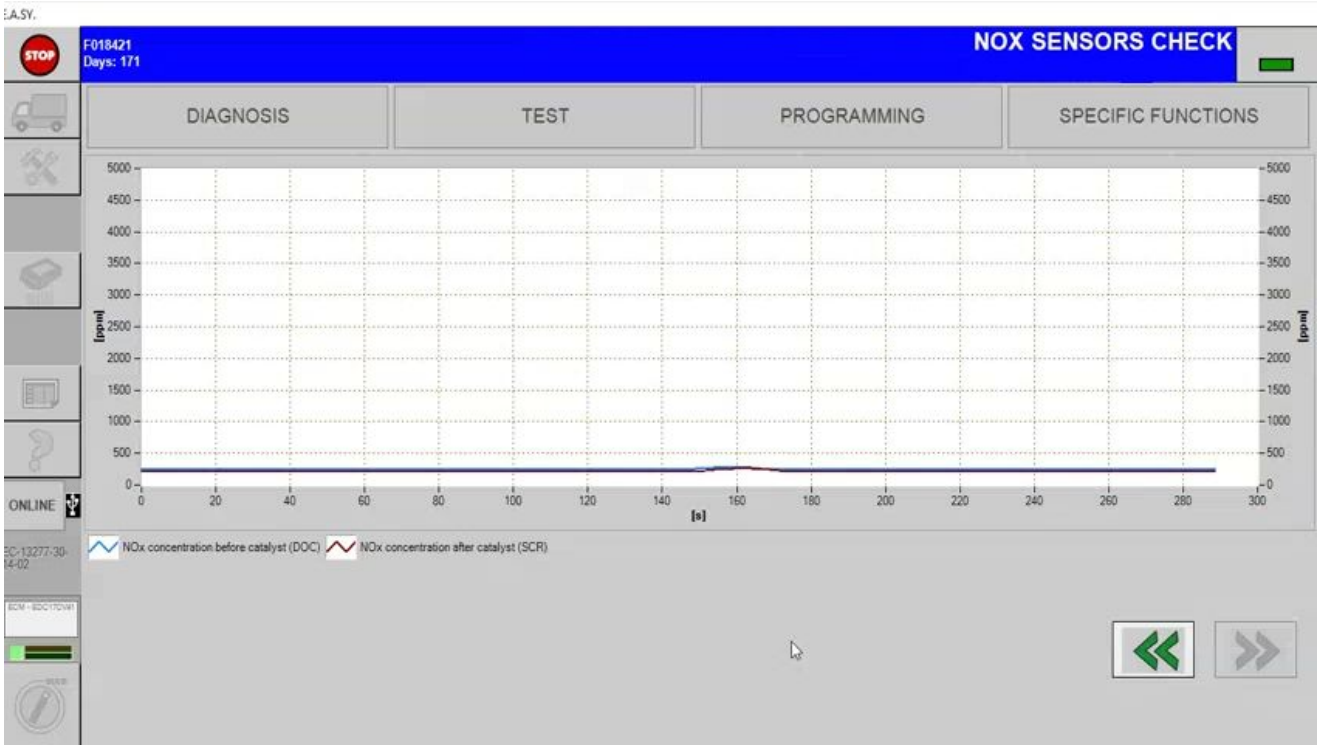

290091 9

10. Wait for the sensor values **B-F67** and **B-F49** to converge. In this phase, the **ADBLUE FLUID LEVEL. MEETS THE REQUIREMENTS OF ISO 22241. QUALIFICATION IVECO STANDARD 18-1852** residues inside the pipes of the exhaust system are gradually spent.




290092 10

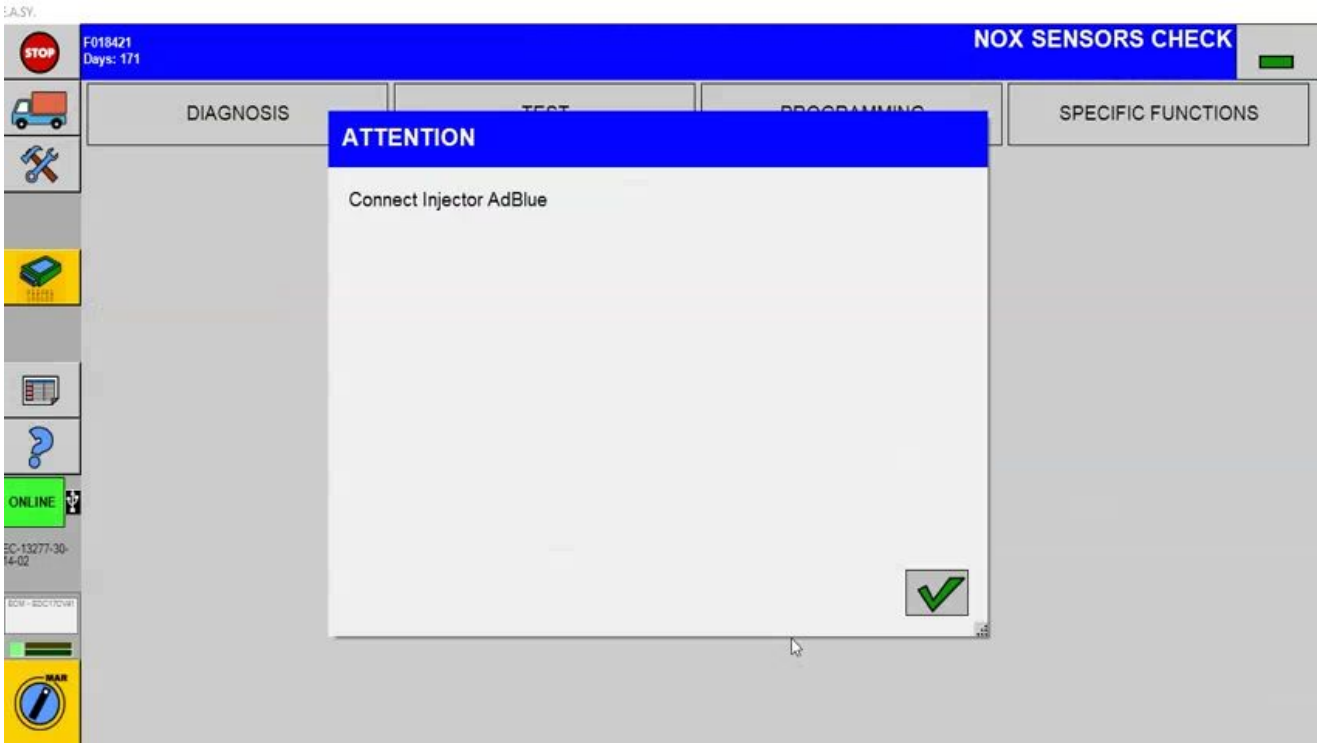
11. continue by selecting the “>>” key to wait for the graph to be completed




290093 11

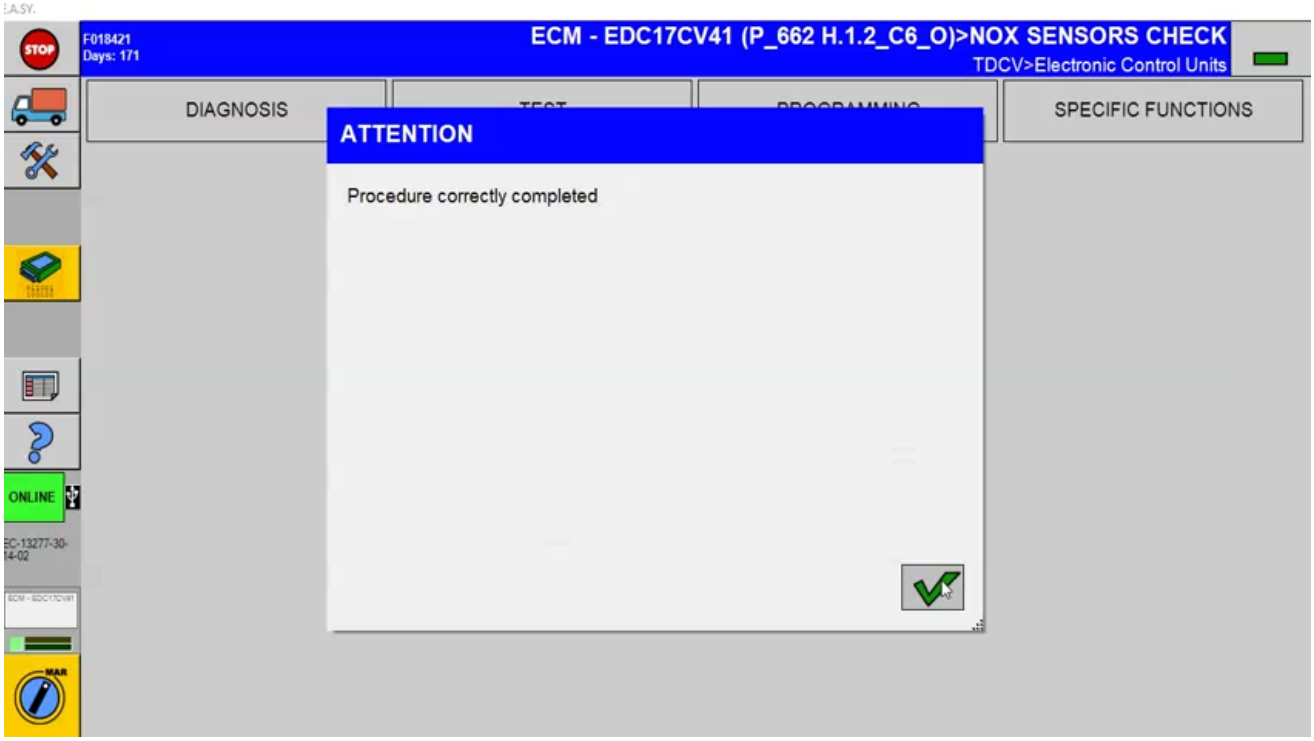
12. Reconnect the connector of the dosing module **X-F44**/ **X-F44A**

Hazard warning
Before starting, make sure you have suitable PPE (gloves, shoes, glasses, overalls).
Failure to comply with these prescriptions can result in the risk of serious injury




290094 12

13. The procedure is complete, clear the fault memory and go to the step **14**




290095 13

14. The procedure allows correct operation and plausibility of the sensors to be checked upstream and downstream of the Selective Catalytic Reduction (SCR).

    A. If both sensors return a similar value to each other, then the procedure is verified. Return to the troubleshooting procedure.

    B. If the sensors do not return similar values, there could be a malfunction on one of the two components. Return to the fault identification procedure.

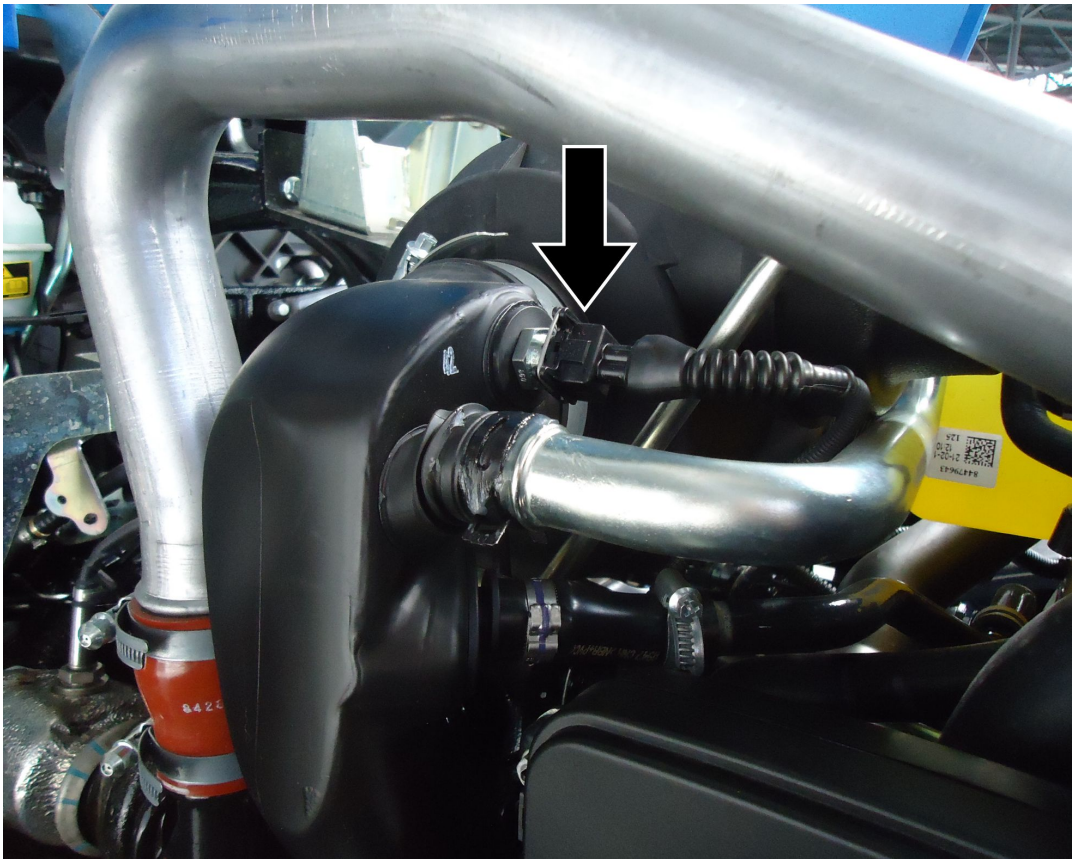
# 507436 HUMIDITY SENSOR - Test Check intake air humidity and temperature sensor

## Preparation

- Ignition switch set to OFF position.

## Visually check intake air humidity and temperature sensor

1. Visually check intake air humidity and temperature sensor
   - Visually check the connector of the sensor
   - Check if the sensor is installed correctly
   - Check if the screw of the sensor is tight
   - Check the sensor assembly to the intake air pipe
   - See figure below for explanation and go to **2**



275033 1

**Location of intake air humidity and temperature sensor**

2. Check the intake air humidity and temperature sensor.
   - A. Connector of the sensor not damaged and not contaminated
   - B. The sensor is mounted in the correct orientation.
   - C. The sensor is correctly fitted to the air intake pipe
   - D. The screws are not loose
   - E. If intake air humidity and temperature sensor is OK, go to **4**.
   - F. If intake air humidity and temperature sensor is NOT OK, go to **3**.

3. Possible root cause
   - Connector of the sensor damaged and/or contaminated
   - The sensor is not mounted in the correct orientation
   - The sensor is loosely fitted to the air intake pipe
   - Tighten the screws

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The intake air humidity and temperature sensor works properly.

# 507466 AD-BLUE COOLANT LEVEL SENSOR - Test - AdBlue quality, level and temperature SUN-A sensor

The AdBlue quality, level and temperature sensor is present in the exhaust gas after treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the AdBlue temperature, level and quality inside the tank.

To refer to the technical data relating to the AdBlue temperature, level, and quality sensor, see **AD-BLUE COOLANT LEVEL SENSOR - Technical Data (50.74)**.

## Diagnostics procedure

1. Check that the AdBlue fluid is not contaminated and that the concentration is correct ( **32.5%**). Proceed as follows:



Risk of injury:
If AdBlue is overheated inside the tank to more than 50°C (e.g. due to direct sunlight), the AdBlue could break down, forming ammonia vapours. Ammonia vapours have a pungent smell: Be careful when you loosen the tank cap.
Failure to comply with these prescriptions can result in the risk of serious injury

***NOTE:*** *Do not add water or any liquid other than the one specified into the AdBlue tank. This would cause serious damage to the after-treatment system.*

- AdBlue concentration must be **32.5 +/- 0.7%**. If the concentration is not within the specified value, the tank must be drained, washed with distilled water and refilled with the quality of fluid indicated.
- AdBlue concentration must be verified in the following cases:
  - The vehicle has been stationary for an extended period
  - There is the possibility that water might have been added to the AdBlue tank.
  - There is the possibility that water might have evaporated from the AdBlue tank.
  - The AdBlue filler cap has been removed from the tank for an extended period of time.
  - There is the possibility of a fault in the heating system in the AdBlue tank.
  - There is the possibility of incorrect refilling having been carried out.
- Checking of the AdBlue concentration is carried out using a refractometer. The refractometer consists of two prisms and a light source. The indication of concentration is read on a graded scale created by the curvature of the light beam that passes through the liquid. Proceed as follows:
  - Place a few droplets of the liquid to be analysed on the lens
  - Go to a well lit area and look at the lens
  - The quadrant will divide into two colours
  - The line separating the two colours will indicate the percentage of concentration.
- Refractometer calibration, proceed as follows:
  - Take a solvent for parenteral use to wash the light source and the lens cover.
  - Place three droplets of the solvent for parenteral use on the lens and lower the lens cover.
  - Look through the eyepiece and bring the droplets into focus.
  - Rotate the calibration screw until the instrument is calibrated to "0".

- AdBlue tank contamination:
  If the AdBlue tank has been contaminated, proceed as follows:
  - Remove the filter from the AdBlue dosing module.
  - Check that the filter does not show any sign of contaminated liquid having passed through it.
  - Drain the tank.
  - Wash it with distilled water.
  - Check and replace all line filters. Follow the procedure **AD-BLUE FILTER - Replace (50.74)**
  - Refill with liquid of the specified quality.

If the filter from the AdBlue dosing module shows signs of contamination, proceed as follows:

- Drain the tank.
- Wash it with distilled water.
- Replace all line filters. Follow the procedure **AD-BLUE FILTER - Replace (50.74)**
- Replace the dosing module filter.
- Disconnect all the lines and wash them with distilled water.
- Fill the tank with distilled water.
- Use the diagnostic tool to activate the pump module and repeat the test on the dosing module until clear liquid is obtained.
- Drain the distilled water from the tank and refill with liquid of the specified quality.

A. If the AdBlue concentration is correct, go to step **2**.

B. If the AdBlue concentration is not correct, repeat the verification.

2. Use the diagnostic tool to acquire the data relating to the temperature of the fluid in the AdBlue tank. Use a digital thermometer with a probe to measure the temperature relating to the fluid in the AdBlue tank. Compare the data provided by the diagnostic tool with the data measured directly using the digital thermometer.

   A. If the temperature values match, this indicates that the temperature read by the sensor is correct. Go to step **3**.

   B. If the temperature values do not coincide, this indicates that the sensor might not be working correctly. Go back to the fault identification procedure and then go to step **4**.

3. Use the diagnostic tool to acquire the data relating to the level of liquid present in the AdBlue® tank in the following conditions:
   - AdBlue tank completely empty ( **0%**).
   - AdBlue tank **50%** full, use the capacity data to determine the exact amount of fluid to be introduced.
   - AdBlue tank completely full ( **100%**)

   Analyse the three sets of data provided by the diagnostic instrument, checking that they are consistent with the three different test conditions.

   A. If the values relating to the level sensor are consistent, go to step **4**.

   B. If the temperature values are not consistent, this indicates that the sensor might not be working correctly. Go back to the fault identification procedure and then go to step **4**.

4. Use the diagnostic instrument to disable and delete the fault code. Restore vehicle operating conditions and check that the fault code relating to the quality, temperature, and level sensor AdBlue does not activate.

   A. If the fault code relating to the quality, temperature, and level sensor AdBlue is not active, the sensor is working correctly. Continue with the fault identification procedure.

   B. If the fault code relating to the AdBlue temperature, level and quality sensor is active, check the efficiency of the electrical wiring and continue with the fault identification procedure.

# 507466 AD-BLUE COOLANT LEVEL SENSOR - Test - AdBlue quality, level and temperature Wema sensor

The AdBlue quality, level and temperature sensor is present in the exhaust gas after treatment system **AD-BLUE SYSTEM - Overview (50.74)** and measures the AdBlue temperature, level and quality inside the tank.

To refer to the technical data relating to the AdBlue temperature, level, and quality sensor, see **AD-BLUE COOLANT LEVEL SENSOR - Technical Data (50.74)**.

## Diagnostics procedure

1. Check that the AdBlue fluid is not contaminated and that the concentration is correct ( **32.5%**). Proceed as follows:

***NOTE:*** *Do not add water or any liquid other than the one specified into the AdBlue tank. This would cause serious damage to the after-treatment system.*

- AdBlue concentration must be **32.5 +/- 0.7%**. If the concentration is not within the specified value, the tank must be drained, washed with distilled water and refilled with the quality of fluid indicated.
- AdBlue concentration must be verified in the following cases:
  - The vehicle has been stationary for an extended period
  - There is the possibility that water might have been added to the AdBlue tank.
  - There is the possibility that water might have evaporated from the AdBlue tank.
  - The AdBlue filler cap has been removed from the tank for an extended period of time.
  - There is the possibility of a fault in the heating system in the AdBlue tank.
  - There is the possibility of incorrect refilling having been carried out.
- Checking of the AdBlue concentration is carried out using a refractometer. The refractometer consists of two prisms and a light source. The indication of concentration is read on a graded scale created by the curvature of the light beam that passes through the liquid. Proceed as follows:
  - Place a few droplets of the liquid to be analysed on the lens
  - Go to a well lit area and look at the lens
  - The quadrant will divide into two colours
  - The line separating the two colours will indicate the percentage of concentration.
- Refractometer calibration, proceed as follows:
  - Take a solvent for parenteral use to wash the light source and the lens cover.
  - Place three droplets of the solvent for parenteral use on the lens and lower the lens cover.
  - Look through the eyepiece and bring the droplets into focus.
  - Rotate the calibration screw until the instrument is calibrated to "0".

- AdBlue tank contamination:
  If the AdBlue tank has been contaminated, proceed as follows:
  - Remove the filter from the AdBlue dosing module.
  - Check that the filter does not show any sign of contaminated liquid having passed through it.
  - Drain the tank.
  - Wash it with distilled water.
  - Check and replace (if necessary) all the filters in the line.
  - Refill with liquid of the specified quality.

  If the filter from the AdBlue dosing module shows signs of contamination, proceed as follows:
- Drain the tank.
- Wash it with distilled water.
- Replace all the filters in the line.
- Replace the dosing module filter.
- Disconnect all the lines and wash them with distilled water.
- Fill the tank with distilled water.
- Use the diagnostic tool to activate the pump module and repeat the test on the dosing module until clear liquid is obtained.
- Drain the distilled water from the tank and refill with liquid of the specified quality.

A. If the AdBlue concentration is correct, go to step **2**.

B. If the AdBlue concentration is not correct, repeat the verification.

2. Use the diagnostic tool to measure the temperature of the fluid in the AdBlue tank. Use a digital thermometer with a probe to measure the temperature of the fluid in the AdBlue tank. Compare the data provided by the diagnostic tool with the value measured using the digital thermometer.

   A. If the temperature values match, this indicates that the temperature read by the sensor is correct. Go to step **3**.

   B. If the temperature values do not coincide, this indicates that the sensor might not be working correctly. Go back to the fault identification procedure and then go to step **4**.

3. Use the diagnostic tool to acquire the data relating to the level of liquid present in the AdBlue® tank in the following conditions:
   - AdBlue tank completely empty ( **0%**).
   - AdBlue tank **50%** full, use the capacity data to determine the exact amount of fluid to be introduced.
   - AdBlue tank completely full ( **100%**)

   Analyse the three sets of data provided by the diagnostic instrument, checking that they are consistent with the three different test conditions.

   A. If the values relating to the level sensor are consistent, go to step **4**.

   B. If the temperature values are not consistent, this indicates that the sensor might not be working correctly. Go back to the fault identification procedure and then go to step **4**.

4. Use the diagnostic tool to disable and delete the fault code. Restore vehicle operating conditions and check that the fault code relating to the quality, temperature, and level sensor does not activate.

   A. If the fault code relating to the quality, temperature, and level sensor AdBlue is not active, the sensor is working correctly. Continue with the fault identification procedure.

   B. If the fault code relating to the AdBlue temperature, level and quality sensor is active, check the efficiency of the electrical wiring and continue with the fault identification procedure.

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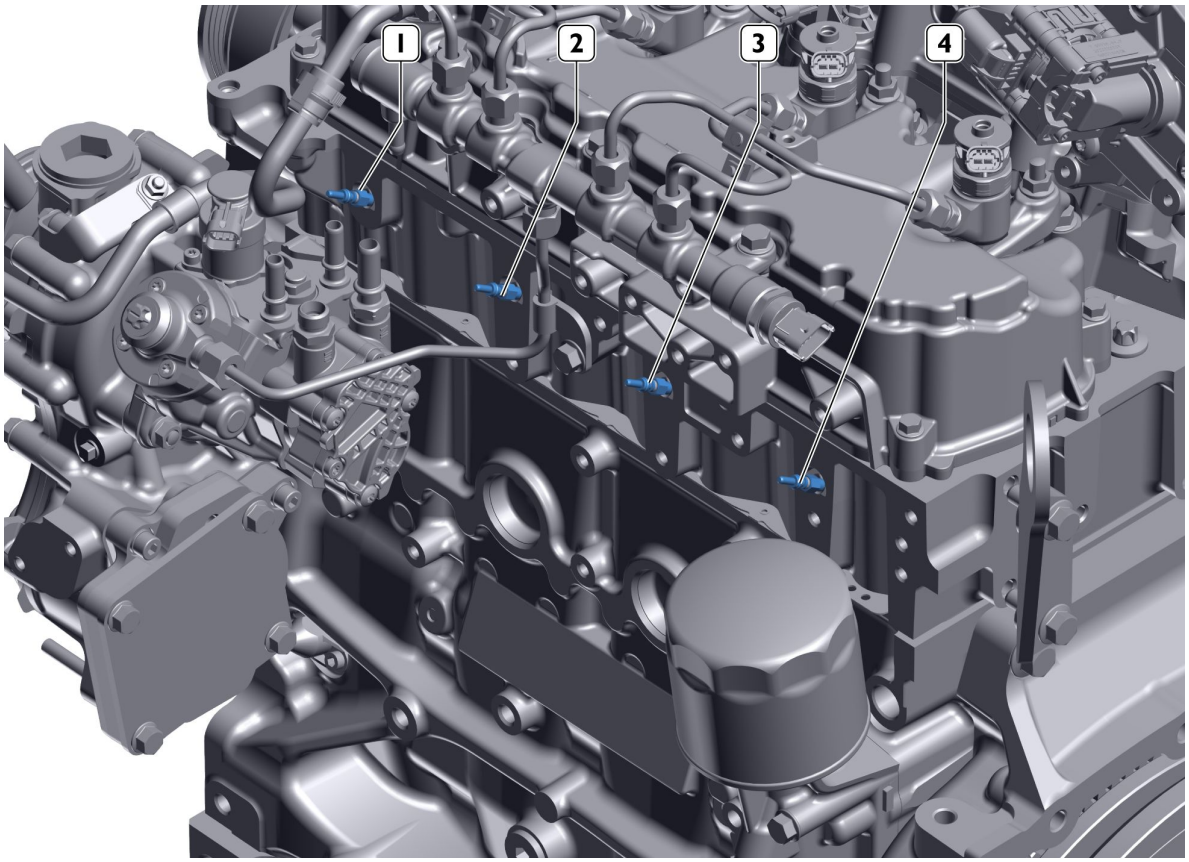
# 761911 THERMOSTARTER PLUG - Test Check spark plug heater

## Preparation

- Ignition switch set OFF position

## Visual check of glow plugs

1. Visual check of glow plugs
   - Check if the glow plugs are fitted correctly
   - Remove the glow plugs from their housing
   - Check there is no damage to the glow plug
   - See figure below for explanation and go to **2**




275041 1

**Location of the glow plug**

| Ref. | Description |
|---|---|
| **(1–4)** | Pre-heating glow plug |

2. Glow plugs check.
   A. Glow plugs fitted correctly
   B. Glow plugs neither faulty nor damaged
   C. If the glow plugs are efficient, go to **4**
   D. If the glow plugs are NOT efficient, go to **3**

3. Possible root cause
   - The electrical connection from the relay to the glow plugs could be damaged
   - Glow plugs faulty or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Glow plug activation check

4. General checks
   - Battery voltage is sufficient
   - Component related fuses are OK
   - Connectors/plugs OK. No loose contact or corrosion.
   - Offboard tool Diagnosis tester

## Preparation

5. - Connect the diagnostic tester
   - Start the engine
   - Carry out the run up test as per the instructions from the diagnostic tester
6. - Press the start button
   - Check and verify activation of the glow plug (measure the current flow on the wiring with a current clamp)
   - Go to **7**
7. Glow plug activation check
   A. Measurable current flow during activation
   B. Increase in temperature of the glow plugs
   C. If the glow plugs are efficient, go to **9**
   D. If the glow plugs are NOT efficient, go to **8**
8. Possible root cause
   - Communication loss with diagnosis tester
   - The electrical connection from the relay to the glow plugs could be damaged
   - Glow plug faulty or damaged

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

9. The glow plugs are working correctly.

# 764264 TIMING GEAR SPEED SENDER - Test Engine speed adjustment check

## Preparation

General checks

- Battery voltage is sufficient
- Vehicle fuses are OK
- Connectors/plugs OK. No loose contact or corrosion.
- Offboard tool: Diagnosis tester

## Engine speed adjustment check

## Preparation

This procedure is used to modify and maintain the engine rpm. Adjustment is possible in the range from idle to **2300 RPM**.

- Turn the key to ON position and start the engine at idle speed
- Connect the diagnostic tester
- Select Engine Speed item on diagnostic tester

## Check

1. 
   - Modify and maintain the engine rpm
   - Adjust the engine speed from idle to **2300 RPM**
   - Go to **2**
2. Engine speed adjustment check
   - The actual engine speed is into specified rpm range
   - If the engine speed adjustment check is OK, go to **4**
   - If the engine speed adjustment check is NOT OK, go to **3**
3. Possible root cause
   - Engine air system fault, e.g. air leak, faulty turbocharger etc.
   - Engine fuel system fault, e.g. leaking injector, faulty fuel pump etc.
   - Engine/transmission fault, e.g. head cylinder pressure leaking, wrong cam crank timing etc.

***NOTE:*** *Minimum speed should be engine idle speed.*

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The engine speed adjustment check works properly.

# 764264 TIMING GEAR SPEED SENDER - Test Check camshaft and crankshaft synchronization

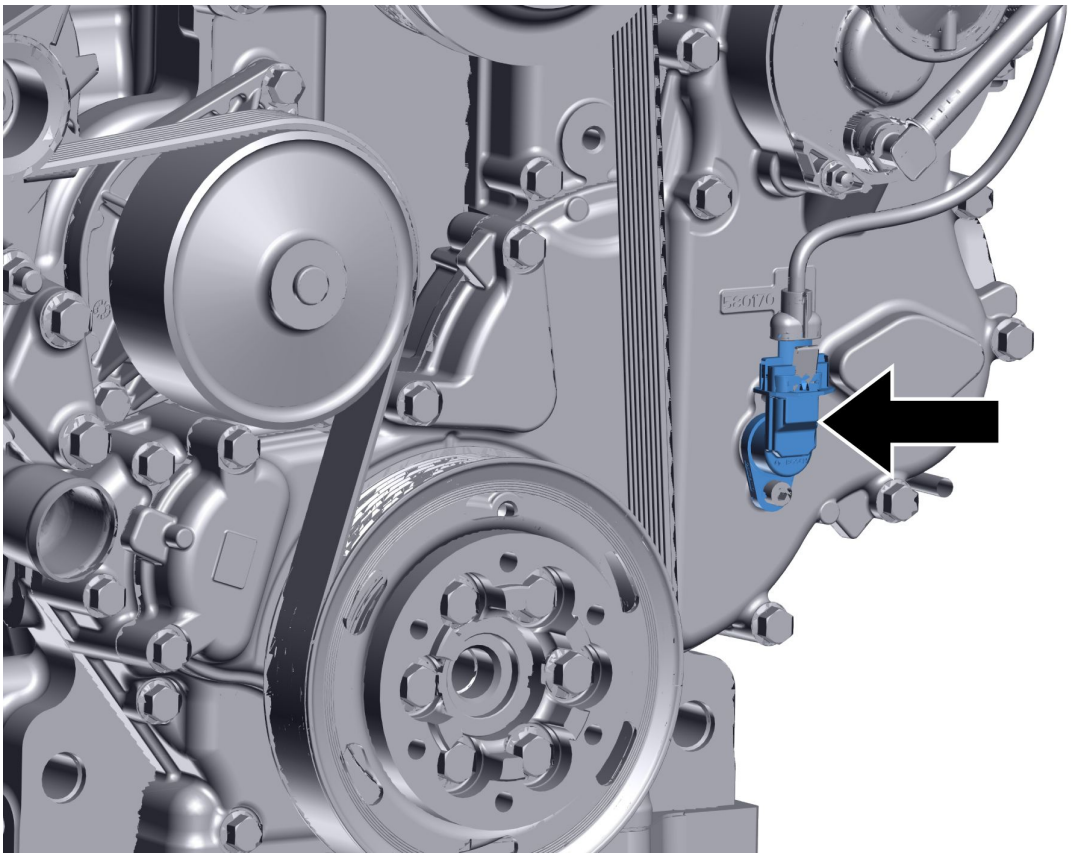
## Preparation

General checks

- Battery voltage is sufficient
- Electrical circuit is OK, like fuses, connectors, wiring harness, relays
- Offboard tool: oscilloscope

## Visual check the camshaft sensor

1. Visual check the camshaft sensor
   - Visually check the connector of the sensor
   - Check if the sensor is installed correctly
   - Check if the screw of the sensor is tight
   - Check the sensor assembly to the engine body
   - See figure below for aid and go to **2**



275057 1

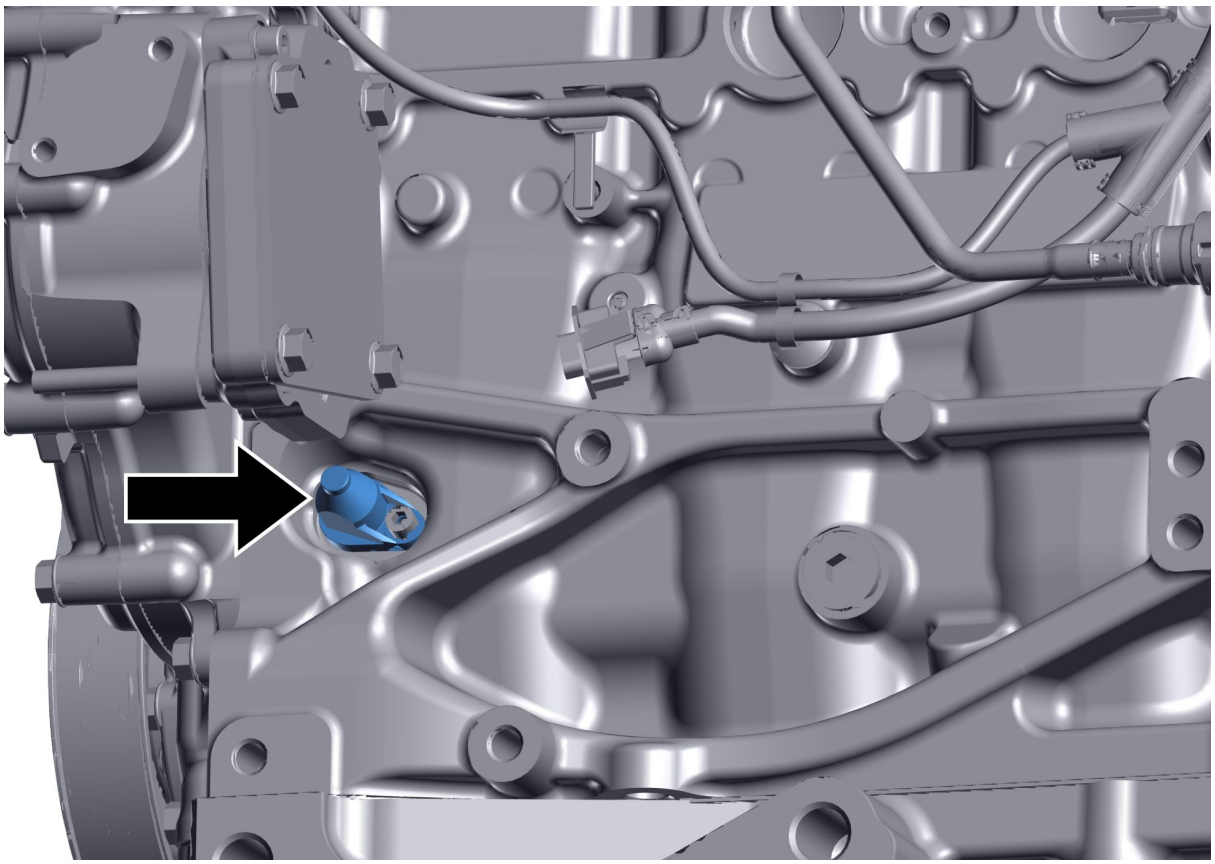
**Camshaft speed sensor**

2. Check the camshaft sensor
   A. Connector of the sensor not damaged and not contaminated
   B. The sensor is mounted in the correct orientation
   C. The sensor is correctly fitted to the engine body, no gap between the sensor and the engine body
   D. The screw is not loose
   E. If the camshaft sensor is OK, go to **4**
   F. If the camshaft sensor is NOT OK, go to **3**
3. Possible root cause
   - Connector of the sensor damaged and/or contaminated
   - The sensor is not mounted in the correct orientation
   - The sensor is loosely fitted to the engine body
   - Tighten the screw.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Visual check the crankshaft sensor

4. Visual check the crankshaft sensor
   - Visually check the connector of the sensor
   - Check if the sensor is installed correctly
   - Check if the screw of the sensor is tight
   - Check the sensor assembly to the engine body
   - See figure below for aid and go to **5**



275058 2

**Crankshaft speed sensor**

5. Check the crankshaft sensor
   A. Connector of the sensor not damaged and not contaminated
   B. The sensor is mounted in the correct orientation
   C. The sensor is correctly fitted to the engine body, no gap between the sensor and the engine body
   D. The screw is not loose
   E. If the crankshaft sensor is OK, go to **7**
   F. If the crankshaft sensor is NOT OK, go to **6**
6. Possible root cause
   - Connector of the sensor damaged and/or contaminated
   - The sensor is not mounted in the correct orientation
   - The sensor is loosely fitted to the engine body
   - Tighten the screw

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check camshaft and crankshaft synchronization

7. Check camshaft and crankshaft signals
   - Use an oscilloscope to check and compare the electrical signal of the camshaft and crankshaft sensor, go to **8**.

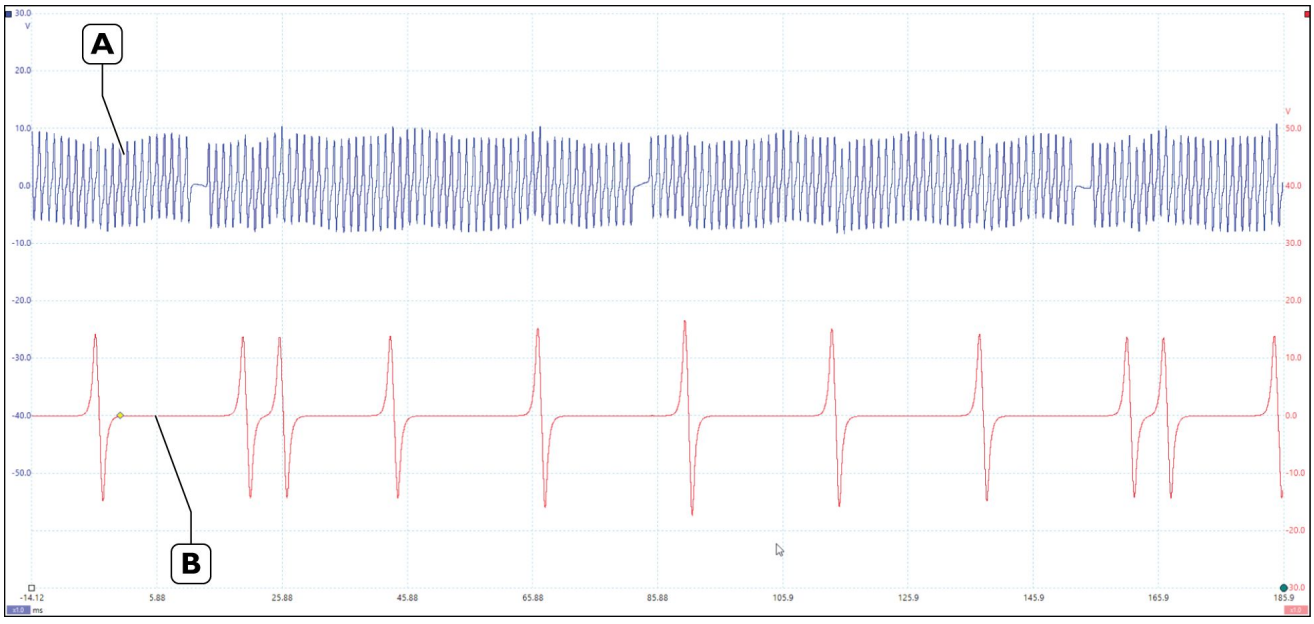
8. Signal check of Camshaft Speed Sensor ( Cm-SpdSens) by oscilloscope
   - Capture indicated CmSpdSens signal
   - Keep engine in low idle at least **1 min**
   - Go to **9**

| Component [Controller connector] | PIN | Destination [Controller connector] | PIN |
|---|---|---|---|
| CmSpdSens ECU Connector 2 | 68 | CmSpdSens ECU Connector 2 | 67 |

9. Signal check of Crankshaft Speed Sensor ( Cr-SpdSens) by oscilloscope
   - Capture indicated CrSpdSens signal
   - Keep engine in low idle at least **1 min**
   - Go to **10**

| Component [Controller connector] | PIN | Destination [Controller connector] | PIN |
|---|---|---|---|
| CrSpdSens ECU Connector 2 | 66 | CrSpdSens ECU Connector 2 | 65 |

10. Check camshaft and crankshaft synchronization
    A. The Camshaft and Crankshaft speed sensors' outputs should have a similar waveshape to the figure below:
    B. If the synchronization is OK, go to **12**
    C. If the synchronization is NOT OK, go to **11**




271859 3

**Camshaft and crankshaft sensors output signals comparison (sync in low idle speed)**

| Ref. | Description |
|---|---|
| **(A)** | Crankshaft speed sensor |
| **(B)** | Camshaft speed sensor |

***NOTE:*** *The maximum allowed output voltage peaks for the speed sensor is according to the control unit interface definition: "output V" minor to* ***100 V*** *and major to* ***-100 V***

11. Possible root cause
    - Wrong mechanical trimming
    - The sensor is loosely fitted to the engine

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

12. The camshaft and crankshaft synchronization works properly.

# 766161 ENGINE CONTROL UNIT - Test Check ECU power supply

## Preparation

- Ignition switch set to OFF position.
- Disconnect the wiring harness connector from the required ECU.

## Check power supply of indicated Electronic Control Unit (ECU)

1. Check power supply of Electronic Control Unit (ECU)
   - Measure the voltage between the required ECU wiring harness connector and ground point in accordance with the following table and go to **2**

| Ignition switch set OFF position | | | | | |
|---|---|---|---|---|---|
| **Component [Connector]** | **PIN** | **Via [fuse, relay]** | **Destination [Connector]** | **PIN** | **Typical Value** |
| ECU | 1 | Fuse F 7.5A | Vehicle ground point | – | From **11 V** to **14.8 V** |
| ECU | 3 | Fuse F-20A | Vehicle ground point | – | From **11 V** to **14.8 V** |
| ECU | 5 | Fuse F-20A | Vehicle ground point | – | From **11 V** to **14.8 V** |

***NOTE:*** *Please consider internal resistance of measurement equipment and breakout box used.*

2. Check power supply of indicated Electronic Control Unit (ECU)
   A. If all values within specified range or similar to typical value, go to **4**.
   B. If not all values within specified range or similar to typical value, go to **3**.
3. Possible root cause
   - Wiring harness damaged.
   - Wiring harness connector damaged.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

## Check ECU Wiring Harness – Open Circuit check

4. Preparation
   - Ignition switch set to OFF position.
   - Disconnect the controller connectors and fuses or relays linked to the inspected terminals/cables.
   - Disconnect the wiring harness connector from the required ECU.
5. Open circuit check of indicated Electronic Control Unit (ECU)
   - Measure the resistance between the required ECU wiring harness connector and indicated connector/destination point in accordance with the following table and go to **6**

| Component [Connector] | PIN | Destination [Connector] | PIN | Typical Value |
|---|---|---|---|---|
| ECU | 1 | Battery pole (+) via Fuse F 7.5A | Not applicable | From **0 Ω** to **0.2 Ω** |
| ECU | 3 | Battery pole (+) via Fuse F 20A | Not applicable | From **0 Ω** to **0.2 Ω** |
| ECU | 5 | Battery pole (+) via Fuse F 20A | Not applicable | From **0 Ω** to **0.2 Ω** |
| ECU | 2 | Battery pole (-) | Not applicable | From **0 Ω** to **0.2 Ω** |
| ECU | 4 | Battery pole (-) | Not applicable | From **0 Ω** to **0.2 Ω** |
| ECU | 6 | Battery pole (-) | Not applicable | From **0 Ω** to **0.2 Ω** |

6. Open circuit check of indicated Electronic Control Unit (ECU)
   A. If all values within specified range, go to **8**.
   B. If not all values within specified range, go to **7**.
7. Possible root cause
   - Wiring harness damaged.
   - Wiring harness connector damaged.

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

8. The ECU Power Supply works properly.

# 766161 ENGINE CONTROL UNIT - Test MIL activation check

## Preparation

General checks

- Battery voltage is sufficient
- Vehicle fuses are OK
- Connectors/plugs OK. No loose contact or corrosion.
- Offboard tool Diagnosis tester

## MIL Activation check

## Preparation

- Connect the diagnostic tester
- Turn the key to ON position
- Select MIL activation light item on diagnosis tester

## Check

1. 
   - Pressing the star button, you can verify the activation of MIL light on cluster
   - MIL is activated 3 times and you will get a visual feedback
   - Go to **2**
2. MIL Activation check
   - The diagnosis tester output shows the MIL providing a visual feedback. If the MIL Activation is not OK, go to **3**
   - If the MIL Activation is OK, go to **4**
3. Possible root cause
   - Defect cluster

***NOTE:*** *After fixing the error cause, please clear up fault memory and read again to verify.*

4. The MIL light on cluster works properly.

# 766161 ENGINE CONTROL UNIT - Test Read parameter check

## Preparation

General checks

- Battery voltage is sufficient
- Vehicle fuses are OK
- Connectors/plugs OK. No loose contact or corrosion.
- Off-board tool: Diagnosis tester

## Read Parameters check

## Preparation

- Set the key to ON.
- Connect the diagnostic tester

## Check

***NOTE:*** *This procedure is used to modify and maintain the engine rpm and analyse the performance of a number of pressure and injector parameters. Adjustment is possible in the range from idle to nominal speed. Tools for modifying the following parameters are arranged on the screen page (click on the instrument to visualize the name of the measurement channel)*

1. Procedure
   - Check and modify the boost air temperature: air temperature in intake manifold
   - Check and modify the relative boost air temperature: difference between absolute supercharging pressure and ambient pressure
   - Check and modify the target fuel pressure: target fuel pressure value to be reached by the ECU
   - Check and modify the fuel pressure: pressure in the rail
   - Check and modify the pre-injection fuel delivery: quantity of the fuel injected per cycle during pre-injection (certain rpm only)
   - Check and modify the main fuel delivery: main fuel quantity injected per cycle
   - Check and modify the total fuel delivery: quantity of fuel injected per cycle, including pre-injection and main injection
   - Check and modify the coolant temperature: temperature of coolant to obtain engine cooling effect
   - Go to **2**
2. Read parameter check
   - The following table shows the indicative reading parameters obtained by means of the diagnostics tool.
   - See the table below
   - If the parameters are OK, go to **4**
   - If the parameters are NOT OK, go to **3**

***NOTE:*** *The values shown in the table are purely indicative and do not refer to the current application*

| Description | Value | | | Unit |
|---|---|---|---|---|
| | IGN_On **0 RPM** | ENG_On **900 RPM** | ENG_On **1500 RPM** | |
| Engine Revolutions | 0 | 900 | 1,500 | Rpm |
| Injection Advance | 0 | 2.33 | 3.43 | ° |
| Battery Voltage | 12 | 14 | 14 | Volt |
| Turbocharger Actuator | 99 | 81 | 53 | % |
| Boost Pressure | 1016 | 1031 | 1097 | mBar |
| Oil Pressure | 30 | 4311 | 4898 | mBar |
| Coolant Temperature | 32 | 71 | 80 | °C |
| Fuel temperature sensor | 26 | 25 | 26 | °C |
| Oil Temperature | 32 | 53 | 68 | °C |
| Main Fuel Quantity | 0 | 37 | 39 | mg/str |
| Fuel Introduced Pre-Injection | 0 | 1.5 | 1.5 | mg/str |
| Total Fuel Introduced | 0 | 35 | 37 | mg/str |
| Current Injection Quantity | 0 | 35 | 37 | mg/str |
| Cylinder Air Mass | 0 | 1600 | 1660 | mg/str |
| Fuel Pressure | 2 | 500 | 877 | Bar |
| Fuel Pressure Setpoint | 323 | 500 | 875 | Bar |
| Intake Air Quantity | 0 | 1576 | 1662 | mg/str |
| Humidity sensor (if present) | 33 | 43 | 43 | % |
| Humidity sensor voltage (if present) | 1847 | 2097 | 2097 | mV |

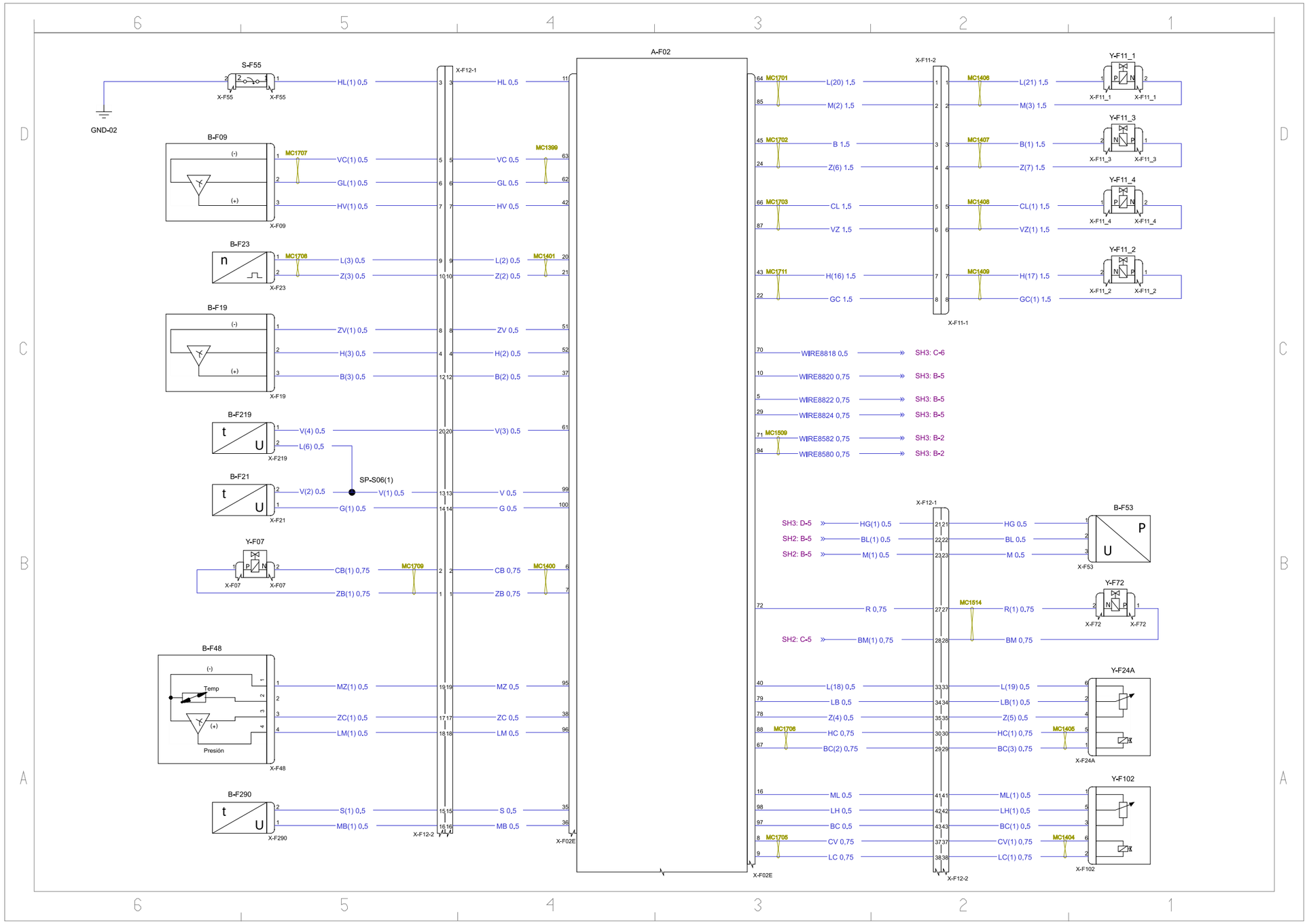
3. Possible root cause
   - Electrical defect of fuel and/or air system's components check wiring harness and component electrically
   - Mechanical defect of fuel and/or air system's components
   - Engine mechanical defect

***NOTE:*** *After having eliminated the cause of the error, delete the fault memory and repeat the reading.*

4. The engine control unit works properly.

# 769130 CONNECTIONS - Electrical schematic sheet 1 SH01 - ECU engine side

| Type | Component | Connector / Link |
|---|---|---|
| control unit | **A-F02** - Engine control unit (Control unit) | **X-F02V** - Engine control unit [A-F02]<br>**X-F02E** - Engine control unit [A-F02] (5802805180) |
| Sensor | **B-F09** B -F09 - Pressure sensor on the rail (Sensor) | **X-F09** - Pressure sensor on the rail [B-F09] |
| Sensor | **B-F19** - Timing sensor (Sensor) | **X-F19** - Timing sensor [B-F19] |
| Sensor | **B-F21** - Engine coolant temperature sensor (Sensor) | **X-F21** - Engine coolant temperature sensor [B-F21] |
| Sensor | **B-F219** - Turbo temperature sensor (Sensor) | **X-F219** - Turbo temperature sensor [B-F219] |
| Sensor | **B-F23** - RPM sensor (Sensor) | **X-F23** - RPM sensor [B-F23] |
| Sensor | **B-F290** - Fuel temperature sensor (Sensor) | **X-F290** - Fuel temperature sensor [B-F290] |
| Sensor | **B-F48** - Overpressure air temperature and pressure sensor (Sensor) | **X-F48** - Boost air temperature and pressure sensor [B-F48] |
| Sensor | **B-F53** - Exhaust gas pressure sensor (Sensor) | **X-F53** - Exhaust gas pressure sensor [B-F53] |
| Ground | **GND-02** - (Ground) | GND-02 |
| Switch | **S-F55** - Low engine oil level alarm switch (Switch) | **X-F55** - Low engine oil level alarm switch [S-F55] |
| Connector | | **X-F02E** - Engine control unit [A-F02] (5802805180) |
| Connector | | **X-F07** - Fuel pressure regulating solenoid valve [Y-F07] |
| Connector | | **X-F09** - Pressure sensor on the rail [B-F09] |
| Connector | | **X-F102** - Throttle solenoid valve (TVA) [Y-F102] |
| Connector | | **X-F11-1** - Connector SEZ.1 M |
| Connector | | **X-F11-2** - Connector SEZ.1 F |
| Connector | | **X-F11_1** - Injector 1 [Y-F11_1] |
| Connector | | **X-F11_2** - Injector 2 [Y-F11_2] |
| Connector | | **X-F11_3** - Injector 3 [Y-F11_3] |
| Connector | | **X-F11_4** - Injector 4 [Y-F11_4] |
| Connector | | **X-F12-1** - Connector SEZ.2 F |
| Connector | | **X-F12-2** - Connector SEZ.2 M |
| Connector | | **X-F19** - Timing sensor [B-F19] |
| Connector | | **X-F21** - Engine coolant temperature sensor [B-F21] |
| Connector | | **X-F219** - Turbo temperature sensor [B-F219] |
| Connector | | **X-F23** - RPM sensor [B-F23] |
| Connector | | **X-F24A** - EGR solenoid valve (Pierburg) [Y-F24A] |
| Connector | | **X-F290** - Fuel temperature sensor [B-F290] |
| Connector | | **X-F48** - Boost air temperature and pressure sensor [B-F48] |
| Connector | | **X-F53** - Exhaust gas pressure sensor [B-F53] |
| Connector | | **X-F55** - Low engine oil level alarm switch [S-F55] |
| Connector | | **X-F72** - Wastegate solenoid valve (WG) [Y-F72] |
| Solenoid | **Y-F07** - Solenoid valve for fuel pressure regulation (Solenoid) | **X-F07** - Fuel pressure regulating solenoid valve [Y-F07] |
| Solenoid | **Y-F102** - Throttle solenoid valve (TVA) (Solenoid) | **X-F102** - Throttle solenoid valve (TVA) [Y-F102] |
| Solenoid | **Y-F11_1** - Injector 1 (Solenoid) | **X-F11_1** - Injector 1 [Y-F11_1] |
| Solenoid | **Y-F11_2** - Injector 2 (Solenoid) | **X-F11_2** - Injector 2 [Y-F11_2] |
| Solenoid | **Y-F11_3** - Injector 3 (Solenoid) | **X-F11_3** - Injector 3 [Y-F11_3] |
| Solenoid | **Y-F11_4** - Injector 4 (Solenoid) | **X-F11_4** - Injector 4 [Y-F11_4] |
| Solenoid | **Y-F24A** - EGR solenoid valve (Pierburg) (Solenoid) | **X-F24A** - EGR solenoid valve (Pierburg) [Y-F24A] |
| Solenoid | **Y-F72** - Wastegate solenoid valve (WG) (Solenoid) | **X-F72** - Wastegate solenoid valve (WG) [Y-F72] |

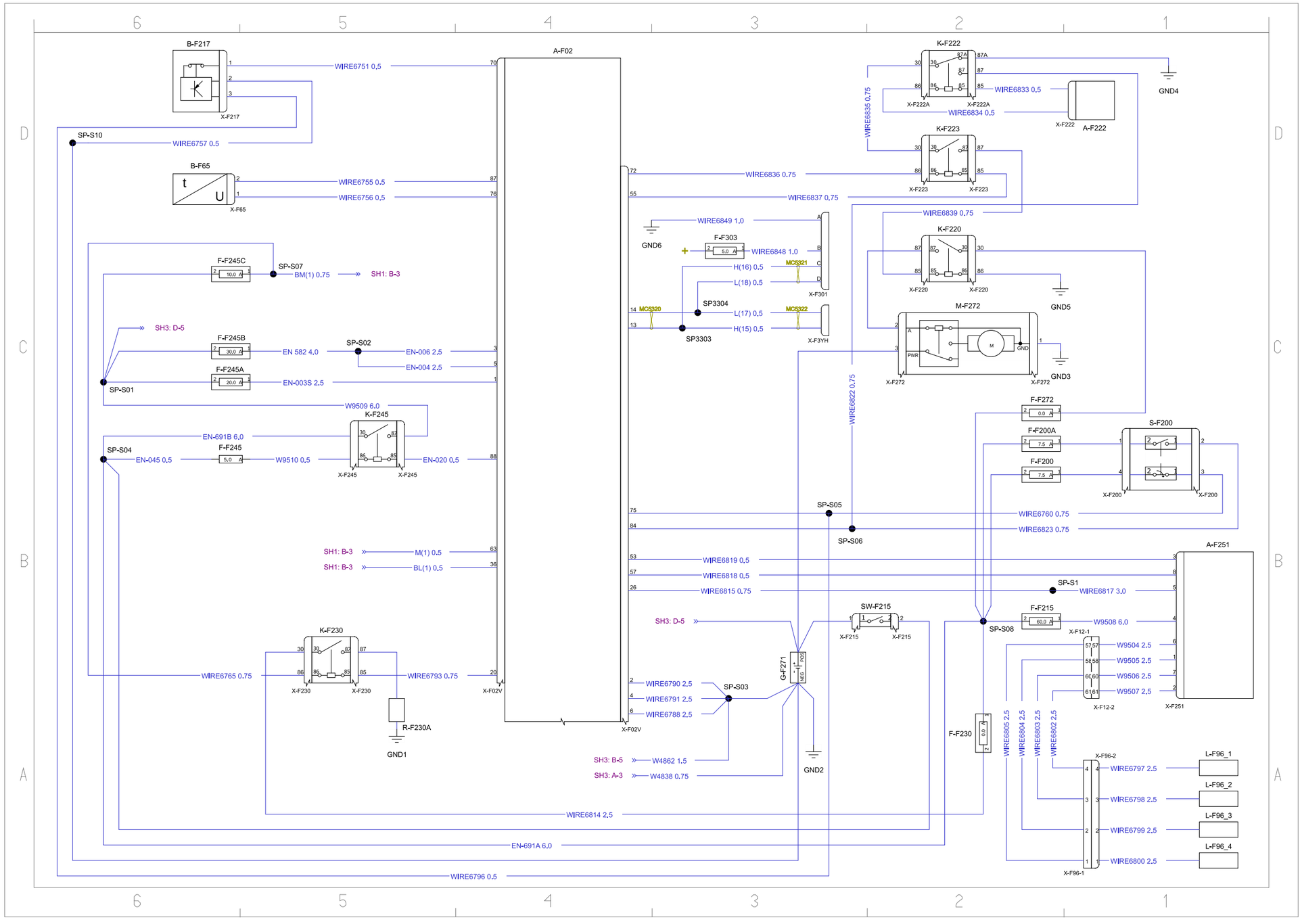

S-F55
X-F55
X-F55
HL(1) 0.5
GND-02
B-F09
MC1707
VC(1) 0.5
GL(1) 0.5
HV(1) 0.5
X-F09
B-F23
MC1708
L(3) 0.5
Z(3) 0.5
X-F23
B-F19
ZV(1) 0.5
H(3) 0.5
B(3) 0.5
X-F19
B-F219
V(4) 0.5
L(6) 0.5
X-F219
B-F21
V(2) 0.5
G(1) 0.5
X-F21
SP-S06(1)
V(1) 0.5
Y-F07
CB(1) 0,75
ZB(1) 0,75
X-F07
X-F07
MC1709
B-F48
MZ(1) 0.5
ZC(1) 0.5
LM(1) 0.5
X-F48
B-F290
S(1) 0.5
MB(1) 0.5
X-F290
X-F12-1
X-F12-2
HL 0.5
VC 0.5
GL 0.5
HV 0.5
L(2) 0.5
Z(2) 0.5
ZV 0.5
H(2) 0.5
B(2) 0.5
V(3) 0.5
V 0.5
G 0.5
CB 0,75
ZB 0,75
S 0.5
MB 0.5
MC1399
MC1401
MC1400
X-F02E
A-F02
MC1701
L(20) 1.5
M(2) 1.5
MC1702
B 1.5
Z(6) 1.5
MC1703
CL 1.5
VZ 1.5
MC1711
H(16) 1.5
GC 1.5
WIRE8818 0.5
WIRE8820 0,75
WIRE8822 0,75
WIRE8824 0,75
MC1509
WIRE8582 0,75
WIRE8580 0,75
SH3: C-6
SH3: B-5
SH3: B-5
SH3: B-5
SH3: B-2
SH3: B-2
X-F11-2
X-F11-1
MC1406
L(21) 1.5
M(3) 1.5
MC1407
B(1) 1.5
Z(7) 1.5
MC1408
CL(1) 1.5
VZ(1) 1.5
MC1409
H(17) 1.5
GC(1) 1.5
Y-F11_1
Y-F11_3
Y-F11_4
Y-F11_2
X-F11_1
X-F11_1
X-F11_3
X-F11_3
X-F11_4
X-F11_4
X-F11_2
X-F11_2
SH3: D-5
SH2: B-5
SH2: B-5
HG(1) 0.5
BL(1) 0.5
M(1) 0.5
SH2: C-5
BM(1) 0,75
R 0,75
MC1514
HG 0.5
BL 0.5
M 0.5
R(1) 0.75
BM 0,75
B-F53
X-F53
Y-F72
X-F72
X-F72
L(18) 0.5
LB 0.5
Z(4) 0.5
MC1708
HC 0,75
BC(2) 0.75
L(19) 0.5
LB(1) 0,5
Z(5) 0.5
HC(1) 0,75
BC(3) 0.75
MC1405
Y-F24A
X-F24A
ML 0.5
LH 0.5
BC 0.5
MC1705
CV 0,75
LC 0,75
ML(1) 0.5
LH(1) 0,5
BC(1) 0,5
CV(1) 0,75
LC(1) 0,75
MC1404
Y-F102
X-F102
X-F12-2
X-F02E

SHT_1 1

# 769130 CONNECTIONS - Electrical schematic sheet 2 SH02 - ECU vehicle side

| Type | Component | Connector / Link |
|---|---|---|
| control unit | **A-F02** - Engine control unit (Control unit) | **X-F02V** - Engine control unit [A-F02]<br>**X-F02E** - Engine control unit [A-F02] (5802805180) |
| Control unit | **A-F222** - Start up control unit (Control unit) | **X-F222** - Contactor for start-up control from Body Controller [A-F222] |
| Control unit | **A-F251** - Preheating glow-plugs control unit (Control unit) | **X-F251** - Preheating glow-plugs control unit [A-F251] (84356962) |
| Sensor | **B-F217** - Sensor detecting water in fuel (Sensor) | **X-F217** - Water in fuel sensor [B-F217] (87747172) |
| Sensor | **B-F65** - Intake air temperature sensor (Sensor) | **X-F65** - Intake air temperature sensor [B-F65] |
| Fuse | **F-F200** - Fuse (Fuse) | |
| Fuse | **F-F200A** - Fuse (Fuse) | |
| Fuse | **F-F215** - Fuse (Fuse) | |
| Fuse | **F-F230** - Fuse (Fuse) | |
| Fuse | **F-F245** - Fuse (Fuse) | |
| Fuse | **F-F245A** - Fuse (Fuse) | |
| Fuse | **F-F245B** - Fuse (Fuse) | |
| Fuse | **F-F245C** - Fuse (Fuse) | |
| Fuse | **F-F272** - Fuse (Fuse) | |
| Fuse | **F-F303** - Fuse (Fuse) | |
| Energy source | **G-F271** - Battery (Power source) | |
| Relay | **K-F220** - Ignition contactor (Relay) | **X-F220** - Starter relay [K-F220] |
| Relay | **K-F222** - Contactor for start-up control from Body Controller (Relay) | **X-F222A** - Starter control unit [K-F222] |
| Relay | **K-F223** - Ignition control contactor (Relay) | **X-F223** - Starter relay [K-F223] |
| Relay | **K-F230** - Fuel filter heating contactor (Relay) | **X-F230** - Fuel filter heating contactor [K-F230] |
| Relay | **K-F245** - Main contactor (Relay) | **X-F245** - Main contactor [K-F245] |
| Ash | **L-F96_1** - Pre-heating glow plug (Load) | |
| Ash | **L-F96_2** - Pre-heating glow plug (Load) | |
| Ash | **L-F96_3** - Pre-heating glow plug (Load) | |

| Type | Component | Connector / Link |
|---|---|---|
| Ash | **L-F96_4** - Pre-heating glow plug (Load) | |
| Engine | **M-F272** - Starter motor (Engine) | **X-F272** - Starter motor [M-F272] |
| Resistance | **R-F230A** - Fuel filter resistor (Resistor) | |
| Switch | **S-F200** - Ignition switch (Switch) | **X-F200** - Ignition switch [S-F200] |
| Switch | **SW-F215** - Battery disconnect switch (BDS) (Switch) | **X-F215** - Battery cut-off switch (BDS) [SW-F215] |
| Connector | | **X-F02V** - Engine control unit [A-F02] |
| Connector | | **X-F12-1** - Connector SEZ.2 F |
| Connector | | **X-F12-2** - Connector SEZ.2 M |
| Connector | | **X-F200** - Ignition switch [S-F200] |
| Connector | | **X-F215** - Battery cut-off switch (BDS) [SW-F215] |
| Connector | | **X-F217** - Water in fuel sensor [B-F217] (87747172) |
| Connector | | **X-F220** - Starter relay [K-F220] |
| Connector | | **X-F222** - Contactor for start-up control from Body Controller [A-F222] |
| Connector | | **X-F222A** - Starter control unit [K-F222] |
| Connector | | **X-F223** - Starter relay [K-F223] |
| Connector | | **X-F230** - Fuel filter heating contactor [K-F230] |
| Connector | | **X-F245** - Main contactor [K-F245] |
| Connector | | **X-F251** - Preheating glow-plugs control unit [A-F251] (84356962) |
| Connector | | **X-F272** - Starter motor [M-F272] |
| Connector | | **X-F301** - Diagnostics connector |
| Connector | | **X-F3YH** - Connector CAN Interface 1 for interfacing with CAN network |
| Connector | | **X-F65** - Intake air temperature sensor [B-F65] |
| Connector | | **X-F96-1** - Connector SEZ.GP |
| Connector | | **X-F96-2** - Connector SEZ.EH |

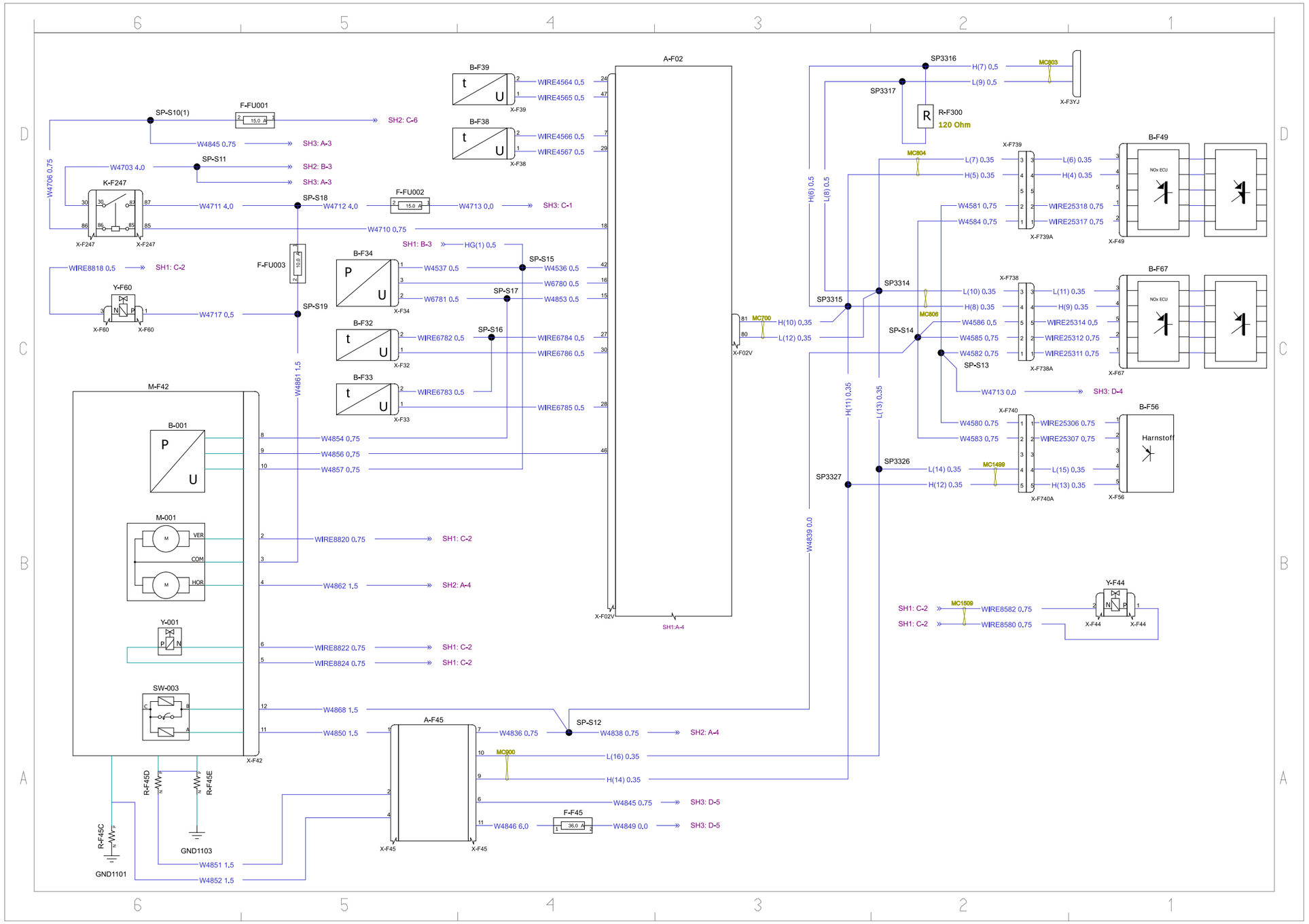

B-F217
X-F217
WIRE6751 0,5
SP-S10
WIRE6757 0,5
B-F65
X-F65
WIRE6755 0,5
WIRE6756 0,5
A-F02
X-F02V
F-F245C
10,0 A
SP-S07
BM(1) 0,75
SH1: B-3
SH3: D-5
F-F245B
30,0 A
EN 582 4,0
SP-S02
EN-006 2,5
EN-004 2,5
F-F245A
20,0 A
EN-003S 2,5
SP-S01
W9509 6,0
K-F245
EN-691B 6,0
SP-S04
EN-045 0,5
F-F245
5,0 A
W9510 0,5
EN-020 0,5
SH1: B-3
M(1) 0,5
SH1: B-3
BL(1) 0,5
K-F230
WIRE6765 0,75
WIRE6793 0,75
R-F230A
GND1
WIRE6836 0,75
WIRE6837 0,75
WIRE6849 1,0
GND6
F-F303
5,0 A
WIRE6848 1,0
H(16) 0,5
L(18) 0,5
SP3304
L(17) 0,5
H(15) 0,5
SP3303
X-F301
X-F3YH
WIRE6790 2,5
WIRE6791 2,5
WIRE6788 2,5
SP-S03
SH3: B-5
W4862 1,5
SH3: A-3
W4838 0,75
G-F271
GND2
SW-F215
SH3: D-5
K-F222
X-F222A
WIRE6833 0,5
WIRE6834 0,5
X-F222
A-F222
WIRE6835 0,75
GND4
K-F223
X-F223
WIRE6839 0,75
K-F220
X-F220
GND5
M-F272
PWR
GND
X-F272
GND3
WIRE6822 0,75
F-F272
0,0 A
F-F200A
7,5 A
F-F200
7,5 A
S-F200
X-F200
SP-S05
SP-S06
WIRE6760 0,75
WIRE6823 0,75
A-F251
SP-S1
WIRE6817 3,0
F-F215
60,0 A
SP-S08
W9508 6,0
X-F12-1
W9504 2,5
W9505 2,5
W9506 2,5
W9507 2,5
X-F12-2
X-F251
F-F230
0,0 A
WIRE6805 2,5
WIRE6804 2,5
WIRE6803 2,5
WIRE6802 2,5
X-F96-2
X-F96-1
WIRE6797 2,5
WIRE6798 2,5
WIRE6799 2,5
WIRE6800 2,5
L-F96_1
L-F96_2
L-F96_3
L-F96_4
WIRE6819 0,5
WIRE6818 0,5
WIRE6815 0,75
WIRE6814 2,5
EN-691A 6,0
WIRE6796 0,5

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# 769130 CONNECTIONS - Electrical schematic sheet 3 SH03 - ECU vehicle side

| Type | Component | Connector / Link |
|---|---|---|
| control unit | **A-F02** - Engine control unit (Control unit) | **X-F02V** - Engine control unit [A-F02]<br>**X-F02E** - Engine control unit [A-F02] (5802805180) |
| Control unit | **A-F45** - Urea pipe heating control unit (Control unit) | **X-F45** - Urea pipes heating contactor [A-F45] |
| Sensor | **B-001** - Relative Pressure Sensor (PS) (Sensor) | |
| Sensor | **B-F32** - Exhaust gas temperature sensor upstream of the DOC (Sensor) | **X-F32** - Exhaust gas temperature sensor upstream of DOC [B-F32] |
| Sensor | **B-F33** - Exhaust gas temperature sensor upstream of the DPF (Sensor) | **X-F33** - Exhaust gas temperature sensor upstream of the DPF[[B-F33] |
| Sensor | **B-F34** - Differential pressure sensor on the DPF (Sensor) | **X-F34** - Differential pressure sensor on DPF [B-F34] |
| Sensor | **B-F38** - Exhaust gas temperature sensor upstream of the SCR (Sensor) | **X-F38** - Exhaust gas temperature sensor upstream of the SCR [B-F38] |
| Sensor | **B-F39** - Exhaust gas temperature sensor downstream of the SCR (Sensor) | **X-F39** - Exhaust gas temperature sensor downstream of the SCR [B-F39] |
| Sensor | **B-F49** - NOx detection sensor downstream of the SCR (Sensor) | **X-F49** - NOx detection sensor downstream of SCR [B-F49] (872-860-541) |
| Sensor | **B-F56** - Urea level quality and temperature sensor (Sensor) | **X-F56** - Urea tank quality - level - temperature sensor [B-F56] |
| Sensor | **B-F67** - NOx detection sensor upstream of the SCR (Sensor) | **X-F67** - NOx detection sensor upstream of SCR [B-F67] (872-860-541) |
| Fuse | **F-F45** - Fuse (Fuse) | |
| Fuse | **F-FU001** - Fuse (Fuse) | |
| Fuse | **F-FU002** - Fuse (Fuse) | |
| Fuse | **F-FU003** - Fuse (Fuse) | |
| Relay | **K-F247** - SCR contactor (Relay) | **X-F247** - SCR contactor [K-F247] |
| Engine | **M-001** - Pump motor (Motor) | |
| Engine | **M-F42** - Urea pump module (Motor) | **X-F42** - Urea pump module [M-F42] (1-1703639-1) |
| Resistor | **R-F300** - Termination resistor for CAN bus (Resistor) | |
| Resistor | **R-F45C** - Urea delivery pipe heating resistor (Resistor) | |
| Resistor | **R-F45D** - Urea return pipe heating resistor (Resistor) | |
| Resistor | **R-F45E** - Urea drain pipe heating resistor (Resistor) | |
| switch | **SW-003** - Urea heater module (Switch) | |
| Connector | | **X-F02V** - Engine control unit [A-F02] |

| Type | Component | Connector / Link |
|---|---|---|
| Connector | | **X-F247** - SCR contactor [K-F247] |
| Connector | | **X-F32** - Exhaust gas temperature sensor upstream of DOC [B-F32] |
| Connector | | **X-F33** - Exhaust gas temperature sensor upstream of the DPF[[B-F33] |
| Connector | | **X-F34** - Differential pressure sensor on DPF [B-F34] |
| Connector | | **X-F38** - Exhaust gas temperature sensor upstream of the SCR [B-F38] |
| Connector | | **X-F39** - Exhaust gas temperature sensor downstream of the SCR [B-F39] |
| Connector | | **X-F3YJ** - CAN Interface 2 connector for interface with CAN network |
| Connector | | **X-F42** - Urea pump module [M-F42] (1-1703639-1) |
| Connector | | **X-F44** - Urea dosing module [Y-F44] |
| Connector | | **X-F45** - Urea pipes heating contactor [A-F45] |
| Connector | | **X-F49** - NOx detection sensor downstream of SCR [B-F49] (872-860-541) |
| Connector | | **X-F56** - Urea tank quality - level - temperature sensor [B-F56] |
| Connector | | **X-F60** - Urea tank heating solenoid valve [Y-F60] |
| Connector | | **X-F67** - NOx detection sensor upstream of SCR [B-F67] (872-860-541) |
| Connector | | **X-F738** - Connector NOx 1 |
| Connector | | **X-F738A** - Connector NOx 1 |
| Connector | | **X-F739** - Connector NOx 2 |
| Connector | | **X-F739A** - Connector NOx 2 |
| Connector | | **X-F740** - Connector UQS |
| Connector | | **X-F740A** - Connector UQS |
| Solenoid | **Y-001** - Bleed solenoid valve (Solenoid) | |
| Solenoid | **Y-F44** - Urea dosing module (Solenoid) | **X-F44** - Urea dosing module [Y-F44] |
| Solenoid | **Y-F60** - Urea tank heating solenoid valve (Solenoide) | **X-F60** - Urea tank heating solenoid valve [Y-F60] |


A-F02
B-F39
WIRE4564 0.5
WIRE4565 0.5
B-F38
WIRE4566 0.5
WIRE4567 0.5
SP-S10(1)
F-FU001
SH2: C-6
W4845 0.75
SH3: A-3
SP-S11
W4703 4.0
SH2: B-3
SH3: A-3
K-F247
W4706 0.75
W4711 4.0
SP-S18
W4712 4.0
F-FU002
W4713 0.0
SH3: C-1
W4710 0.75
WIRE8818 0.5
SH1: C-2
F-FU003
SH1: B-3
HG(1) 0.5
Y-F60
W4717 0.5
B-F34
W4537 0.5
W6780 0.5
W6781 0.5
SP-S15
W4536 0.5
W4853 0.5
SP-S17
SP-S19
B-F32
WIRE6782 0.5
WIRE6784 0.5
WIRE6786 0.5
SP-S16
B-F33
WIRE6783 0.5
WIRE6785 0.5
W4861 1.5
M-F42
B-001
W4854 0.75
W4856 0.75
W4857 0.75
M-001
WIRE8820 0.75
SH1: C-2
W4862 1.5
SH2: A-4
Y-001
WIRE8822 0.75
SH1: C-2
WIRE8824 0.75
SH1: C-2
SW-003
W4868 1.5
W4850 1.5
X-F42
R-F45D
R-F45E
R-F45C
GND1103
GND1101
W4851 1.5
W4852 1.5
A-F45
W4836 0.75
W4838 0.75
SH2: A-4
SP-S12
L(16) 0.35
H(14) 0.35
W4845 0.75
SH3: D-5
F-F45
W4846 6,0
W4849 0,0
SH3: D-5
X-F45
X-F02V
SH1:A-4
W4839 0.0
SP3316
H(7) 0.5
L(9) 0.5
MC803
X-F3YJ
SP3317
R
R-F300
120 Ohm
MC804
L(7) 0.35
H(5) 0.35
X-F739
L(6) 0.35
H(4) 0.35
B-F49
W4581 0.75
W4584 0.75
WIRE25318 0.75
WIRE25317 0.75
X-F739A
X-F49
H(6) 0.5
L(8) 0.5
SP3314
SP3315
MC700
H(10) 0.35
L(12) 0.35
MC806
SP-S14
L(10) 0.35
H(8) 0.35
W4586 0.5
W4585 0.75
W4582 0.75
X-F738
L(11) 0.35
H(9) 0.35
WIRE25314 0.5
WIRE25312 0.75
WIRE25311 0.75
X-F738A
B-F67
X-F67
SP-S13
W4713 0.0
SH3: D-4
H(11) 0.35
L(13) 0.35
X-F740
W4580 0.75
W4583 0.75
WIRE25306 0.75
WIRE25307 0.75
B-F56
Harnstoff
X-F56
SP3326
SP3327
L(14) 0.35
H(12) 0.35
MC1499
L(15) 0.35
H(13) 0.35
X-F740A
W4839 0.0
Y-F44
SH1: C-2
MC1509
WIRE8582 0.75
SH1: C-2
WIRE8580 0.75
X-F44
X-F44

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# 769130 CONNECTIONS - Component Diagram 00 Connector X-000 to X-009

***X-F02E - Engine control unit [ A-F02] (5802805180) (Receptacle)***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 5 | **X-F42 pin 6** - Urea pump module [M-F42] (1-1703639-1) | WIRE8822 | Bleed solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F12-1 (Receptacle) pin 2** - Connector SEZ.2 F | CB | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 7 | **X-F12-1 (Receptacle) pin 1** - Connector SEZ.2 F | ZB | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 8 | **X-F12-1 (Receptacle) pin 37** - Connector SEZ.2 F | CV | Throttle solenoid valve (TVA) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 9 | **X-F12-1 (Receptacle) pin 38** - Connector SEZ.2 F | LC | Throttle solenoid valve (TVA) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 10 | **X-F42 pin 2** - Urea pump module [M-F42] (1-1703639-1) | WIRE8820 | Pump motor | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 11 | **X-F12-1 (Receptacle) pin 3** - Connector SEZ.2 F | HL | Low engine oil level alarm switch | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 16 | **X-F12-1 (Receptacle) pin 41** - Connector SEZ.2 F | ML | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 20 | **X-F12-1 (Receptacle) pin 9** - Connector SEZ.2 F | L(2) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 21 | **X-F12-1 (Receptacle) pin 10** - Connector SEZ.2 F | Z(2) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 22 | **X-F11-2 (Receptacle) pin 8** - Connector SEZ.1 F | GC | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 24 | **X-F11-2 (Receptacle) pin 4** - Connector SEZ.1 F | Z(6) | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 29 | **X-F42 pin 5** - Urea pump module [M-F42] (1-1703639-1) | WIRE8824 | Bleed solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 35 | **X-F12-1 (Receptacle) pin 15** - Connector SEZ.2 F | S | Fuel temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 36 | **X-F12-1 (Receptacle) pin 16** - Connector SEZ.2 F | MB | Fuel temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 37 | **X-F12-1 (Receptacle) pin 12** - Connector SEZ.2 F | B(2) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 38 | **X-F12-1 (Receptacle) pin 17** - Connector SEZ.2 F | ZC | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 42 | **X-F12-1 (Receptacle) pin 7** - Connector SEZ.2 F | HV | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 43 | **X-F301 pin C** - Diagnostics connector | H(16) | Connector for interface with CAN network | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 45 | **X-F11-2 (Receptacle) pin 3** - Connector SEZ.1 F | B | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 51 | **X-F12-1 (Receptacle) pin 8** - Connector SEZ.2 F | ZV | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 52 | **X-F12-1 (Receptacle) pin 4** - Connector SEZ.2 F | H(2) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 61 | **X-F12-1 (Receptacle) pin 20** - Connector SEZ.2 F | V(3) | Turbo temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 62 | **X-F12-1 (Receptacle) pin 6** - Connector SEZ.2 F | GL | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 63 | **X-F12-1 (Receptacle) pin 5** - Connector SEZ.2 F | VC | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 64 | **X-F11-2 (Receptacle) pin 1** - Connector SEZ.1 F | L(20) | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 66 | **X-F11-2 (Receptacle) pin 5** - Connector SEZ.1 F | CL | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 67 | **X-F12-1 (Receptacle) pin 29** - Connector SEZ.2 F | BC(2) | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 70 | **X-F60 (Receptacle) pin 3** - Urea tank heating solenoid valve [Y-F60] | WIRE8818 | Urea tank heating solenoid valve (3 way) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 71 | **X-F44 pin 2** - Urea dosing module [Y-F44] | WIRE8582 | ATS Junction connector | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 72 | **X-F12-1 (Receptacle) pin 27** - Connector SEZ.2 F | R | Wastegate solenoid valve (WG) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 78 | **X-F12-1 (Receptacle) pin 35** - Connector SEZ.2 F | Z(4) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 79 | **X-F12-1 (Receptacle) pin 34** - Connector SEZ.2 F | LB | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 85 | **X-F11-2 (Receptacle) pin 2** - Connector SEZ.1 F | M(2) | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 87 | **X-F11-2 (Receptacle) pin 6** - Connector SEZ.1 F | VZ | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 88 | **X-F12-1 (Receptacle) pin 30** - Connector SEZ.2 F | HC | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 94 | **X-F44 pin 1** - Urea dosing module [Y-F44] | WIRE8580 | ATS Junction connector | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 95 | **X-F12-1 (Receptacle) pin 19** - Connector SEZ.2 F | MZ | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 96 | **X-F12-1 (Receptacle) pin 18** - Connector SEZ.2 F | LM | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 97 | **X-F12-1 (Receptacle) pin 43** - Connector SEZ.2 F | BC | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 98 | **X-F12-1 (Receptacle) pin 42** - Connector SEZ.2 F | LH | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 99 | **X-F12-1 (Receptacle) pin 13** - Connector SEZ.2 F | V | Engine coolant temperature sensor / Turbo temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 100 | **X-F12-1 (Receptacle) pin 14** - Connector SEZ.2 F | G | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F02V - Engine control unit [ A-F02] (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | F-F245A-P-1 | EN-003S | Main contactor | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | SP-S03-P-PIN1 | WIRE6790 | Battery negative | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | SP-S02-P-PIN1 | EN-006 | Main contactor | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 4 | SP-S03-P-PIN1 | WIRE6791 | Battery negative | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 5 | SP-S02-P-PIN1 | EN-004 | Main contactor | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 6 | SP-S03-P-PIN1 | WIRE6788 | Battery negative | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 7 | **X-F38 pin 2** - Exhaust gas temperature sensor upstream of the SCR [B-F38] | WIRE4566 | Exhaust gas temperature sensor upstream of the SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 8 | | | Not used | | |
| 9 | | | Not used | | |
| 10 | | | Not used | | |
| 11 | | | Not used | | |
| 12 | | | Not used | | |
| 13 | SP3303-P-PIN1 | WIRE6842 | Connector for interface with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 14 | SP3304-P-PIN1 | WIRE6841 | Connector for interface with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 15 | SP-S17-P-1 | W4853 | Differential pressure sensor on the DPF | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 16 | **X-F34 pin 3** - Differential pressure sensor on DPF [B-F34] | W6780 | Differential pressure sensor on the DPF | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 17 | | | Not used | | |
| 18 | **X-F247 pin 85** - SCR contactor [K-F247] | W4710 | SCR contactor | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 19 | | | Not used | | |
| 20 | **X-F230 pin 85** - Fuel filter heating contactor [K-F230] | WIRE6793 | Fuel filter heating contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 21 | | | Not used | | |
| 22 | | | Not used | | |
| 23 | | | Not used | | |
| 24 | **X-F39 pin 2** - Exhaust gas temperature sensor downstream of the SCR [B-F39] | WIRE4564 | Exhaust gas temperature sensor downstream of the SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 25 | | | Not used | | |
| 26 | SP-S1-P-PIN1 | WIRE6815 | Preheating glow-plugs control unit | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 27 | SP-S16-P-PIN1 | WIRE6784 | Exhaust gas temperature sensor upstream of DOC / Exhaust gas temperature sensor upstream of the DPF | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 28 | **X-F33 pin 1** - Exhaust gas temperature sensor upstream of the DPF[[B-F33] | WIRE6785 | exhaust gas temperature sensor upstream of the DPF | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 29 | **X-F38 pin 1** - Exhaust gas temperature sensor upstream of the SCR [B-F38] | WIRE4567 | Exhaust gas temperature sensor upstream of the SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 30 | **X-F32 pin 1** - Exhaust gas temperature sensor upstream of DOC [B-F32] | WIRE6786 | Exhaust gas temperature sensor upstream of the DOC | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 31 | | | Not used | | |
| 32 | | | Not used | | |
| 33 | | | Not used | | |
| 34 | | | Not used | | |
| 35 | | | Not used | | |
| 36 | **X-F12-1 (Receptacle) pin 22** - Connector SEZ.2 F | BL(1) | Exhaust gas pressure sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 37 | | | Not used | | |
| 38 | | | Not used | | |
| 39 | | | Not used | | |
| 40 | | | Not used | | |
| 41 | | | Not used | | |
| 42 | SP-S15-P-1 | W4536 | Exhaust gas pressure sensor (P3) | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 43 | | | Not used | | |
| 44 | | | Not used | | |
| 45 | | | Not used | | |
| 46 | **X-F42 pin 9** - Urea pump module [M-F42] (1-1703639-1) | W4856 | Relative Pressure Sensor (PS) | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 47 | **X-F39 pin 1** - Exhaust gas temperature sensor downstream of the SCR [B-F39] | WIRE4565 | Exhaust gas temperature sensor downstream of the SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 48 | | | Not used | | |
| 49 | | | Not used | | |
| 50 | | | Not used | | |
| 51 | | | Not used | | |
| 52 | | | Not used | | |
| 53 | **X-F251 (Receptacle) pin 3** - Preheating glow-plugs control unit [A-F251] (84356962) | WIRE6819 | Preheating glow-plugs control unit | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 54 | | | Not used | | |
| 55 | **X-F223 pin 85** - Starter relay [K-F223] | WIRE6837 | Starter control relay | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 56 | | | Not used | | |
| 57 | **X-F251 (Receptacle) pin 8** - Preheating glow-plugs control unit [A-F251] (84356962) | WIRE6818 | Preheating glow-plugs control unit | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 58 | | | Not used | | |
| 59 | | | Not used | | |
| 60 | | | Not used | | |
| 61 | | | Not used | | |
| 62 | | | Not used | | |
| 63 | **X-F12-1 (Receptacle) pin 23** - Connector SEZ.2 F | M(1) | Exhaust gas pressure sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 64 | | | Not used | | |
| 65 | | | Not used | | |
| 66 | | | Not used | | |
| 67 | | | Not used | | |
| 68 | | | Not used | | |
| 69 | | | Not used | | |
| 70 | **X-F217 (Receptacle) pin 1** - Water in fuel sensor [B-F217] (87747172) | WIRE6751 | Water in fuel sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 71 | | | Not used | | |
| 72 | **X-F223 pin 86** - Starter relay [K-F223] | WIRE6836 | Starter control relay | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 73 | | | Not used | | |
| 74 | | | Not used | | |
| 75 | SP-S05-P-PIN1 | WIRE6795 | Ignition switch | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 76 | **X-F65 pin 1** - Intake air temperature sensor [B-F65] | WIRE6756 | Intake air temperature sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 77 | | | Not used | | |
| 78 | | | Not used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 79 | | | Not used | | |
| 80 | SP3314-P-1 | L(12) | Engine control unit | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 81 | SP3315-P-1 | H(10) | Engine control unit | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 82 | | | Not used | | |
| 83 | | | Not used | | |
| 84 | SP-S06-P-PIN1 | WIRE6820 | Ignition switch | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 85 | | | Not used | | |
| 86 | | | Not used | | |
| 87 | **X-F65 pin 2** - Intake air temperature sensor [B-F65] | WIRE6755 | Intake air temperature sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 88 | **X-F245 pin 85** - Main contactor [K-F245] | EN-020 | Main contactor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F07 - Fuel pressure regulating solenoid valve [ Y-F07] (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 1** - Connector SEZ.2 M | ZB(1) | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 2** - Connector SEZ.2 M | CB(1) | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |

### *X-F09 - Pressure sensor on the rail [ B-F09]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 5** - Connector SEZ.2 M | VC(1) | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 6** - Connector SEZ.2 M | GL(1) | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F12-2 (Plug) pin 7** - Connector SEZ.2 M | HV(1) | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F11_1 - Injector 1 [ Y-F11_1]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F11-1 (Plug) pin 1** - Connector SEZ.1 M | L(21) | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F11-1 (Plug) pin 2** - Connector SEZ.1 M | M(3) | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F11_2 - Injector 2 [ Y-F11_2]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F11-1 (Plug) pin 8** - Connector SEZ.1 M | GC(1) | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F11-1 (Plug) pin 7** - Connector SEZ.1 M | H(17) | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F11_3 - Injector 3 [ Y-F11_3]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F11-1 (Plug) pin 4** - Connector SEZ.1 M | Z(7) | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F11-1 (Plug) pin 3** - Connector SEZ.1 M | B(1) | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F11_4 - Injector 4 [ Y-F11_4]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F11-1 (Plug) pin 5** - Connector SEZ.1 M | CL(1) | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F11-1 (Plug) pin 6** - Connector SEZ.1 M | VZ(1) | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F3YH - Connector CAN Interface 1 for interfacing with CAN network*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| PIN1 | SP3304-P-PIN1 | L(17) | Connector for interface with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| PIN2 | SP3303-P-PIN1 | H(15) | Connector for interface with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F3YJ - CAN Interface 2 connector for interface with CAN network*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | SP3317-P-1 | L(9) | Connector for interface with CAN network | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | SP3316-P-1 | H(7) | Connector for interface with CAN network | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 01 Connector X-010 to X-019

### *X-F11-1 - Connector SEZ.1 M (Plug)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F11_1 pin 1** - Injector 1 [Y-F11_1] | L(21) | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F11_1 pin 2** - Injector 1 [Y-F11_1] | M(3) | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F11_3 pin 2** - Injector 3 [Y-F11_3] | B(1) | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | **X-F11_3 pin 1** - Injector 3 [Y-F11_3] | Z(7) | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 5 | **X-F11_4 pin 1** - Injector 4 [Y-F11_4] | CL(1) | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F11_4 pin 2** - Injector 4 [Y-F11_4] | VZ(1) | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 7 | **X-F11_2 pin 2** - Injector 2 [Y-F11_2] | H(17) | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 8 | **X-F11_2 pin 1** - Injector 2 [Y-F11_2] | GC(1) | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F11-2 - Connector SEZ.1 F (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02E (Receptacle) pin 64** - Engine control unit [A-F02] (5802805180) | L(20) | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F02E (Receptacle) pin 85** - Engine control unit [A-F02] (5802805180) | M(2) | Injector 1 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F02E (Receptacle) pin 45** - Engine control unit [A-F02] (5802805180) | B | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | **X-F02E (Receptacle) pin 24** - Engine control unit [A-F02] (5802805180) | Z(6) | Injector 3 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 5 | **X-F02E (Receptacle) pin 66** - Engine control unit [A-F02] (5802805180) | CL | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F02E (Receptacle) pin 87** - Engine control unit [A-F02] (5802805180) | VZ | Injector 4 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |
| 7 | | | Not used | | |
| 8 | **X-F02E (Receptacle) pin 22** - Engine control unit [A-F02] (5802805180) | GC | Injector 2 | none - 1.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F12-1 - Connector SEZ.2 F (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02E (Receptacle) pin 7** - Engine control unit [A-F02] (5802805180) | ZB | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F02E (Receptacle) pin 6** - Engine control unit [A-F02] (5802805180) | CB | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F02E (Receptacle) pin 11** - Engine control unit [A-F02] (5802805180) | HL | Low engine oil level alarm switch | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | **X-F02E (Receptacle) pin 52** - Engine control unit [A-F02] (5802805180) | H(2) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 5 | **X-F02E (Receptacle) pin 63** - Engine control unit [A-F02] (5802805180) | VC | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F02E (Receptacle) pin 62** - Engine control unit [A-F02] (5802805180) | GL | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 7 | **X-F02E (Receptacle) pin 42** - Engine control unit [A-F02] (5802805180) | HV | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 8 | **X-F02E (Receptacle) pin 51** - Engine control unit [A-F02] (5802805180) | ZV | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 9 | **X-F02E (Receptacle) pin 20** - Engine control unit [A-F02] (5802805180) | L(2) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 10 | **X-F02E (Receptacle) pin 21** - Engine control unit [A-F02] (5802805180) | Z(2) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 11 | | | Not used | | |
| 12 | **X-F02E (Receptacle) pin 37** - Engine control unit [A-F02] (5802805180) | B(2) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 13 | **X-F02E (Receptacle) pin 99** - Engine control unit [A-F02] (5802805180) | V | Engine coolant temperature sensor / Turbo temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 14 | **X-F02E (Receptacle) pin 100** - Engine control unit [A-F02] (5802805180) | G | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 15 | **X-F02E (Receptacle) pin 35** - Engine control unit [A-F02] (5802805180) | S | Fuel temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 16 | **X-F02E (Receptacle) pin 36** - Engine control unit [A-F02] (5802805180) | MB | Fuel temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 17 | **X-F02E (Receptacle) pin 38** - Engine control unit [A-F02] (5802805180) | ZC | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 18 | **X-F02E (Receptacle) pin 96** - Engine control unit [A-F02] (5802805180) | LM | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 19 | **X-F02E (Receptacle) pin 95** - Engine control unit [A-F02] (5802805180) | MZ | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 20 | **X-F02E (Receptacle) pin 61** - Engine control unit [A-F02] (5802805180) | V(3) | Turbo temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 21 | SP-S15-P-1 | HG(1) | Exhaust gas pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 22 | **X-F02V (Receptacle) pin 36** - Engine control unit [A-F02] | BL(1) | Exhaust gas pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 23 | **X-F02V (Receptacle) pin 63** - Engine control unit [A-F02] | M(1) | Exhaust gas pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 24 | | | Not used | | |
| 25 | | | Not used | | |
| 26 | | | Not used | | |
| 27 | **X-F02E (Receptacle) pin 72** - Engine control unit [A-F02] (5802805180) | R | Wastegate solenoid valve (WG) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 28 | SP-S07-P-PIN1 | BM(1) | Wastegate solenoid valve (WG) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 29 | **X-F02E (Receptacle) pin 67** - Engine control unit [A-F02] (5802805180) | BC(2) | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 30 | **X-F02E (Receptacle) pin 88** - Engine control unit [A-F02] (5802805180) | HC | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 31 | | | Not used | | |
| 32 | | | Not used | | |
| 33 | **X-F301 pin D** - Diagnostics connector | L(18) | Connector for interface with CAN network | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 34 | **X-F02E (Receptacle) pin 79** - Engine control unit [A-F02] (5802805180) | LB | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 35 | **X-F02E (Receptacle) pin 78** - Engine control unit [A-F02] (5802805180) | Z(4) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 36 | | | Not used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 37 | **X-F02E (Receptacle) pin 8** - Engine control unit [A-F02] (5802805180) | CV | Throttle solenoid valve (TVA) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 38 | **X-F02E (Receptacle) pin 9** - Engine control unit [A-F02] (5802805180) | LC | Throttle solenoid valve (TVA) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 39 | | | Not used | | |
| 40 | | | Not used | | |
| 41 | **X-F02E (Receptacle) pin 16** - Engine control unit [A-F02] (5802805180) | ML | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 42 | **X-F02E (Receptacle) pin 98** - Engine control unit [A-F02] (5802805180) | LH | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 43 | **X-F02E (Receptacle) pin 97** - Engine control unit [A-F02] (5802805180) | BC | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 44 | | | Not used | | |
| 45 | | | Not used | | |
| 46 | | | Not used | | |
| 47 | | | Not used | | |
| 48 | | | Not used | | |
| 49 | | | Not used | | |
| 50 | | | Not used | | |
| 51 | | | Not used | | |
| 52 | | | Not used | | |
| 53 | | | Not used | | |
| 54 | | | Not used | | |
| 55 | | | Not used | | |
| 56 | | | Not used | | |
| 57 | **X-F251 (Receptacle) pin 6** - Preheating glow-plugs control unit [A-F251] (84356962) | W9504 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 58 | **X-F251 (Receptacle) pin 1** - Preheating glow-plugs control unit [A-F251] (84356962) | W9505 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 59 | | | Not used | | |
| 60 | **X-F251 (Receptacle) pin 7** - Preheating glow-plugs control unit [A-F251] (84356962) | W9506 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 61 | **X-F251 (Receptacle) pin 2** - Preheating glow-plugs control unit [A-F251] (84356962) | W9507 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F12-2 - Connector SEZ.2 M (Plug)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F07 (Receptacle) pin 1** - Fuel pressure regulating solenoid valve [Y-F07] | ZB(1) | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F07 (Receptacle) pin 2** - Fuel pressure regulating solenoid valve [Y-F07] | CB(1) | Fuel pressure regulating solenoid valve | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F55 pin 1** - Low engine oil level alarm switch [S-F55] | HL(1) | Low engine oil level alarm switch | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | **X-F19 pin 2** - Timing sensor [B-F19] | H(3) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 5 | **X-F09 pin 1** - Pressure sensor on the rail [B-F09] | VC(1) | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F09 pin 2** - Pressure sensor on the rail [B-F09] | GL(1) | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 7 | **X-F09 pin 3** - Pressure sensor on the rail [B-F09] | HV(1) | Pressure sensor on the rail | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 8 | **X-F19 pin 1** - Timing sensor [B-F19] | ZV(1) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 9 | **X-F23 (Receptacle) pin 1** - RPM sensor [B-F23] | L(3) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 10 | **X-F23 (Receptacle) pin 2** - RPM sensor [B-F23] | Z(3) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 11 | | | Not used | | |
| 12 | **X-F19 pin 3** - Timing sensor [B-F19] | B(3) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 13 | SP-S06(1)-P-1 | V(1) | Turbo temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 14 | **X-F21 pin 1** - Engine coolant temperature sensor [B-F21] | G(1) | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 15 | **X-F290 pin 2** - Fuel temperature sensor [B-F290] | S(1) | Fuel temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 16 | **X-F290 pin 1** - Fuel temperature sensor [B-F290] | MB(1) | Fuel temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 17 | **X-F48 (Receptacle) pin 3** - Boost air temperature and pressure sensor [B-F48] | ZC(1) | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 18 | **X-F48 (Receptacle) pin 4** - Boost air temperature and pressure sensor [B-F48] | LM(1) | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 19 | **X-F48 (Receptacle) pin 1** - Boost air temperature and pressure sensor [B-F48] | MZ(1) | Overpressure air temperature pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 20 | **X-F219 pin 1** - Turbo temperature sensor [B-F219] | V(4) | Turbo temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 21 | **X-F53 pin 1** - Exhaust gas pressure sensor [B-F53] | HG | Exhaust gas pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 22 | **X-F53 pin 2** - Exhaust gas pressure sensor [B-F53] | BL | Exhaust gas pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 23 | **X-F53 pin 3** - Exhaust gas pressure sensor [B-F53] | M | Exhaust gas pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 24 | | | Not used | | |
| 25 | | | Not used | | |
| 26 | | | Not used | | |
| 27 | **X-F72 pin 2** - Wastegate solenoid valve (WG) [Y-F72] | R(1) | Wastegate solenoid valve (WG) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 28 | **X-F72 pin 1** - Wastegate solenoid valve (WG) [Y-F72] | BM | Wastegate solenoid valve (WG) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 29 | **X-F24A pin 1** - EGR solenoid valve (Pierburg) [Y-F24A] | BC(3) | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 30 | **X-F24A pin 5** - EGR solenoid valve (Pierburg) [Y-F24A] | HC(1) | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 31 | | | Not used | | |
| 32 | | | Not used | | |
| 33 | **X-F24A pin 6** - EGR solenoid valve (Pierburg) [Y-F24A] | L(19) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 34 | **X-F24A pin 2** - EGR solenoid valve (Pierburg) [Y-F24A] | LB(1) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 35 | **X-F24A pin 4** - EGR solenoid valve (Pierburg) [Y-F24A] | Z(5) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 36 | | | Not used | | |
| 37 | **X-F102 pin 6** - Throttle solenoid valve (TVA) [Y-F102] | CV(1) | Throttle solenoid valve (TVA) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 38 | **X-F102 pin 2** - Throttle solenoid valve (TVA) [Y-F102] | LC(1) | Throttle solenoid valve (TVA) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 39 | | | Not used | | |
| 40 | | | Not used | | |
| 41 | **X-F102 pin 1** - Throttle solenoid valve (TVA) [Y-F102] | ML(1) | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 42 | **X-F102 pin 5** - Throttle solenoid valve (TVA) [Y-F102] | LH(1) | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 43 | **X-F102 pin 3** - Throttle solenoid valve (TVA) [Y-F102] | BC(1) | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 44 | | | Not used | | |
| 45 | | | Not used | | |
| 46 | | | Not used | | |
| 47 | | | Not used | | |
| 48 | | | Not used | | |
| 49 | | | Not used | | |
| 50 | | | Not used | | |
| 51 | | | Not used | | |
| 52 | | | Not used | | |
| 53 | | | Not used | | |
| 54 | | | Not used | | |
| 55 | | | Not used | | |
| 56 | | | Not used | | |
| 57 | **X-F96-1 pin 1** - Connector SEZ.GP | WIRE6805 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 58 | **X-F96-1 pin 2** - Connector SEZ.GP | WIRE6804 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 59 | | | Not used | | |
| 60 | **X-F96-1 pin 3** - Connector SEZ.GP | WIRE6803 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 61 | **X-F96-1 pin 4** - Connector SEZ.GP | WIRE6802 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F19 - Timing sensor [ B-F19]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 8** - Connector SEZ.2 M | ZV(1) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 4** - Connector SEZ.2 M | H(3) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F12-2 (Plug) pin 12** - Connector SEZ.2 M | B(3) | Timing sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Component diagram 02 Connector X-020 to X-029

### *X-F21 - Engine coolant temperature sensor [ B-F21]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 14** - Connector SEZ.2 M | G(1) | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | SP-S06(1)-P-1 | V(2) | Engine coolant temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F23 - RPM sensor [ B-F23] (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 9** - Connector SEZ.2 M | L(3) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 10** - Connector SEZ.2 M | Z(3) | Rpm sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F24A - EGR solenoid valve (Pierburg) [ Y-F24A]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 29** - Connector SEZ.2 M | BC(3) | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 34** - Connector SEZ.2 M | LB(1) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | | | Not used | | |
| 4 | **X-F12-2 (Plug) pin 35** - Connector SEZ.2 M | Z(5) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 5 | **X-F12-2 (Plug) pin 30** - Connector SEZ.2 M | HC(1) | EGR solenoid valve (Pierburg) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F12-2 (Plug) pin 33** - Connector SEZ.2 M | L(19) | EGR solenoid valve (Pierburg) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Component diagram 03 Connector X-030 to X-039

### *X-F32 - Exhaust gas temperature sensor upstream of DOC [ B-F32]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02V (Receptacle) pin 30** - Engine control unit [A-F02] | WIRE6786 | Exhaust gas temperature sensor upstream of the DOC | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | SP-S16-P-PIN1 | WIRE6782 | Exhaust gas temperature sensor upstream of the DOC | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F33 - Exhaust gas temperature sensor upstream of the DPF[ B-F33]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02V (Receptacle) pin 28** - Engine control unit [A-F02] | WIRE6785 | Exhaust gas temperature sensor upstream of the DPF | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | SP-S16-P-PIN1 | WIRE6783 | Exhaust gas temperature sensor upstream of the DPF | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F34 - Differential pressure sensor on DPF [ B-F34]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | SP-S15-P-1 | W4537 | Differential pressure sensor on the DPF | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | SP-S17-P-1 | W6781 | Differential pressure sensor on the DPF | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | **X-F02V (Receptacle) pin 16** - Engine control unit [A-F02] | W6780 | Differential pressure sensor on the DPF | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F38 - Exhaust gas temperature sensor upstream of the SCR [ B-F38]*

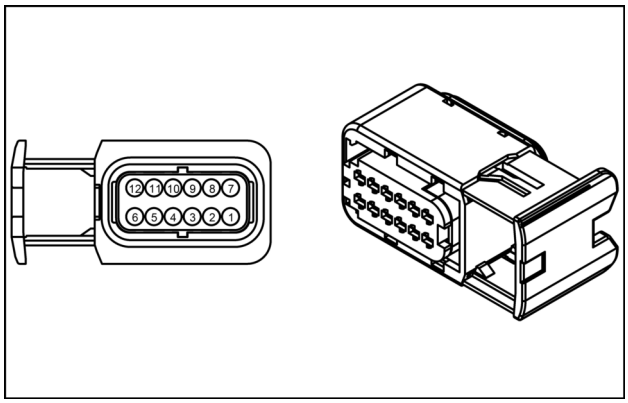
| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02V (Receptacle) pin 29** - Engine control unit [A-F02] | WIRE4567 | Exhaust gas temperature sensor upstream of the SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | **X-F02V (Receptacle) pin 7** - Engine control unit [A-F02] | WIRE4566 | Exhaust gas temperature sensor upstream of the SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F39 - Exhaust gas temperature sensor downstream of the SCR [ B-F39]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02V (Receptacle) pin 47** - Engine control unit [A-F02] | WIRE4565 | Exhaust gas temperature sensor downstream of the SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | **X-F02V (Receptacle) pin 24** - Engine control unit [A-F02] | WIRE4564 | Exhaust gas temperature sensor downstream of the SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 04 Connector X-040 to X-049

### *X-F42 - Urea pump module [ M-F42] (1-1703639-1)*




1-1703639-1 1

**1-1703639-1**

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | | | Not used | | |
| 2 | **X-F02E (Receptacle) pin 10** - Engine control unit [A-F02] (5802805180) | WIRE8820 | Pump motor | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | SP-S19-P-1 | W4861 | Pump Motor | none - 1.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 4 | SP-S03-P-PIN1 | W4862 | Pump motor | none - 1.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 5 | **X-F02E (Receptacle) pin 29** - Engine control unit [A-F02] (5802805180) | WIRE8824 | Bleed solenoid valve | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 6 | **X-F02E (Receptacle) pin 5** - Engine control unit [A-F02] (5802805180) | WIRE8822 | Bleed solenoid valve | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 7 | | | Not used | | |
| 8 | SP-S17-P-1 | W4854 | Differential pressure sensor on the DPF | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 9 | **X-F02V (Receptacle) pin 46** - Engine control unit [A-F02] | W4856 | Relative Pressure Sensor (PS) | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 10 | SP-S15-P-1 | W4857 | Relative Pressure Sensor (PS) | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 11 | **X-F45 (Plug) pin 1** - Urea pipes heating contactor [A-F45] | W4850 | Urea pipes heating contactor | none - 1.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 12 | SP-S12-P-1 | W4868 | Urea heater module | none - 1.5 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F44 - Urea dosing module [ Y-F44]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02E (Receptacle) pin 94** - Engine control unit [A-F02] (5802805180) | WIRE8580 | ATS Junction connector | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | **X-F02E (Receptacle) pin 71** - Engine control unit [A-F02] (5802805180) | WIRE8582 | ATS Junction connector | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F45 - Urea pipes heating contactor [ A-F45] (Plug)*

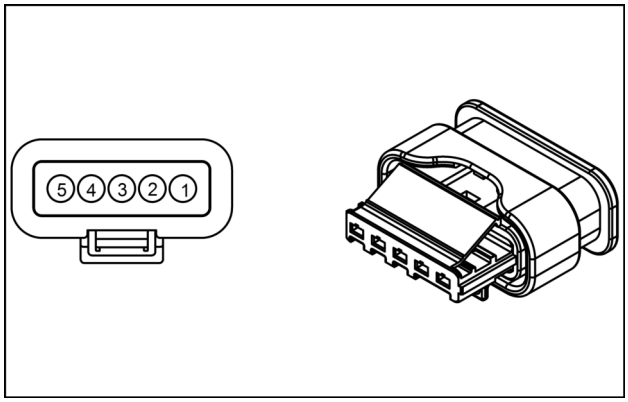
| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F42 pin 11** - Urea pump module [M-F42] (1-1703639-1) | W4850 | Urea pipes heating contactor | none - 1.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | R-F45D-P-N | W4851 | Urea pipes heating contactor | none - 1.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | | | Not used | | |
| 4 | | W4852 | Urea pipes heating contactor | none - 1.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 5 | | | Not used | | |
| 6 | SP-S10(1)-P-1 | W4845 | Urea pipes heating contactor | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 7 | SP-S12-P-1 | W4836 | Urea pipes heating contactor | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 8 | | | Not used | | |
| 9 | SP3327-P-1 | H(14) | Urea pipes heating contactor | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 10 | SP3326-P-1 | L(16) | Urea pipes heating contactor | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 11 | F-F45-P-1 | W4846 | Urea tank heating solenoid valve (3 way) | none - 6.0 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F48 - Boost air temperature and pressure sensor [ B-F48] (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 19** - Connector SEZ.2 M | MZ(1) | Boost air temperature and pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | | | Not used | | |
| 3 | **X-F12-2 (Plug) pin 17** - Connector SEZ.2 M | ZC(1) | Boost air temperature and pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | **X-F12-2 (Plug) pin 18** - Connector SEZ.2 M | LM(1) | Boost air temperature and pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F49 - NOx detection sensor downstream of SCR [ B-F49] (872-860-541)*




872-860-541 2

**872-860-541**

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F739A pin 2** - Connector NOx 2 | WIRE25318 | NOx detection sensor downstream of the SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | **X-F739A pin 1** - Connector NOx 2 | WIRE25317 | NOx detection sensor downstream of the SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | | | Not used | | |
| 4 | **X-F739A pin 4** - Connector NOx 2 | H(4) | NOx detection sensor downstream of the SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 05 Connector X-050 to X-059

### *X-F53 - Exhaust gas pressure sensor [ B-F53]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 21** - Connector SEZ.2 M | HG | Exhaust gas pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 22** - Connector SEZ.2 M | BL | Exhaust gas pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F12-2 (Plug) pin 23** - Connector SEZ.2 M | M | Exhaust gas pressure sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

### *X-F55 - Low engine oil level alarm switch [ S-F55]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 3** - Connector SEZ.2 M | HL(1) | Low engine oil level alarm switch | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | GND-02-P-1 | WIRE4457 | Mass | none - 0.0 | **SHEET 1 SH01 - ECU engine side** |

### *X-F56 - Urea tank quality - level - temperature sensor [ B-F56] (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F740A pin 1** - Connector UQS | WIRE25306 | Urea tank level-quality-temperature sensor | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | **X-F740A pin 2** - Connector UQS | WIRE25307 | Urea tank level-quality-temperature sensor | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | | | Not Used | | |
| 4 | **X-F740A pin 4** - Connector UQS | L(15) | Urea tank level-quality-temperature sensor | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 5 | **X-F740A pin 5** - Connector UQS | H(13) | Urea tank level-quality-temperature sensor | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 06 Connector X-060 to X-069

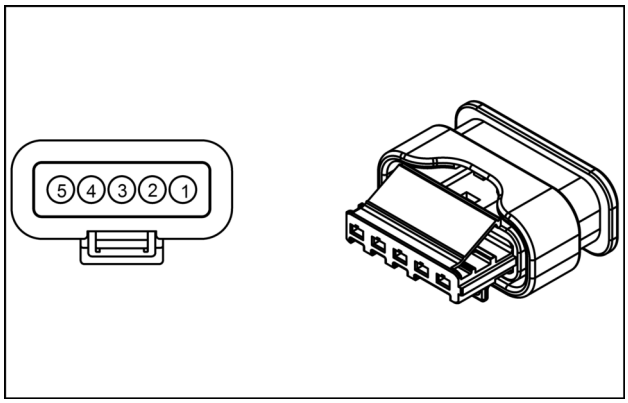
### *X-F60 - Urea tank heating solenoid valve [ Y-F60] (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | SP-S19-P-1 | W4717 | Urea tank heating solenoid valve (3 way) | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | | | Not used | | |
| 3 | **X-F02E (Receptacle) pin 70** - Engine control unit [A-F02] (5802805180) | WIRE8818 | Urea tank heating solenoid valve (3 way) | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F65 - Intake air temperature sensor [ B-F65]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02V (Receptacle) pin 76** - Engine control unit [A-F02] | WIRE6756 | Intake air temperature sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F02V (Receptacle) pin 87** - Engine control unit [A-F02] | WIRE6755 | Intake air temperature sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F67 - NOx detection sensor upstream of SCR [ B-F67] (872-860-541)*




872-860-541 1

**872-860-541**

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F738A pin 1** - Connector NOx 1 | WIRE25311 | NOx detection sensor upstream of SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | **X-F738A pin 2** - Connector NOx 1 | WIRE25312 | NOx detection sensor upstream of SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | **X-F738A pin 3** - Connector NOx 1 | L(11) | NOx detection sensor upstream of SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 4 | **X-F738A pin 4** - Connector NOx 1 | H(9) | NOx detection sensor upstream of SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 5 | **X-F738A pin 5** - Connector NOx 1 | WIRE25314 | NOx detection sensor upstream of SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 07 Connector X-070 to X-079

***X-F72 - Wastegate solenoid valve (WG) [ Y-F72]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 28** - Connector SEZ.2 M | BM | Wastegate solenoid valve (WG) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 27** - Connector SEZ.2 M | R(1) | Wastegate solenoid valve (WG) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Component diagram 09 Connector X-090 to X-099

### *X-F96-1 - Connector SEZ.GP*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 57** - Connector SEZ.2 M | WIRE6805 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F12-2 (Plug) pin 58** - Connector SEZ.2 M | WIRE6804 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | **X-F12-2 (Plug) pin 60** - Connector SEZ.2 M | WIRE6803 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 4 | **X-F12-2 (Plug) pin 61** - Connector SEZ.2 M | WIRE6802 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F96-2 - Connector SEZ.EH*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | L-F96_4-P-PIN1 | WIRE6800 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | L-F96_3-P-PIN1 | WIRE6799 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | L-F96_2-P-PIN1 | WIRE6798 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 4 | L-F96_1-P-PIN1 | WIRE6797 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 10 Connector X-100 to X-109

***X-F102 - Throttle solenoid valve (TVA) [ Y-F102]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 41** - Connector SEZ.2 M | ML(1) | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 38** - Connector SEZ.2 M | LC(1) | Throttle solenoid valve (TVA) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |
| 3 | **X-F12-2 (Plug) pin 43** - Connector SEZ.2 M | BC(1) | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 4 | | | Not used | | |
| 5 | **X-F12-2 (Plug) pin 42** - Connector SEZ.2 M | LH(1) | Throttle solenoid valve (TVA) | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 6 | **X-F12-2 (Plug) pin 37** - Connector SEZ.2 M | CV(1) | Throttle solenoid valve (TVA) | none - 0.75 | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Component diagram 20 Connector X-200 to X-209

***X-F200 - Ignition switch [ S-F200]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | F-F200A-P-1 | WIRE6824 | Ignition switch | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | SP-S06-P-PIN1 | WIRE6823 | Ignition switch | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | SP-S05-P-PIN1 | WIRE6760 | Ignition switch | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 4 | F-F200-P-1 | WIRE6825 | Ignition switch | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 21 Connector X-210 to X-219

### *X-F215 - Battery cut-off switch (BDS) [ SW-F215]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | G-F271-P-POS | WIRE6794 | Battery positive | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | SP-S04-P-PIN1 | W33996 | Battery positive | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F217 - Water in fuel sensor [ B-F217] (87747172) (Receptacle)*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F02V (Receptacle) pin 70** - Engine control unit [A-F02] | WIRE6751 | Water in fuel sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | SP-S10-P-PIN1 | WIRE6757 | Water in fuel sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | SP-S05-P-PIN1 | WIRE6796 | Water in fuel sensor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F219 - Turbo temperature sensor [ B-F219]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 20** - Connector SEZ.2 M | V(4) | Turbo temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F739A pin 3** - Connector NOx 2 | L(6) | Turbo temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Component diagram 22 Connector X-220 to X-229

***X-F220 - Starter relay [ K-F220]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | | | Not used | | |
| 2 | | | Not used | | |
| 3 | | | Not used | | |
| 4 | | | Not used | | |
| 5 | | | Not used | | |
| 6 | | | Not used | | |
| 7 | | | Not used | | |
| 8 | | | Not used | | |
| 9 | | | Not used | | |
| 10 | | | Not used | | |
| 11 | | | Not used | | |
| 12 | | | Not used | | |
| 13 | | | Not used | | |
| 14 | | | Not used | | |
| 15 | | | Not used | | |
| 16 | | | Not used | | |
| 17 | | | Not used | | |
| 18 | | | Not used | | |
| 19 | | | Not used | | |
| 20 | | | Not used | | |
| 21 | | | Not used | | |
| 22 | | | Not used | | |
| 23 | | | Not used | | |
| 24 | | | Not used | | |
| 25 | | | Not used | | |
| 26 | | | Not used | | |
| 27 | | | Not used | | |
| 28 | | | Not used | | |
| 29 | | | Not used | | |
| 30 | F-F272-P-1 | WIRE6829 | Starter contactor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 31 | | | Not used | | |
| 32 | | | Not used | | |
| 33 | | | Not used | | |
| 34 | | | Not used | | |
| 35 | | | Not used | | |
| 36 | | | Not used | | |
| 37 | | | Not used | | |
| 38 | | | Not used | | |
| 39 | | | Not used | | |
| 40 | | | Not used | | |
| 41 | | | Not used | | |
| 42 | | | Not used | | |
| 43 | | | Not used | | |
| 44 | | | Not used | | |
| 45 | | | Not used | | |
| 46 | | | Not used | | |
| 47 | | | Not used | | |
| 48 | | | Not used | | |
| 49 | | | Not used | | |
| 50 | | | Not used | | |
| 51 | | | Not used | | |
| 52 | | | Not used | | |
| 53 | | | Not used | | |
| 54 | | | Not used | | |
| 55 | | | Not used | | |
| 56 | | | Not used | | |
| 57 | | | Not used | | |
| 58 | | | Not used | | |
| 59 | | | Not used | | |
| 60 | | | Not used | | |
| 61 | | | Not used | | |
| 62 | | | Not used | | |
| 63 | | | Not used | | |
| 64 | | | Not used | | |
| 65 | | | Not used | | |
| 66 | | | Not used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 67 | | | Not used | | |
| 68 | | | Not used | | |
| 69 | | | Not used | | |
| 70 | | | Not used | | |
| 71 | | | Not used | | |
| 72 | | | Not used | | |
| 73 | | | Not used | | |
| 74 | | | Not used | | |
| 75 | | | Not used | | |
| 76 | | | Not used | | |
| 77 | | | Not used | | |
| 78 | | | Not used | | |
| 79 | | | Not used | | |
| 80 | | | Not used | | |
| 81 | | | Not used | | |
| 82 | | | Not used | | |
| 83 | | | Not used | | |
| 84 | | | Not used | | |
| 85 | **X-F223 pin 87** - Starter relay [K-F223] | WIRE6839 | Starter contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 86 | GND5-P-1 | WIRE6838 | Starter contactor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 87 | **X-F272 pin 2** - Starter motor [M-F272] | WIRE6840 | Starter motor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F222 - Contactor for start-up control from Body Controller [ A-F222]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| PIN1 | **X-F222A pin 85** - Starter control unit [K-F222] | WIRE6833 | Contactor for start-up control from Body Controller | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| PIN2 | **X-F222A pin 86** - Starter control unit [K-F222] | WIRE6834 | Contactor for start-up control from Body Controller | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F222A - Starter control unit [ K-F222]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 30 | **X-F223 pin 30** - Starter relay [K-F223] | WIRE6835 | Starter control contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 85 | **X-F222 pin PIN1** - Contactor for start-up control from Body Controller [A-F222] | WIRE6833 | Contactor for start-up control from Body Controller | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 86 | **X-F222 pin PIN2** - Contactor for start-up control from Body Controller [A-F222] | WIRE6834 | Contactor for start-up control from Body Controller | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 87 | SP-S06-P-PIN1 | WIRE6822 | Contactor for start-up control from Body Controller | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 87A | GND4-P-1 | WIRE6832 | Contactor for start-up control from Body Controller | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F223 - Starter relay [ K-F223]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | | | Not used | | |
| 2 | | | Not used | | |
| 3 | | | Not used | | |
| 4 | | | Not used | | |
| 5 | | | Not used | | |
| 6 | | | Not used | | |
| 7 | | | Not used | | |
| 8 | | | Not used | | |
| 9 | | | Not used | | |
| 10 | | | Not used | | |
| 11 | | | Not used | | |
| 12 | | | Not used | | |
| 13 | | | Not used | | |
| 14 | | | Not used | | |
| 15 | | | Not used | | |
| 16 | | | Not used | | |
| 17 | | | Not used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 18 | | | Not used | | |
| 19 | | | Not used | | |
| 20 | | | Not used | | |
| 21 | | | Not used | | |
| 22 | | | Not used | | |
| 23 | | | Not used | | |
| 24 | | | Not used | | |
| 25 | | | Not used | | |
| 26 | | | Not used | | |
| 27 | | | Not used | | |
| 28 | | | Not used | | |
| 29 | | | Not used | | |
| 30 | **X-F222A pin 30** - Starter control unit [K-F222] | WIRE6835 | Starter control contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 31 | | | Not used | | |
| 32 | | | Not used | | |
| 33 | | | Not used | | |
| 34 | | | Not used | | |
| 35 | | | Not used | | |
| 36 | | | Not used | | |
| 37 | | | Not used | | |
| 38 | | | Not used | | |
| 39 | | | Not used | | |
| 40 | | | Not used | | |
| 41 | | | Not used | | |
| 42 | | | Not used | | |
| 43 | | | Not used | | |
| 44 | | | Not used | | |
| 45 | | | Not used | | |
| 46 | | | Not used | | |
| 47 | | | Not used | | |
| 48 | | | Not used | | |
| 49 | | | Not used | | |
| 50 | | | Not used | | |
| 51 | | | Not used | | |
| 52 | | | Not used | | |
| 53 | | | Not used | | |
| 54 | | | Not used | | |
| 55 | | | Not used | | |
| 56 | | | Not used | | |
| 57 | | | Not used | | |
| 58 | | | Not used | | |
| 59 | | | Not used | | |
| 60 | | | Not used | | |
| 61 | | | Not used | | |
| 62 | | | Not used | | |
| 63 | | | Not used | | |
| 64 | | | Not used | | |
| 65 | | | Not used | | |
| 66 | | | Not used | | |
| 67 | | | Not used | | |
| 68 | | | Not used | | |
| 69 | | | Not used | | |
| 70 | | | Not used | | |
| 71 | | | Not used | | |
| 72 | | | Not used | | |
| 73 | | | Not used | | |
| 74 | | | Not used | | |
| 75 | | | Not used | | |
| 76 | | | Not used | | |
| 77 | | | Not used | | |
| 78 | | | Not used | | |
| 79 | | | Not used | | |
| 80 | | | Not used | | |
| 81 | | | Not used | | |
| 82 | | | Not used | | |
| 83 | | | Not used | | |
| 84 | | | Not used | | |
| 85 | **X-F02V (Receptacle) pin 55** - Engine control unit [A-F02] | WIRE6837 | Starter control contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 86 | **X-F02V (Receptacle) pin 72** - Engine control unit [A-F02] | WIRE6836 | Starter control contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 87 | **X-F220 pin 85** - Starter relay [K-F220] | WIRE6839 | Starter contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 23 Connector X-230 to X-239

***X-F230 - Fuel filter heating contactor [ K-F230]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | | | Not used | | |
| 2 | | | Not used | | |
| 3 | | | Not used | | |
| 4 | | | Not used | | |
| 5 | | | Not used | | |
| 6 | | | Not used | | |
| 7 | | | Not used | | |
| 8 | | | Not used | | |
| 9 | | | Not used | | |
| 10 | | | Not used | | |
| 11 | | | Not used | | |
| 12 | | | Not used | | |
| 13 | | | Not used | | |
| 14 | | | Not used | | |
| 15 | | | Not used | | |
| 16 | | | Not used | | |
| 17 | | | Not used | | |
| 18 | | | Not used | | |
| 19 | | | Not used | | |
| 20 | | | Not used | | |
| 21 | | | Not used | | |
| 22 | | | Not used | | |
| 23 | | | Not used | | |
| 24 | | | Not used | | |
| 25 | | | Not used | | |
| 26 | | | Not used | | |
| 27 | | | Not used | | |
| 28 | | | Not used | | |
| 29 | | | Not used | | |
| 30 | F-F230-P-2 | WIRE6814 | Fuel filter heating contactor | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 31 | | | Not used | | |
| 32 | | | Not used | | |
| 33 | | | Not used | | |
| 34 | | | Not used | | |
| 35 | | | Not used | | |
| 36 | | | Not used | | |
| 37 | | | Not used | | |
| 38 | | | Not used | | |
| 39 | | | Not used | | |
| 40 | | | Not used | | |
| 41 | | | Not used | | |
| 42 | | | Not used | | |
| 43 | | | Not used | | |
| 44 | | | Not used | | |
| 45 | | | Not used | | |
| 46 | | | Not used | | |
| 47 | | | Not used | | |
| 48 | | | Not used | | |
| 49 | | | Not used | | |
| 50 | | | Not used | | |
| 51 | | | Not used | | |
| 52 | | | Not used | | |
| 53 | | | Not used | | |
| 54 | | | Not used | | |
| 55 | | | Not used | | |
| 56 | | | Not used | | |
| 57 | | | Not used | | |
| 58 | | | Not used | | |
| 59 | | | Not used | | |
| 60 | | | Not used | | |
| 61 | | | Not used | | |
| 62 | | | Not used | | |
| 63 | | | Not used | | |
| 64 | | | Not used | | |
| 65 | | | Not used | | |
| 66 | | | Not used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 67 | | | Not used | | |
| 68 | | | Not used | | |
| 69 | | | Not used | | |
| 70 | | | Not used | | |
| 71 | | | Not used | | |
| 72 | | | Not used | | |
| 73 | | | Not used | | |
| 74 | | | Not used | | |
| 75 | | | Not used | | |
| 76 | | | Not used | | |
| 77 | | | Not used | | |
| 78 | | | Not used | | |
| 79 | | | Not used | | |
| 80 | | | Not used | | |
| 81 | | | Not used | | |
| 82 | | | Not used | | |
| 83 | | | Not used | | |
| 84 | | | Not used | | |
| 85 | **X-F02V (Receptacle) pin 20** - Engine control unit [A-F02] | WIRE6793 | Fuel filter heating contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 86 | SP-S07-P-PIN1 | WIRE6765 | Fuel filter heating contactor | none - 0.75 | **SHEET 2 SH02 - ECU vehicle side** |
| 87 | R-F230A-P-PIN1 | WIRE6767 | Fuel filter resistor | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 24 Connector X-240 to X-249

***X-F245 - Main contactor [ K-F245]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | | | Not used | | |
| 2 | | | Not used | | |
| 3 | | | Not used | | |
| 4 | | | Not used | | |
| 5 | | | Not used | | |
| 6 | | | Not used | | |
| 7 | | | Not used | | |
| 8 | | | Not used | | |
| 9 | | | Not used | | |
| 10 | | | Not used | | |
| 11 | | | Not used | | |
| 12 | | | Not used | | |
| 13 | | | Not used | | |
| 14 | | | Not used | | |
| 15 | | | Not used | | |
| 16 | | | Not used | | |
| 17 | | | Not used | | |
| 18 | | | Not used | | |
| 19 | | | Not used | | |
| 20 | | | Not used | | |
| 21 | | | Not used | | |
| 22 | | | Not used | | |
| 23 | | | Not used | | |
| 24 | | | Not used | | |
| 25 | | | Not used | | |
| 26 | | | Not used | | |
| 27 | | | Not used | | |
| 28 | | | Not used | | |
| 29 | | | Not used | | |
| 30 | SP-S04-P-PIN1 | EN-691B | Battery positive | none - 6.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 31 | | | Not used | | |
| 32 | | | Not used | | |
| 33 | | | Not used | | |
| 34 | | | Not used | | |
| 35 | | | Not used | | |
| 36 | | | Not used | | |
| 37 | | | Not used | | |
| 38 | | | Not used | | |
| 39 | | | Not used | | |
| 40 | | | Not used | | |
| 41 | | | Not used | | |
| 42 | | | Not used | | |
| 43 | | | Not used | | |
| 44 | | | Not used | | |
| 45 | | | Not used | | |
| 46 | | | Not used | | |
| 47 | | | Not used | | |
| 48 | | | Not used | | |
| 49 | | | Not used | | |
| 50 | | | Not used | | |
| 51 | | | Not used | | |
| 52 | | | Not used | | |
| 53 | | | Not used | | |
| 54 | | | Not used | | |
| 55 | | | Not used | | |
| 56 | | | Not used | | |
| 57 | | | Not used | | |
| 58 | | | Not used | | |
| 59 | | | Not used | | |
| 60 | | | Not used | | |
| 61 | | | Not used | | |
| 62 | | | Not used | | |
| 63 | | | Not used | | |
| 64 | | | Not used | | |
| 65 | | | Not used | | |
| 66 | | | Not used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 67 | | | Not used | | |
| 68 | | | Not used | | |
| 69 | | | Not used | | |
| 70 | | | Not used | | |
| 71 | | | Not used | | |
| 72 | | | Not used | | |
| 73 | | | Not used | | |
| 74 | | | Not used | | |
| 75 | | | Not used | | |
| 76 | | | Not used | | |
| 77 | | | Not used | | |
| 78 | | | Not used | | |
| 79 | | | Not used | | |
| 80 | | | Not used | | |
| 81 | | | Not used | | |
| 82 | | | Not used | | |
| 83 | | | Not used | | |
| 84 | | | Not used | | |
| 85 | **X-F02V (Receptacle) pin 88** - Engine control unit [A-F02] | EN-020 | Main contactor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 86 | F-F245-P-2 | W9510 | Main contactor | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 87 | SP-S01-P-PIN1 | W9509 | Main contactor | none - 6.0 | **SHEET 2 SH02 - ECU vehicle side** |

### *X-F247 - SCR contactor [ K-F247]*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | | | Not used | | |
| 2 | | | Not used | | |
| 3 | | | Not used | | |
| 4 | | | Not used | | |
| 5 | | | Not used | | |
| 6 | | | Not used | | |
| 7 | | | Not used | | |
| 8 | | | Not used | | |
| 9 | | | Not used | | |
| 10 | | | Not used | | |
| 11 | | | Not used | | |
| 12 | | | Not used | | |
| 13 | | | Not used | | |
| 14 | | | Not used | | |
| 15 | | | Not used | | |
| 16 | | | Not used | | |
| 17 | | | Not used | | |
| 18 | | | Not used | | |
| 19 | | | Not used | | |
| 20 | | | Not used | | |
| 21 | | | Not used | | |
| 22 | | | Not used | | |
| 23 | | | Not used | | |
| 24 | | | Not used | | |
| 25 | | | Not used | | |
| 26 | | | Not used | | |
| 27 | | | Not used | | |
| 28 | | | Not used | | |
| 29 | | | Not used | | |
| 30 | SP-S11-P-1 | W4703 | SCR contactor | none - 4.0 | **SHEET 3 SH03 - ECU vehicle side** |
| 31 | | | Not used | | |
| 32 | | | Not used | | |
| 33 | | | Not used | | |
| 34 | | | Not used | | |
| 35 | | | Not used | | |
| 36 | | | Not used | | |
| 37 | | | Not used | | |
| 38 | | | Not used | | |
| 39 | | | Not used | | |
| 40 | | | Not used | | |
| 41 | | | Not used | | |
| 42 | | | Not used | | |
| 43 | | | Not used | | |
| 44 | | | Not used | | |
| 45 | | | Not used | | |
| 46 | | | Not used | | |

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 47 | | | Not used | | |
| 48 | | | Not used | | |
| 49 | | | Not used | | |
| 50 | | | Not used | | |
| 51 | | | Not used | | |
| 52 | | | Not used | | |
| 53 | | | Not used | | |
| 54 | | | Not used | | |
| 55 | | | Not used | | |
| 56 | | | Not used | | |
| 57 | | | Not used | | |
| 58 | | | Not used | | |
| 59 | | | Not used | | |
| 60 | | | Not used | | |
| 61 | | | Not used | | |
| 62 | | | Not used | | |
| 63 | | | Not used | | |
| 64 | | | Not used | | |
| 65 | | | Not used | | |
| 66 | | | Not used | | |
| 67 | | | Not used | | |
| 68 | | | Not used | | |
| 69 | | | Not used | | |
| 70 | | | Not used | | |
| 71 | | | Not used | | |
| 72 | | | Not used | | |
| 73 | | | Not used | | |
| 74 | | | Not used | | |
| 75 | | | Not used | | |
| 76 | | | Not used | | |
| 77 | | | Not used | | |
| 78 | | | Not used | | |
| 79 | | | Not used | | |
| 80 | | | Not used | | |
| 81 | | | Not used | | |
| 82 | | | Not used | | |
| 83 | | | Not used | | |
| 84 | | | Not used | | |
| 85 | **X-F02V (Receptacle) pin 18** - Engine control unit [A-F02] | W4710 | SCR contactor | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 86 | SP-S10(1)-P-1 | W4706 | SCR contactor | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 87 | SP-S18-P-1 | W4711 | SCR contactor | none - 4.0 | **SHEET 3 SH03 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 25 Connector X-250 to X-259

***X-F251 - Preheating glow-plugs control unit [ A-F251] (84356962) (Receptacle)***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-1 (Receptacle) pin 58** - Connector SEZ.2 F | W9505 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F12-1 (Receptacle) pin 61** - Connector SEZ.2 F | W9507 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | **X-F02V (Receptacle) pin 53** - Engine control unit [A-F02] | WIRE6819 | Preheating glow-plugs control unit | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 4 | F-F215-P-1 | W9508 | Pre-heating glow plug | none - 6.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 5 | SP-S1-P-PIN1 | WIRE6817 | Preheating glow-plugs control unit | none - 3.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 6 | **X-F12-1 (Receptacle) pin 57** - Connector SEZ.2 F | W9504 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 7 | **X-F12-1 (Receptacle) pin 60** - Connector SEZ.2 F | W9506 | Pre-heating glow plug | none - 2.5 | **SHEET 2 SH02 - ECU vehicle side** |
| 8 | **X-F02V (Receptacle) pin 57** - Engine control unit [A-F02] | WIRE6818 | Preheating glow-plugs control unit | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 27 Connector X-270 to X-279

***X-F272 - Starter motor [ M-F272]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | GND3-P-1 | WIRE6830 | Starter motor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 2 | **X-F220 pin 87** - Starter relay [K-F220] | WIRE6840 | Starter motor | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |
| 3 | G-F271-P-POS | WIRE6831 | Battery positive | none - 0.0 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 29 Connector X-290 to X-299

***X-F290 - Fuel temperature sensor [ B-F290]***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F12-2 (Plug) pin 16** - Connector SEZ.2 M | MB(1) | Fuel temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |
| 2 | **X-F12-2 (Plug) pin 15** - Connector SEZ.2 M | S(1) | Fuel temperature sensor | none - 0.5 | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Component diagram 30 Connector X-300 to X-309

***X-F301 - Diagnostics connector***

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| A | GND6-P-1 | WIRE6849 | Connector for interface with CAN network | none - 1.0 | **SHEET 2 SH02 - ECU vehicle side** |
| B | F-F303-P-1 | WIRE6848 | Connector for interface with CAN network | none - 1.0 | **SHEET 2 SH02 - ECU vehicle side** |
| C | **X-F02E (Receptacle) pin 43** - Engine control unit [A-F02] (5802805180) | H(16) | Connector for interface with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |
| D | **X-F12-1 (Receptacle) pin 33** - Connector SEZ.2 F | L(18) | Connector for interface with CAN network | none - 0.5 | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 73 Connector X-730 to X-739

### *X-F738 - Connector NOx 1*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | SP-S13-P-1 | W4582 | NOx detection sensor upstream of SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | SP-S14-P-1 | W4585 | NOx detection sensor upstream of SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | SP3314-P-1 | L(10) | NOx detection sensor upstream of SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 4 | SP3315-P-1 | H(8) | NOx detection sensor upstream of SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 5 | SP-S14-P-1 | W4586 | NOx detection sensor upstream of SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F738A - Connector NOx 1*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F67 pin 1** - NOx detection sensor upstream of SCR [B-F67] (872-860-541) | WIRE25311 | NOx detection sensor upstream of SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | **X-F67 pin 2** - NOx detection sensor upstream of SCR [B-F67] (872-860-541) | WIRE25312 | NOx detection sensor upstream of SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | **X-F67 pin 3** - NOx detection sensor upstream of SCR [B-F67] (872-860-541) | L(11) | NOx detection sensor upstream of SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 4 | **X-F67 pin 4** - NOx detection sensor upstream of SCR [B-F67] (872-860-541) | H(9) | NOx detection sensor upstream of SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 5 | **X-F67 pin 5** - NOx detection sensor upstream of SCR [B-F67] (872-860-541) | WIRE25314 | NOx detection sensor upstream of SCR | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F739 - Connector NOx 2*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | SP-S14-P-1 | W4584 | NOx detection sensor downstream of SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | SP-S13-P-1 | W4581 | NOx detection sensor downstream of SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | SP3314-P-1 | L(7) | NOx detection sensor downstream of SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 4 | SP3315-P-1 | H(5) | NOx detection sensor downstream of SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F739A - Connector NOx 2*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F49 pin 2** - NOx detection sensor downstream of SCR [B-F49] (872-860-541) | WIRE25317 | NOx detection sensor downstream of the SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | **X-F49 pin 1** - NOx detection sensor downstream of SCR [B-F49] (872-860-541) | WIRE25318 | NOx detection sensor downstream of the SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | **X-F219 pin 2** - Turbo temperature sensor [B-F219] | L(6) | Turbo temperature sensor | none - 0.5 | **SHEET 3 SH03 - ECU vehicle side** |
| 4 | **X-F49 pin 4** - NOx detection sensor downstream of SCR [B-F49] (872-860-541) | H(4) | NOx detection sensor downstream of the SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |

# 769130 CONNECTIONS - Component diagram 74 Connector X-740 to X-749

### *X-F740 - Connector UQS*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | SP-S13-P-1 | W4580 | NOx detection sensor upstream of SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | SP-S14-P-1 | W4583 | NOx detection sensor upstream of SCR | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | | | Not used | | |
| 4 | SP3326-P-1 | L(14) | NOx detection sensor upstream of SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 5 | | H(12) | NOx detection sensor upstream of SCR | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |

### *X-F740A - Connector UQS*

| Pin | From | Wire | Description | Color-Size | Frame |
|---|---|---|---|---|---|
| 1 | **X-F56 (Receptacle) pin 1** - Urea tank quality - level - temperature sensor [B-F56] | WIRE25306 | Urea tank level-quality-temperature sensor | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 2 | **X-F56 (Receptacle) pin 2** - Urea tank quality - level - temperature sensor [B-F56] | WIRE25307 | Urea tank level-quality-temperature sensor | none - 0.75 | **SHEET 3 SH03 - ECU vehicle side** |
| 3 | | | Not Used | | |
| 4 | **X-F56 (Receptacle) pin 4** - Urea tank quality - level - temperature sensor [B-F56] | L(15) | Urea tank level-quality-temperature sensor | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |
| 5 | **X-F56 (Receptacle) pin 5** - Urea tank quality - level - temperature sensor [B-F56] | H(13) | Urea tank level-quality-temperature sensor | none - 0.35 | **SHEET 3 SH03 - ECU vehicle side** |

# 769130 CONNECTIONS - ECU description

***A-F02 - Engine control unit (Control unit)***

| | |
|---|---|
| Component Type | Control unit |
| Wiring frames | **SHEET 1 SH01 - ECU engine side**<br>**SHEET 2 SH02 - ECU vehicle side**<br>**SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F02V (Receptacle)** - Engine control unit [A-F02]<br>**X-F02E (Receptacle)** - Engine control unit [A-F02] (5802805180) |

***A-F222 - Start up control unit (Control unit)***

| | |
|---|---|
| Component Type | Control unit |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F222** - Contactor for start-up control from Body Controller [A-F222] |

***A-F251 - Preheating glow-plugs control unit (Control unit)***

| | |
|---|---|
| Component Type | Control unit |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F251 (Receptacle)** - Preheating glow-plugs control unit [A-F251] (84356962) |

***A-F45 - Urea pipe heating control unit (Control unit)***

| | |
|---|---|
| Component Type | Control unit |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F45 (Plug)** - Urea pipes heating contactor [A-F45] |

# 769130 CONNECTIONS - Sensor description

***B-001 - Relative Pressure Sensor (PS) (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

***B -F09 - Pressure sensor on the rail (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F09** - Pressure sensor on the rail [B-F09] |

***B-F19 - Timing sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F19** - Timing sensor [B-F19] |

***B-F21 - Engine coolant temperature sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F21** - Engine coolant temperature sensor [B-F21] |

***B-F217 - Sensor detecting water in fuel (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F217 (Receptacle)** - Water in fuel sensor [B-F217] (87747172) |

***B-F219 - Turbo temperature sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F219** - Turbo temperature sensor [B-F219] |

***B-F23 - RPM sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F23 (Receptacle)** - RPM sensor [B-F23] |

***B-F290 - Fuel temperature sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F290** - Fuel temperature sensor [B-F290] |

***B-F32 - Exhaust gas temperature sensor upstream of the DOC (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F32** - Exhaust gas temperature sensor upstream of DOC [B-F32] |

***B-F33 - Exhaust gas temperature sensor upstream of the DPF (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F33** - Exhaust gas temperature sensor upstream of the DPF[[B-F33] |

***B-F34 - Differential pressure sensor on the DPF (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F34** - Differential pressure sensor on DPF [B-F34] |

***B-F38 - Exhaust gas temperature sensor upstream of the SCR (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F38** - Exhaust gas temperature sensor upstream of the SCR [B-F38] |

***B-F39 - Exhaust gas temperature sensor downstream of the SCR (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F39** - Exhaust gas temperature sensor downstream of the SCR [B-F39] |

***B-F48 - Overpressure air temperature and pressure sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F48 (Receptacle)** - Boost air temperature and pressure sensor [B-F48] |

***B-F49 - NOx detection sensor downstream of the SCR (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F49** - NOx detection sensor downstream of SCR [B-F49] (872-860-541) |

***B-F53 - Exhaust gas pressure sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F53** - Exhaust gas pressure sensor [B-F53] |

***B-F56 - Urea level quality and temperature sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F56 (Receptacle)** - Urea tank quality - level - temperature sensor [B-F56] |

***B-F65 - Intake air temperature sensor (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F65** - Intake air temperature sensor [B-F65] |

***B-F67 - NOx detection sensor upstream of the SCR (Sensor)***

| | |
|---|---|
| Component Type | Sensor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F67** - NOx detection sensor upstream of SCR [B-F67] (872-860-541) |

# 769130 CONNECTIONS - Fuse description

***F-F200 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F200A - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F215 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F230 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F245 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F245A - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F245B - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F245C - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F272 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F303 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***F-F45 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

***F-FU001 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

***F-FU002 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

***F-FU003 - Fuse (Fuse)***

| | |
|---|---|
| Component Type | Fuse |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

# 769130 CONNECTIONS - Voltage source description

***G-F271 - Battery (Power source)***

| Component Type | Power source |
|---|---|
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Ground description

***GND-02 - (Ground)***

| | |
|---|---|
| Component Type | Ground |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |

# 769130 CONNECTIONS - Relay description

***K-F220 - Ignition contactor (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F220** - Starter relay [K-F220] |

***K-F222 - Contactor for start-up control from Body Controller (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F222A** - Starter control unit [K-F222] |

***K-F223 - Ignition control contactor (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F223** - Starter relay [K-F223] |

***K-F230 - Fuel filter heating contactor (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F230** - Fuel filter heating contactor [K-F230] |

***K-F245 - Main contactor (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F245** - Main contactor [K-F245] |

***K-F247 - SCR contactor (Relay)***

| | |
|---|---|
| Component Type | Relay |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F247** - SCR contactor [K-F247] |

# 769130 CONNECTIONS - Load description

***L-F96_1 - Pre-heating glow plug (Load)***

| | |
|---|---|
| Component Type | Ash |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***L-F96_2 - Pre-heating glow plug (Load)***

| | |
|---|---|
| Component Type | Ash |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***L-F96_3 - Pre-heating glow plug (Load)***

| | |
|---|---|
| Component Type | Ash |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***L-F96_4 - Pre-heating glow plug (Load)***

| | |
|---|---|
| Component Type | Ash |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

# 769130 CONNECTIONS - Motor description

***M-001 - Pump motor (Motor)***

| | |
|---|---|
| Component Type | Engine |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

***M-F272 - Starter motor (Engine)***

| | |
|---|---|
| Component Type | Engine |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F272** - Starter motor [M-F272] |

***M-F42 - Urea pump module (Motor)***

| | |
|---|---|
| Component Type | Engine |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F42** - Urea pump module [M-F42] (1-1703639-1) |

# 769130 CONNECTIONS - Resistor description

***R-F230A - Fuel filter resistor (Resistor)***

| | |
|---|---|
| Component Type | Resistor |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |

***R-F300 - Termination resistor for CAN bus (Resistor)***

| | |
|---|---|
| Component Type | Resistor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

***R-F45C - Urea delivery pipe heating resistor (Resistor)***

| | |
|---|---|
| Component Type | Resistor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

***R-F45D - Urea return pipe heating resistor (Resistor)***

| | |
|---|---|
| Component Type | Resistor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

***R-F45E - Urea drain pipe heating resistor (Resistor)***

| | |
|---|---|
| Component Type | Resistor |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

# 769130 CONNECTIONS - Switch description

***S-F200 - Ignition switch (Switch)***

| | |
|---|---|
| Component Type | Switch |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F200** - Ignition switch [S-F200] |

***S-F55 - Low engine oil level alarm switch (Switch)***

| | |
|---|---|
| Component Type | Switch |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F55** - Low engine oil level alarm switch [S-F55] |

***SW-003 - Urea heater module (Switch)***

| | |
|---|---|
| Component Type | Switch |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

***SW-F215 - Battery disconnect switch (BDS) (Switch)***

| | |
|---|---|
| Component Type | Switch |
| Wiring frames | **SHEET 2 SH02 - ECU vehicle side** |
| Connectors | **X-F215** - Battery cut-off switch (BDS) [SW-F215] |

# 769130 CONNECTIONS - Solenoid description

***Y-001 - Bleed solenoid valve (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |

***Y-F07 - Solenoid valve for fuel pressure regulation (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F07 (Receptacle)** - Fuel pressure regulating solenoid valve [Y-F07] |

***Y-F102 - Throttle solenoid valve (TVA) (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F102** - Throttle solenoid valve (TVA) [Y-F102] |

***Y-F11_1 - Injector 1 (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F11_1** - Injector 1 [Y-F11_1] |

***Y-F11_2 - Injector 2 (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F11_2** - Injector 2 [Y-F11_2] |

***Y-F11_3 - Injector 3 (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F11_3** - Injector 3 [Y-F11_3] |

***Y-F11_4 - Injector 4 (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F11_4** - Injector 4 [Y-F11_4] |

***Y-F24A - EGR solenoid valve (Pierburg) (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F24A** - EGR solenoid valve (Pierburg) [Y-F24A] |

***Y-F44 - Urea dosing module (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F44** - Urea dosing module [Y-F44] |

***Y-F60 - Urea tank heating solenoid valve (Solenoide)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 3 SH03 - ECU vehicle side** |
| Connectors | **X-F60 (Receptacle)** - Urea tank heating solenoid valve [Y-F60] |

***Y-F72 - Wastegate solenoid valve (WG) (Solenoid)***

| | |
|---|---|
| Component Type | Solenoid |
| Wiring frames | **SHEET 1 SH01 - ECU engine side** |
| Connectors | **X-F72** - Wastegate solenoid valve (WG) [Y-F72] |

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7EECE4 519294-4 - Fault in the DEF/AdBlue heater module;: short circuit to ground [FPT ECU] . . . . 668

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0D2006 8205-6 - DEF/AdBlue heater module: overtemperature error [FPT ECU] . . . . . 677

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522005-31 15F7FF - Error in the high side powerstage of the DEF/AdBlue pump: open circuit [FPT ECU] . . . . . 683

18F7FF 522008-31 - Error in the DEF/AdBlue pump: short circuit to ground [FPT ECU] . . . . . 685

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0D201F 8205-31 - DEF/AdBlue heater module: error in non volatile memory [FPT ECU] . . . . . 688

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BF1311 5055-17 - Oil viscosity below the minimum threshold [FPT ECU] . . . . . 700

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5A150F 5466-15 - DPF system: particulate filter overload [FPT ECU] . . . . . 702

# 295467 641-5 810205 - VGT turbocharger actuator: open circuit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the circuit of the wastegate pressure modulating valve **Y-F72**. If the ECU **A-F02** determines the presence of an open load condition in the circuit of the wastegate pressure modulating valve **Y-F72**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an open load in the wastegate pressure modulating valve **Y-F72** circuit.

**Possible failure modes:**

1. Faulty wastegate pressure modulating valve **Y-F72** wiring, open circuit.
2. Faulty wastegate pressure modulating valve **Y-F72**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**.
2. Check the internal voltage of the wastegate pressure modulating valve **Y-F72**.

   Disconnect the wiring of the wastegate pressure modulating valve **Y-F72** connector **X-F72**.

   Use a multimeter to carry out the following voltage checks on the pins of the wastegate pressure modulating valve **Y-F72**:

| From | To | Value |
|---|---|---|
| **X-F72 (Plug) pin 1** | Positive | This should be **12.0 V**. |

   A. If the reading is approximately **12.0 V**, leave the wiring disconnected of the wastegate pressure modulating valve connector **X-F72** and go to step **3**.

   B. If a value of approximately **12.0 V** is not detected, this indicates a fault inside the wastegate pressure modulating valve **Y-F72**. Replace the wastegate pressure modulating valve **Y-F72**.
3. Check the wastegate pressure modulating valve **Y-F72** vehicle wiring harness (VE) wiring for an open circuit.

   Disconnect the wiring of the wastegate pressure modulating valve **Y-F72** connector **X-F72**.

   With the key set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F72 (Receptacle) pin 2** | **X-F02E pin 72** | There should be continuity. |

   A. If there is no continuity, there is an open circuit in the wiring of the wastegate pressure modulating valve. Use the appropriate workshop manual if necessary, to locate and repair the broken conductor.

   B. If continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 519095-6 B7EBE6 - VGT turbocharger actuator: overtemperature

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the circuit of the wastegate pressure modulating valve **Y-F72**. If the ECU **A-F02** determines the presence of an overtemperture/overcurrent condition in the circuit of the wastegate pressure modulating valve **Y-F72**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an over temperature/current condition in the wastegate pressure modulator valve **Y-F72** circuit.

**Possible failure modes:**

1. Faulty wastegate pressure modulator valve **Y-F72** wiring, short to a voltage source.
2. Faulty wastegate pressure modulating valve **Y-F72**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active,pass on to point **6**.
2. Check the wastegate pressure modulating valve **Y-F72** internal resistance.

   Disconnect the wastegate pressure modulating valve **Y-F72** connector **X-F72**.

   Use a multimeter to perform the following resistance check on the wastegate pressure modulating valve **Y-F72** pins:

| From | To | Value |
|---|---|---|
| **X-F72 (Plug) pin 1** | **X-F72 (Plug) pin 2** | The resistance should be between **21.8 Ω** and **24.2 Ω**. |
| ***NOTE:*** *The provided value should be measured at a temperature of approximately* ***20 °C (68 °F)****.* | | |

   A. If the value is between **21.8 Ω** and **24.2 Ω**, leave the connector **X-F72** disconnected and go to **3**.

   B. If there is not between **21.8 Ω** and **24.2 Ω**, the wastegate pressure modulating valve **Y-F72** and has failed internally. Replace the wastegate pressure modulating valve **Y-F72**.
3. Check the wastegate pressure modulator valve **Y-F72** wiring for a short circuit.

   With the key in the OFF position, use the a multimeter to perform the following continuity check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F72 (Plug) pin 1** | **X-F72 (Plug) pin 2** | There should be no continuity. |

   A. If there is continuity, there is a short circuit in the wastegate pressure modulator valve wiring. if necessary, use the appropriate service manual to locate and repair the shorted conductor.

   B. If there is no continuity, pass on to point **4**.
4. Check the wastegate pressure modulator valve **Y-F72** wiring for a short to battery condition.

With the key in the OFF position, use the a multimeter to perform the following voltage check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F72 (Plug) pin 2** | Chassis ground | There should be no voltage. |

A. If there is voltage, there is a short to battery in the wastegate pressure modulating valve wiring. if necessary, use the appropriate service manual to locate and repair the shorted conductor.

B. If there is no voltage, pass on to point **5**.

5. Check the wastegate pressure modulator valve **Y-F72** wiring for a short to a voltage source.

   Disconnect the vehicle wiring harness from the engine interface at connector **X-F72**.

   With the key in the ON position, use the a multimeter to perform the following voltage check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F72 (Plug) pin 2** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short to a voltage source in the wastegate pressure modulator valve wiring in the engine wiring harness. Locate and repair the shorted conductor.

   B. If there is no voltage, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 5457-3 511503 - VGT turbocharger actuator: short-circuit to battery

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the circuit of the wastegate pressure modulating valve **Y-F72**. If the ECU **A-F02** determines the presence of a short circuit to battery condition in the circuit of the wastegate pressure modulating valve **Y-F72**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the circuit of the wastegate pressure modulating valve **Y-F72**.

**Possible failure modes:**

1. Faulty wastegate pressure modulator valve **Y-F72** wiring, short to a voltage source.
2. Faulty wastegate pressure modulating valve **Y-F72**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**.
2. Check the wastegate pressure modulating valve **Y-F72** internal resistance.

   Disconnect the wastegate pressure modulating valve **Y-F72** connector **X-F72**.

   Use a multimeter to perform the following resistance check on the wastegate pressure modulating valve **Y-F72** pins:

| From | To | Value |
|---|---|---|
| **X-F72 (Plug) pin 1** | **X-F72 (Plug) pin 2** | The resistance should be between **21.8 Ω** and **24.2 Ω**. |
| ***NOTE:*** *The provided value should be measured at a temperature of approximately* ***20 °C (68 °F)****.* | | |

   A. If the value is between **21.8 Ω** and **24.2 Ω**, leave the connector **X-F72** disconnected and go to step **3**.

   B. If there is not between **21.8 Ω** and **24.2 Ω**, the wastegate pressure modulating valve **Y-F72** and has failed internally. Replace the wastegate pressure modulating valve **Y-F72**.
3. Check the wastegate pressure modulator valve **Y-F72** wiring for a short circuit.

   With the key in the OFF position, use the a multimeter to perform the following continuity check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F72 (Plug) pin 1** | **X-F72 (Plug) pin 2** | There should be no continuity. |

   A. If there is continuity, there is a short circuit in the wastegate pressure modulator valve wiring. Use the appropriate service manual, if necessary, to locate and repair the shorted conductor.

   B. If there is no continuity, go to **4**.
4. Check the wastegate pressure modulator valve **Y-F72** wiring for a short to battery condition.

With the key in the OFF position, use the a multimeter to perform the following voltage check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F72 (Plug) pin 2** | Frame ground | There should be no voltage. |

A. If there is voltage, there is a short to battery in the wastegate pressure modulating valve wiring. Use the appropriate service manual, if necessary, to locate and repair the shorted conductor.

B. If there is no voltage, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 641-4 810204 - VGT turbocharger actuator: short circuit to ground

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the circuit of the wastegate pressure modulating valve **Y-F72**. If the ECU **A-F02** determines the presence of a short circuit to ground condition in the circuit of the wastegate pressure modulating valve **Y-F72**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground in the circuit of the wastegate pressure modulating valve **Y-F72**.

**Possible failure modes:**

1. Fault in the wiring of the wastegate pressure modulating valve **Y-F72** short circuit to ground.
2. Faulty wastegate pressure modulating valve **Y-F72**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**.
2. Check the wastegate pressure modulating valve **Y-F72** internal resistance.

   Disconnect the wastegate pressure modulating valve **Y-F72** connector **X-F72**.

   Use a multimeter to perform the following resistance check on the wastegate pressure modulating valve **Y-F72** pins:

| From | To | Value |
|---|---|---|
| **X-F72 (Plug) pin 1** | **X-F72 (Plug) pin 2** | The resistance should be between **21.8 Ω** and **24.2 Ω**. |
| ***NOTE:*** *The provided value should be measured at a temperature of approximately* ***20 °C (68 °F)****.* | | |

   A. If the value is between **21.8 Ω** and **24.2 Ω**, leave the connector **X-F72** disconnected and go to step **3**.

   B. If there is not between **21.8 Ω** and **24.2 Ω**, the wastegate pressure modulating valve **Y-F72** and has failed internally. Replace the wastegate pressure modulating valve **Y-F72**.
3. Check the circuit of the wastegate pressure modulating valve **Y-F72** for a short circuit to ground condition.

   The key must be in OFF position.

   Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F72 (Plug) pin 1**. | Battery positive | There should be no continuity. |

   A. If continuity is detected, this indicates a short circuit to ground in the circuit of the wastegate pressure modulating valve **Y-F72**,Locate and repair the damaged conductor.

   B. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 630A12 2659-18 - EGR control: low flow rate detected in the EGR valve

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the EGR system to ensure it is working properly. To detect low flow (obstructed or tampered EGR path), pressure signals before the intake valve and/or pressure in the exhaust manifold upstream of the turbine are evaluated. The function must be performed every time after starting the engine. The closed EGR valve carries out a closed/open/closed sequence. During this sequence, the pressure signals in the intake manifold (P2) and the pressure in the gradients of the exhaust manifold (P3) are checked and if a deviation from the expected behaviour is detected, the error appears.

**Cause:**
The ECU **A-F02** detects a slow response in the EGR actuator **Y-F24A**

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.

2. Check the correct operation of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the EGR actuator **Y-F24A**.

   B. If code remains inactive, return the machine to service.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 2791-31 E70A1F - EGR Valve: Current limited

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the current sent to the actuator of the EGR pilot valve **Y-F24A** If it exceeds a set limit for a time longer than the anti-bouncing time, a slow actuator condition is detected.

**Cause:**
The activation current of the EGR valve **Y-F24A** exceeds the current permitted to reach the required position: there could be an electrical problem inside the EGR valve actuator,a wiring problem ("short circuit") or a mechanical block-age in the valve.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **5**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 4** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 5** | Battery positive | There should be no continuity |

   A. If there is continuity, there is a short circuit condition in the wiring. repair or replace as required.

   B. If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to **3**age.

3. Check for short circuit to ground in the circuit of the EGR valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 1** | Chassis ground | There should be no continuity |
| **X-F24A (Receptacle) pin 2** | Chassis ground | There should be no continuity |
| **X-F24A (Receptacle) pin 6** | Chassis ground | There should be no continuity |

   A. If there is continuity, there is a short circuit condition in the wiring. repair or replace as required.

   B. If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to **4**age.

4. Check for a mechanical block in the EGR actuator **Y-F24A** and remove it if necessary.

Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

A. If code returns in an active status, replace the EGR actuator **Y-F24A**.

B. If code remains inactive, return the machine to service.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 1B0014 27-20 - EGR Valve: leak in valve in closed position

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors movement of the EGR valve **Y-F24A** from the closed position through the feedback signal which must be within specified limits.

**Cause:**
The EGR valve **Y-F24A** does not close completely: the EGR valve is mechanically blocked due to dirt or the position sensor is not aligned.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.

2. Check monitoring of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, correctly mount the EGR actuator **Y-F24A**.

   B. If code remains inactive, return the machine to service.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5DE1E5 516445-5 - EGR Valve: open circuit error in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge) and signals an open circuit error.

**Cause:**
The ECU **A-F02** detects electrical problems in the EGR valve actuator: broken wiring, false connector contacts, internal problems in the actuator.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.

2. Check for an open circuit in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 67** | **X-F24A pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 88** | **X-F24A pin 5** | There should be continuity. |
| **X-F02E (Receptacle) pin 78** | **X-F24A pin 4** | There should be continuity. |
| **X-F02E (Receptacle) pin 79** | **X-F24A pin 2** | There should be continuity. |
| **X-F02E (Receptacle) pin 40** | **X-F24A pin 6** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, return the machine to service.required.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 1DECE6 519197-6 - EGR Valve: overcurrent error in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge) and signals an overcurrent error.

**Cause:**
The ECU **A-F02** detects electrical problems in the EGR valve actuator **Y-F24A**: short circuit to battery in the wiring or short circuit inside the actuator.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Battery positive | There should be no reading |
| **X-F24A (Receptacle) pin 4** | Battery positive | There should be no reading |
| **X-F24A (Receptacle) pin 5** | Battery positive | There should be no reading |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, leave the connectors disconnected and go to **3**age.

3. Check the correct operation of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the EGR actuator **Y-F24A**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 519198-6 1EECE6 - EGR Valve: overtemperature error in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the power stage of the EGR valve actuator **Y-F24A** and signals an over temperature error.

**Cause:**
High battery voltage, high temperature inside ECU, high load or wiring problem

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check for an open circuit in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 67** | **X-F24A pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 88** | **X-F24A pin 5** | There should be continuity. |
| **X-F02E (Receptacle) pin 78** | **X-F24A pin 4** | There should be continuity. |
| **X-F02E (Receptacle) pin 79** | **X-F24A pin 2** | There should be continuity. |
| **X-F02E (Receptacle) pin 40** | **X-F24A pin 6** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the engine control unit (ECU) **A-F02**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 516445-3 5DE1E3 - EGR Valve: short circuit to battery on output 1 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge). The H-Bridge has 2 switches (high side and low side). Each circuit is monitored separately and a short circuit to battery is signalled on Out1.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **3**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 5** | Battery positive | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, return the machine to service.age.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 1EECE3 519198-3 - EGR Valve: short circuit to battery on output 2 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge). The H-Bridge has 2 switches (high side and low side). Each circuit is monitored separately and a short circuit to battery is signalled on Out2.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **3**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 4** | Battery positive | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, return the machine to service.age.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 5DE1E4 516445-4 - EGR Valve: short circuit to ground on output 1 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge). The H-Bridge has 2 switches (high side and low side). Each circuit is monitored separately and a short circuit to ground is signalled on Out1.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring of the EGR valve **Y-F24A**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.

2. Check for short circuit to ground in the circuit of the EGR valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 67** | Mass | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, return the machine to service.required.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 1EECE4 519198-4 - EGR Valve: short circuit to ground on output 2 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge). The H-Bridge has 2 switches (high side and low side). Each circuit is monitored separately and a short circuit to ground is signalled on Out2.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **3**age.

2. Check for short circuit to ground in the circuit of the EGR valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Ground | There should be no continuity |
| **X-F24A (Receptacle) pin 6** | Ground | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, return the machine to service.age.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 519199-6 1FECE6 - EGR Valve: plausibility error from overload on the power stage outputs

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02**monitors the power stage of the EGR valve electric actuator **Y-F24A** (bridge H) An overload error is not directly detectable if the wiring length is greater than 1m and the fault occurs close to the actuator. Therefore, a plausibility check is required if a "Short circuit to battery" (SCB) or "Short circuit to ground" (SCG) fault is detected. Therefore the switch (low side in the case of SCB, high side in the case of SCG) is closed. If the short circuit fault disappears, it is cleared and the short circuit overload fault is activated. In the event of a short circuit to ground fault, the high side switches are closed. If there is no longer a short circuit to ground fault, it is detected as a short circuit overload fault. In the event of a short circuit to battery error, the switches on the lower side are closed. If there is no longer a short circuit to battery error, it is detected as a short circuit overload error. If a short circuit overload fault is detected, the pre-existing SCG / SCB fault is resolved.

**Cause:**
The ECU **A-F02** detects a short circuit in the wiring of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **3**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 4** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 5** | Battery positive | There should be no continuity |

   A. If there is continuity, there is a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to **3**.

3. Check for short circuit to ground in the circuit of the EGR valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 1** | Chassis ground | There should be no continuity |
| **X-F24A (Receptacle) pin 2** | Chassis ground | There should be no continuity |

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 6** | Chassis ground | There should be no continuity |

A. If there is continuity, there is a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

B. If there is no continuity, the wiring is operating correctly, return the machine to service.age.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 1FECE5 519199-5 - EGR Valve: voltage below the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the power stage of the EGR valve electric actuator **Y-F24A** (H-Bridge) and signals an error of voltage below the permitted threshold.

**Cause:**
Voltage fluctuations too high in the system or internal fault in the control unit.('ECU) **A-F02**

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.
2. Check for continuity in the high side of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 1** | **X-F02E (Receptacle) pin 67** | There should be no continuity |
| **X-F24A (Receptacle) pin 5** | **X-F02E (Receptacle) pin 88** | There should be no continuity |

   A. If there is continuity, there is an error in the circuit, For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to **3**age.
3. Check the correct operation of the engine control unit (ECU) **A-F02**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 E70A07 2791-7 - EGR Valve: stuck in the closed position

## Control Module: FPT ECU

**Fault Description:**
The EGR valve actuator **Y-F24A** with a position sensor provides feedback to the engine control unit (ECU) **A-F02**. If there is a deviation between the position requested and the position detected, a deviation error (min or max) is triggered. The system then tries to "release" the closing or opening of the fast actuator. If it is not possible to "release" the actuator, the fault "Valve jammed" is triggered. The valve stuck in the closed state is detected if the deviation is permanent, the valve release attempts have failed or the EGR actuator prosecution is below a predetermined threshold.

**Cause:**
The EGR valve **Y-F24A** does not open within the set time. The EGR valve **Y-F24A** is mechanically blocked or stuck. The position sensor is not aligned.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.
2. Check monitoring of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, correctly mount the EGR actuator **Y-F24A** or replace it if necessary.

   B. If code remains inactive, return the machine to service.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 519201-7 21ECE7 - EGR Valve: stuck on open position

## Control Module: FPT ECU

**Fault Description:**
The EGR valve actuator **Y-F24A** with a position sensor provides feedback to the engine control unit (ECU) **A-F02**. If there is a deviation between the position requested and the position detected, a deviation error (min or max) is triggered. The system then tries to "release" the closing or opening of the fast actuator. If it is not possible to "release" the actuator, the fault "Valve jammed" is triggered. The valve stuck in the open state is detected if the deviation is permanent, the valve release attempts have failed or the EGR actuator prosecution is above a predetermined threshold.

**Cause:**
The EGR valve **Y-F24A** does not closed within the set time. The EGR valve **Y-F24A** is mechanically blocked or stuck. The sensor is not aligned.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.
2. Check monitoring of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, correctly mount the EGR actuator **Y-F24A** or replace it if necessary.

   B. If code remains inactive, return the machine to service.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 676-5 A40205 - Ignition glow plug: open circuit in the power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. An open circuit error is reported.

**Cause:**
The ECU **A-F02** has detected a wiring problem in the direction of the glow plug control unit **A-F251** which may be broken or disconnected.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.
2. Check for an open circuit in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 53** | **X-F251 (Receptacle) pin 3** | There should be continuity. |
| **X-F02V (Receptacle) pin 57** | **X-F251 (Receptacle) pin 8** | There should be continuity. |
| **X-F02V (Receptacle) pin 26** | **X-F251 (Receptacle) pin 5** | There should be continuity. |
| **X-F96 (Plug) pin 4** | **X-F251 (Plug) pin 2** | There should be continuity. |
| **X-F96 (Plug) pin 3** | **X-F251 (Plug) pin 7** | There should be continuity. |
| **X-F96 (Plug) pin 2** | **X-F251 (Plug) pin 1** | There should be continuity. |
| **X-F96 (Plug) pin 1** | **X-F251 (Plug) pin 6** | There should be continuity. |

   A. If there is no continuity, there is an open circuit condition in the wiring harness. repair or replace as required.

   B. If there is continuity, the wiring is operating correctly, pass on to point **3**age.
3. Check the correct operation of the spark plugs **L-F96_1**, **L-F96_2**, **L-F96_3** and **L-F96_4**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the spark plugs one at a time until the fault is inactive again.

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 E70A01 2791-1 - EGR Valve: position sensor voltage below the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the electric signal of the EGR valve position sensor **Y-F24A**. If a fault is detected, the value read is taken as a replacement value. The signal detected is lower than a predetermined threshold.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring or a malfunction on the position sensor of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.

2. Check for short circuit to ground in the circuit of the EGR valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 1** | Ground | There should be no continuity |
| **X-F24A (Receptacle) pin 2** | Ground | There should be no continuity |
| **X-F24A (Receptacle) pin 6** | Ground | There should be no continuity |

   A. If there is continuity, there is a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If there is continuity, the wiring is operating correctly, leave the connectors disconnected and go to **3**age.

3. Check the correct operation of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the EGR actuator **Y-F24A**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 E70A00 2791-0 - EGR Valve: position sensor voltage above the maximum threshold

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the electric signal of the EGR valve position sensor **Y-F24A**. If a fault is detected, the value read is taken as a replacement value. The signal detected is higher than a predetermined threshold.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring or a malfunction on the position sensor of the EGR valve **Y-F24A**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.

2. Check for a short circuit to battery in the circuit of the EGR solenoid valve **Y-F24A**.

   Disconnect the EGR solenoid valve **Y-F24A** at the connector **X-F24A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F24A (Receptacle) pin 2** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 4** | Battery positive | There should be no continuity |
| **X-F24A (Receptacle) pin 5** | Battery positive | There should be no continuity |

   A. If there is continuity, there is a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If there is no continuity, the wiring is operating correctly, leave the connectors disconnected and go to **3**age.

3. Check the correct operation of the EGR actuator **Y-F24A**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the EGR actuator **Y-F24A**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 518500-19 64E9F3 - Ignition glow plug: Ignition control error from power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A fault is detected in the diagnostic data transmission or a protocol error.

**Cause:**
The ECU **A-F02** has detected a fault in the glow plug system due to an open circuit in the wiring, or a malfunction of the preheating glow plug control unit **A-F251**, or a malfunction of the glow plugs **L-F96_1**, **L-F96_2**, **L-F96_3** or **L-F96_4**

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.

2. Check for an open circuit in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251** .

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 53** | **X-F251 (Receptacle) pin 3** | There should be continuity. |
| **X-F02V (Receptacle) pin 57** | **X-F251 (Receptacle) pin 8** | There should be continuity. |
| **X-F02V (Receptacle) pin 26** | **X-F251 (Receptacle) pin 5** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the preheating glow plug control unit **A-F251**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the preheating glow plug control unit **A-F251**.

   B. If code remains inactive, go to step **4**

4. Check the correct operation of the spark plugs **L-F96_1**, **L-F96_2**, **L-F96_3** and **L-F96_4**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the spark plugs one at a time until the fault is inactive again.

B. If code remains inactive, return the machine to service.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 A40206 676-6 - Ignition glow plug: Power stage Overtemperature

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. An overtemperature is reported.

**Cause:**
The ECU **A-F02** detects a high battery voltage, a high temperature inside the engine control unit (ECU) **A-F02**, a high load or a wiring problem or a problem with the glow plug control unit **A-F251**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.
2. Check for an open circuit in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 53** | **X-F251 (Receptacle) pin 3** | There should be continuity. |
| **X-F02V (Receptacle) pin 57** | **X-F251 (Receptacle) pin 8** | There should be continuity. |
| **X-F02V (Receptacle) pin 26** | **X-F251 (Receptacle) pin 5** | There should be continuity. |
| **X-F96 (Plug) pin 4** | **X-F251 (Plug) pin 2** | There should be continuity. |
| **X-F96 (Plug) pin 3** | **X-F251 (Plug) pin 7** | There should be continuity. |
| **X-F96 (Plug) pin 2** | **X-F251 (Plug) pin 1** | There should be continuity. |
| **X-F96 (Plug) pin 1** | **X-F251 (Plug) pin 6** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**
3. Check the correct operation of the engine control unit (ECU) **A-F02**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 A40203 676-3 - Ignition glow plug: Open circuit to battery in the power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit to battery error is reported.

**Cause:**
The ECU **A-F02** has detected a fault in the glow plug system due to a short circuit to battery in the wiring, or a malfunction of the preheating glow plug control unit **A-F251**, or a malfunction of the glow plugs **L-F96_1**, **L-F96_2**, **L-F96_3** or **L-F96_4**

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **5**age.

2. Check for a short circuit to battery in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 53** | Battery positive | There should be no continuity |
| **X-F02V (Receptacle) pin 26** | Battery positive | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the preheating glow plug control unit **A-F251**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the preheating glow plug control unit **A-F251**.

   B. If code remains inactive, go to step **4**

4. Check the correct operation of the spark plugs **L-F96_1**, **L-F96_2**, **L-F96_3** and **L-F96_4**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the spark plugs one at a time until the fault is inactive again.

B. If code remains inactive, return the machine to service.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 A40204 676-4 - Ignition glow plug: Open circuit to ground in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit to ground error is reported.

**Cause:**
The ECU **A-F02** has detected a fault in the glow plug system due to a short circuit to ground in the wiring, or a malfunction of the preheating glow plug control unit **A-F251**, or a malfunction of the glow plugs **L-F96_1**, **L-F96_2**, **L-F96_3** or **L-F96_4**

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **5**age.

2. Check for a short circuit to ground in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 53** | Chassis ground | There should be no continuity |
| **X-F02V (Receptacle) pin 57** | Chassis ground | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the preheating glow plug control unit **A-F251**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the preheating glow plug control unit **A-F251**.

   B. If code remains inactive, go to step **4**

4. Check the correct operation of the spark plugs **L-F96_1**, **L-F96_2**, **L-F96_3** and **L-F96_4**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the spark plugs one at a time until the fault is inactive again.

B. If code remains inactive, return the machine to service.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 5324-4 CC1404 - Short circuit or voltage above the threshold on the ignition glow plug of cylinder 1

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit or overcurrent in the glow plug of cylinder 1 **L-F96_1** is reported.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the wring or an overcurrent in the glow plug of cylinder 1 **L-F96_1** .

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to battery in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251** .

   Disconnect the engine wiring of the glow plug **L-F96_1**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F251 (Receptacle) pin 2** | **X-F96 pin 4** | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, Leave the connectors disconnected and go to **3**
3. Check the correct operation of the spark plug **L-F96_1**. .

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace ignition glow plugs **L-F96_1**. .

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 CE1404 5326-4 - Short circuit or voltage above the threshold on the ignition glow plug of cylinder 3

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit or overcurrent in the glow plug of cylinder 3 **L-F96_3** is reported.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the wring ot an overcurrent in the glow plug of cylinder 3 **L-F96_3** .

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check for a short circuit to battery in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251** .

   Disconnect the engine wiring of the glow plug **L-F96_3** .

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F251 (Receptacle) pin 1** | **X-F96 pin 2** | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the spark plug **L-F96_3**. .

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace ignition glow plugs **L-F96_3**. .

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5327-4 CF1404 - Short circuit or voltage above the threshold on the ignition glow plug of cylinder 4

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit or overcurrent in the glow plug of cylinder 4 **L-F96_4** is reported.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the wring ot an overcurrent in the glow plug of cylinder 4 **L-F96_4** .

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to battery in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251** .

   Disconnect the engine wiring of the glow plug **L-F96_4** .

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F251 (Receptacle) pin 6** | **X-F96 pin 1** | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, Leave the connectors disconnected and go to **3**
3. Check the correct operation of the spark plug **L-F96_4**. .

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace ignition glow plugs **L-F96_4**. .

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5325-4 CD1404 - Short circuit or voltage above the threshold on the ignition glow plug of cylinder 2

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the glow plug control unit **A-F251**. If there is a relay between the engine control unit (ECU) **A-F02** and the glow plug, the fault may be caused by the relay and not the glow plug. If there is no smart relay, an electrical fault in the glow plug cannot be detected. A short circuit or overcurrent in the glow plug of cylinder 2 **L-F96_2** is reported.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the wring or an overcurrent in the glow plug of cylinder 2 **L-F96_2**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check for a short circuit to battery in the circuit of the preheating glow plug control unit **A-F251**.

   Disconnect the preheating glow plug control unit **A-F251** at the connector **X-F251** .

   Disconnect the engine wiring of the glow plug **L-F96_2**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F251 (Receptacle) pin 7** | **X-F96 pin 3** | There should be no continuity |

   A. If the result does not match that expected in the wiring test listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the result does match that expected in the wiring test listed above, the wiring is operating correctly, Leave the connectors disconnected and go to **3**

3. Check the correct operation of the spark plug **L-F96_2**. .

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace ignition glow plugs **L-F96_2**. .

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 651-31 8B021F - Injector cylinder 1: invalid programming of IMA code

## Control Module: FPT ECU

**Fault Description:**
The injectors are individually corrected (IMA code) to ensure the exact injection quantity of each injector from the lowest to the highest quantity. The correction is performed at the end of the production line (EOL) and after replacing the injectors with the tester. The data is stored in the EEPROM of the engine control unit **A-F02** and the values stored in the EEPROM are protected with checksum parameters. At each key "on", the correction data is read by the EEPROM and the values are checked to identify if they are plausible and the checksums are correct. Otherwise, the injector will not be corrected and the fault will be stored. Incorrect checksums of the injector adjustment codes may be reported, or the basic correction amount of at least 1 correction class is not within the acceptable range for this class, or the injector adjustment values might not be read at due to incorrect access to the EEPROM.

**Cause:**
An invalid IMA code has been programmed for injector 1, or there is an incorrect initialization of the EEPROM of the control unit **A-F02** or incorrect operation of the ECU **A-F02**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **4**age.

2. Connect the diagnostic tool to the engine control unit (ECU) **A-F02** and check the correct programming of the IMA code of injector 1.

   A. If the IMA code of injector 1 has not been programmed or is not correct, programme the correct IMA code of injector 1.

   B. If the programmed IMA code is correct, pass on to point **3**age.

3. Connect the diagnostic tool to the engine control unit (ECU) **A-F02** and re-flash the control unit software with the latest version available.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 8D021F 653-31 - Injector cylinder 3: invalid programming of IMA code

## Control Module: FPT ECU

**Fault Description:**
The injectors are individually corrected (IMA code) to ensure the exact injection quantity of each injector from the lowest to the highest quantity. The correction is performed at the end of the production line (EOL) and after replacing the injectors with the tester. The data is stored in the EEPROM of the engine control unit **A-F02** and the values stored in the EEPROM are protected with checksum parameters. At each key "on", the correction data is read by the EEPROM and the values are checked to identify if they are plausible and the checksums are correct. Otherwise, the injector will not be corrected and the fault will be stored. Incorrect checksums of the injector adjustment codes may be reported, or the basic correction amount of at least 1 correction class is not within the acceptable range for this class, or the injector adjustment values might not be read at due to incorrect access to the EEPROM.

**Cause:**
An invalid IMA code has been programmed for injector 3, or there is an incorrect initialization of the EEPROM of the control unit **A-F02** or incorrect operation of the ECU **A-F02**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Connect the diagnostic tool to the engine control unit (ECU) **A-F02** and check the correct programming of the IMA code of injector 3.

   A. If the IMA code of injector 3 has not been programmed or is not correct, programme the correct IMA code of injector 3.

   B. If the programmed IMA code is correct, go to **3**required.
3. Connect the diagnostic tool to the engine control unit (ECU) **A-F02** and re-flash the control unit software with the latest version available.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 654-31 8E021F - Injector cylinder 4: invalid programming of IMA code

## Control Module: FPT ECU

**Fault Description:**
The injectors are individually corrected (IMA code) to ensure the exact injection quantity of each injector from the lowest to the highest quantity. The correction is performed at the end of the production line (EOL) and after replacing the injectors with the tester. The data is stored in the EEPROM of the engine control unit **A-F02** and the values stored in the EEPROM are protected with checksum parameters. At each key "on", the correction data is read by the EEPROM and the values are checked to identify if they are plausible and the checksums are correct. Otherwise, the injector will not be corrected and the fault will be stored. Incorrect checksums of the injector adjustment codes may be reported, or the basic correction amount of at least 1 correction class is not within the acceptable range for this class, or the injector adjustment values might not be read at due to incorrect access to the EEPROM.

**Cause:**
An invalid IMA code has been programmed for injector 4, or there is an incorrect initialization of the EEPROM of the control unit **A-F02** or incorrect operation of the ECU **A-F02**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Connect the diagnostic tool to the engine control unit (ECU) **A-F02** and check the correct programming of the IMA code of injector 4.

   A. If the IMA code of injector 4 has not been programmed or is not correct, programme the correct IMA code of injector 4.

   B. If the programmed IMA code is correct, go to **3**required.

3. Connect the diagnostic tool to the engine control unit (ECU) **A-F02** and re-flash the control unit software with the latest version available.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 8C021F 652-31 - Injector cylinder 2: invalid programming of IMA code

## Control Module: FPT ECU

**Fault Description:**
The injectors are individually corrected (IMA code) to ensure the exact injection quantity of each injector from the lowest to the highest quantity. The correction is performed at the end of the production line (EOL) and after replacing the injectors with the tester. The data is stored in the EEPROM of the engine control unit **A-F02** and the values stored in the EEPROM are protected with checksum parameters. At each key "on", the correction data is read by the EEPROM and the values are checked to identify if they are plausible and the checksums are correct. Otherwise, the injector will not be corrected and the fault will be stored. Incorrect checksums of the injector adjustment codes may be reported, or the basic correction amount of at least 1 correction class is not within the acceptable range for this class, or the injector adjustment values might not be read at due to incorrect access to the EEPROM.

**Cause:**
An invalid IMA code has been programmed for injector 2, or there is an incorrect initialization of the EEPROM of the control unit **A-F02** or incorrect operation of the ECU **A-F02**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Connect the diagnostic tool to the engine control unit (ECU) **A-F02** and check the correct programming of the IMA code of injector 2.

   A. If the IMA code of injector 2 has not been programmed or is not correct, programme the correct IMA code of injector 2.

   B. If the programmed IMA code is correct, go to **3**required.
3. Connect the diagnostic tool to the engine control unit (ECU) **A-F02** and re-flash the control unit software with the latest version available.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 7026-3 721B03 - Short circuit to battery on the fuel metering unit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the fuel pressure regulation solenoid valve **Y-F07**. If the ECU **A-F02** detects a short circuit to battery, this fault occurs.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring towards the solenoid valve for fuel pressure adjustment **Y-F07** or a malfunction of the same solenoid valve.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to battery in the circuit of the fuel pressure regulating solenoid valve **Y-F07**.

   Disconnect the fuel pressure regulating solenoid valve **Y-F07** at the connector **X-F07**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 6** | Battery positive | There should be no continuity |
| **X-F02E (Receptacle) pin 7** | Battery positive | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, leave the connectors disconnected and go to **3**required.
3. Check the correct operation of the fuel pressure regulating solenoid valve **Y-F07**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the fuel pressure regulating solenoid valve **Y-F07**.

   B. If code remains inactive, return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 721B04 7026-4 - Short circuit to ground on the fuel metering unit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the fuel pressure regulation solenoid valve **Y-F07**. If the ECU **A-F02** detects a short circuit to ground, this fault occurs.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring towards the solenoid valve for fuel pressure adjustment **Y-F07** or a malfunction of the same solenoid valve.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check for a short circuit to ground in the circuit of the fuel pressure regulating solenoid valve **Y-F07**.

   Disconnect the fuel pressure regulating solenoid valve **Y-F07** at the connector **X-F07**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 6** | Mass | There should be no continuity |
| **X-F02E (Receptacle) pin 7** | Mass | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, leave the connectors disconnected and go to **3**required.

3. Check the correct operation of the fuel pressure regulating solenoid valve **Y-F07**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the fuel pressure regulating solenoid valve **Y-F07**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 9C000C 156-12 - ECU internal error - Plausibility error of injection times for temperature compensation

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the plausibility of the injector valve closing correction times of all configured injection types. The valve closing correction times are not plausible. The valve closure correction times of VCC or VCA are tested on their plausible value ranges.

**Cause:**
A malfunction in the ECU **A-F02** or incorrect calibration is detected.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, Contact the THD.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **2**required.

2. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 156-31 9C001F - ECU internal error - Plausibility error of injection closing times

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the plausibility of the injector valve closing correction times of all configured injection types. The valve closing correction times are not plausible. The valve closure correction times of VCC or VCA are tested on their plausible value ranges.

**Cause:**
A malfunction in the ECU **A-F02** or incorrect calibration is detected.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, Contact the THD.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **2**required.

2. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 640001 100-1 - Engine oil pressure below the minimum value

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the engine oil pressure value for plausibility. When the engine is running, the pressure must be higher than a defined minimum value, detected by the low oil level alarm switch **S-F55**. The oil pressure signal is acquired from the connected oil pressure sensor. There is no oil pressure signal or the digital oil pressure switch is not active.

**Cause:**
The ECU **A-F02** detects low engine oil pressure or the low oil level alarm switch **S-F55** is blocked.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.

2. Check that the engine oil level is correct and top up if necessary.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, go to **3**required.

   B. If code remains inactive, return the machine to service.

3. Check the correct operation of the low oil level alarm switch **S-F55**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the low oil level alarm switch **S-F55**.

   B. If code remains inactive, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 100-2 640002 - Engine oil pressure not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the engine oil pressure value for plausibility. When the engine is running, the pressure must be lower than a defined maximum value, detected by the low oil level alarm switch **S-F55**. The oil pressure signal is acquired from the connected oil pressure sensor. The signal is present and the oil pressure digital switch is active.

**Cause:**
The ECU **A-F02** detects a fault in the low oil level alarm switch **S-F55**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **3**required.
2. Check the correct operation of the low oil level alarm switch **S-F55**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the low oil level alarm switch **S-F55**.

   B. If code remains inactive, return the machine to service.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5018-18 9A1312 - Temperature monitoring on OxiCat catalyst: passive monitoring

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the conversion of HC in the catalyst, namely, the performance of the catalyst according to OBD regulations by calculating the minimum expected exothermic energy input in the exhaust (i.e. temperature increase) and comparing it with the measured energy input (temperature increase compared to Oxicat). The following temperatures are used: temperature measured before Oxicat (signal of the temperature sensor before turbine), measured temperature after Oxicat (measured thermal energy) (signal from temperature sensor before turbine), calculated temperature after Oxicat (including thermal energy due to HC conversion) (temperature after turbine), calculated temperature after Oxicat without heat energy by HC conversion (reference temperature) (temperature after the turbine). The "expected/measured" ratio of HC conversion energy is lower than the predetermined threshold

**Cause:**
Temperature sensors before and after Oxicat exchanged. Thermal oxicat aged (efficiency too low) or damaged. Post-injection does not work.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **8**required.
2. Check whether the exhaust gas temperature sensor upstream of the DOC **B-F32** and the exhaust gas temperature sensor upstream of the DPF have been interchanged **B-F33**.

   A. If the sensors have been switched, invert their position.

   B. If the sensors have not been switched, go to **3**required.
3. Check for open circuit in the exhaust gas temperature sensor circuit upstream of the DOC **B-F32** and in the exhaust gas temperature sensor circuit upstream of the DPF **B-F33**.

   Disconnect the exhaust gas temperature sensor upstream of the DOC **B-F32** at the connector **X-F32** and the exhaust gas temperature sensor upstream of the DPF **B-F33** at the connector **X-F33**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 27** | **X-F32 pin 2** | There should be continuity. |
| **X-F02V (Receptacle) pin 30** | **X-F32 pin 1** | There should be continuity. |
| **X-F02V (Receptacle) pin 29** | **X-F33 pin 1** | There should be continuity. |
| **X-F02V (Receptacle) pin 27** | **X-F33 pin 2** | There should be continuity. |

   A. If the results are not as expected for the wiring tests listed above, this indicates an open circuit in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, go to **4**required.
4. Check the correct operation of the exhaust gas temperature sensor upstream of the DOC **B-F32**.

A. If the sensor is not working correctly, replace the exhaust gas temperature sensor upstream of the DOC **B-F32**.

B. If the sensor is working correctly, go to **5**required.

5. Check the correct operation of the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   A. If the sensor is not working correctly, replace the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   B. If the sensor is working correctly, go to **6**required.

6. Check the correct operation of the DOC oxidation catalyst.

   A. If the DOC oxidation catalyst is not working correctly, replace the DOC oxidation catalyst.

   B. If the DOC oxidation catalyst is working correctly, go to **7**required.

7. Check the correct operation of injectors **Y-F11_1**, **Y-F11_2**, **Y-F11_3**, and **Y-F11_4**

   A. If the injectors are not working correctly, replace the injectors which are not working correctly.

   B. If the injectors are working correctly, return the machine to service.

8. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 C31502 5571-2 - Fuel pressure relief valve: average pressure value not correct

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the rail pressure gradients and the pressure relief valve is classified as open after the positive evaluation. If the mean rail pressure is outside the expected range, the pressure relief valve opening evaluation via the mean rail pressure has failed. The average rail pressure is outside the defined expected range.

**Cause:**
The pressure relief valve is not open or not fully open also due to a possible obstruction. The ECU **A-F02** detects incorrect pressure due to faulty pressure relief valve or due to a failure of the PRV valve or rail pressure sensor **B-F09** (intermittent connection).

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check the correct operation of the PRV valve.

   A. If the PRV valve is not working correctly, Replace PRV valve.

   B. If the PRV valve is working correctly, go to **3**required.
3. Check the correct operation of the rail pressure sensor **B-F09**.

   A. If the rail pressure sensor **B-F09** is not working Replace the rail pressure sensor **B-F09**.

   B. If the rail pressure sensor **B-F09** is working return the machine to service.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 B90407 1209-7 - Low pressure upstream of turbine

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the pressure upstream of the turbine which is acquired via the connected exhaust gas pressure sensor **B-F53**. The control unit detects **A-F02** a pressure lower than a predetermined threshold and creates this error.

**Cause:**
The ECU **A-F02** detects a pressure loss due to possible leakage in the exhaust gas circuit or detects a malfunction in the exhaust gas pressure sensor **B-F53**

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**required.

2. Check for leaks in the exhaust gas circuit.

   A. If there are leaks in the exhaust gas circuit, eliminate the leaks restoring the correct circuit.

   B. If there are no leaks in the exhaust gas circuit, go to **3**required.

3. Check the correct operation of the exhaust gas pressure sensor **B-F53**.

   A. If the sensor is not working correctly, replace the exhaust gas pressure sensor **B-F53**.

   B. If the sensor is working correctly, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 B90403 1209-3 - Pressure sensor upstream of turbine: high value

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the pressure upstream of the turbine via the exhaust gas pressure sensor **B-F53**. The error appears when the acquired signal is higher than the preset threshold.

**Cause:**
The ECU **A-F02** detects a short circuit to battery in the wiring or a malfunction of the exhaust gas pressure sensor **B-F53**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**required.

2. Check for a short circuit to battery in the exhaust gas pressure sensor circuit **B-F53**.

   Disconnect the exhaust gas pressure sensor **B-F53** at the connector **X-F53**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 42** | Battery positive | There should be no continuity |
| **X-F02V (Receptacle) pin 63** | Battery positive | There should be no continuity |
| **X-F02V (Receptacle) pin 36** | Battery positive | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to battery in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, leave the connectors disconnected and go to **3**required.

3. Check the correct operation of the exhaust gas pressure sensor **B-F53**.

   A. If the sensor is not working correctly, replace the exhaust gas pressure sensor **B-F53**.

   B. If the sensor is working correctly, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 B90404 1209-4 - Pressure sensor upstream of turbine: low value

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the pressure upstream of the turbine via the exhaust gas pressure sensor **B-F53**. The error appears when the acquired signal is lower than the preset threshold.

**Cause:**
The ECU **A-F02** detects a short circuit to ground in the wiring or a malfunction of the exhaust gas pressure sensor **B-F53**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**required.

2. Check for a short circuit to ground in the exhaust gas pressure sensor circuit **B-F53**.

   Disconnect the exhaust gas pressure sensor **B-F53** at the connector **X-F53**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 42** | Mass | There should be no continuity |
| **X-F02V (Receptacle) pin 63** | Mass | There should be no continuity |
| **X-F02V (Receptacle) pin 36** | Mass | There should be no continuity |

   A. If the results are not as expected for the wiring tests listed above, this indicates a short circuit to ground in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

   B. If the results are as expected in all of the wiring tests listed above, the wiring is okay, leave the connectors disconnected and go to **3**required.

3. Check the correct operation of the exhaust gas pressure sensor **B-F53**.

   A. If the sensor is not working correctly, replace the exhaust gas pressure sensor **B-F53**.

   B. If the sensor is working correctly, return the machine to service.

4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 980002 152-2 - ECU has an internal fault: software resets in DSM 2

## Control Module: FPT ECU

**Fault Description:**
An internal software error occurred which led to a software reset of the engine control unit (ECU) **A-F02**. The evaluation of the reason for the reset is performed after each reset, the reset is activated by the application software.

**Cause:**
Electronic interference, various internal ECU hardware defects **A-F02** or configuration problems. Resets are activated by the application software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **5**required.
2. Check for sources of electromagnetic disturbance on the engine control unit (ECU) **A-F02**.

   A. If there are no sources of electromagnetic disturbance, go to **3**required.

   B. If there are sources of electromagnetic disturbance, eliminate the sources of electromagnetic disturbance.
3. Check the correct power supply of the engine control unit (ECU) **A-F02**.

   A. If the power supply is correct, go to **4**required.

   B. If the power supply is not correct, Restore the correct power supply.
4. Connect the diagnostic tool to the engine control unit (ECU) **A-F02** and re-flash the control unit software with the latest version available.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.
5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 8631-14 B7210E - Information: turbine in cold start protection condition

## Control Module: FPT ECU

**Fault Description:**
In a cold start condition, the turbocharger speed may be limited. When this condition occurs, the ECU **A-F02** activates this information error.

# 295467 700410 1136-16 - Temperature sensor inside ECU: temperature too high

## Control Module: FPT ECU

**Fault Description:**
High temperatures can damage the engine control unit processor **A-F02** and one or more sensors monitor the temperature. The temperature must be within a set range. The sensors detect a temperature above the maximum allowed.

**Cause:**
The ECU **A-F02** receives an excessively high temperature signal from the control unit.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **3**required.

2. Let the engine control unit **A-F02** cool down. Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 1136-18 700412 - Temperature sensor inside ECU: Temperature too low

## Control Module: FPT ECU

**Fault Description:**
Low temperatures can damage the engine control unit processor and one or more sensors monitor the temperature. The temperature must be within a set range. The sensors detect a temperature which is lower than the minimum permitted.

**Cause:**
The ECU **A-F02** receives an excessively low temperature signal from the control unit.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **3**required.
2. Take the vehicle to a place with a higher ambient temperature and wait for the engine control unit to reach the same temperature as the ambient temperature. Let the engine control unit **A-F02** cool down. Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the engine control unit (ECU) **A-F02**.

   B. If code remains inactive, return the machine to service.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 03F0E5 520195-5 - Throttle valve (TVA): open circuit error in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) bridge H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects an open circuit,, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an open circuit in the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in the wiring harness, open circuit.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check the continuity of the wiring of the throttle valve solenoid valve (TVA) **Y-F30B**.

   Disconnect the wiring of the solenoid valve throttle valve (TVA) **Y-F30B**, connector **X-F30B**.

   Disconnect the wiring from the ECU **A-F02** at connector **X-F02E**.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | **X-F02E (Receptacle) pin 16** | There should be continuity |
| **X-F30B pin 5** | **X-F02E (Receptacle) pin 98** | There should be continuity |
| **X-F30B pin 3** | **X-F02E (Receptacle) pin 97** | There should be continuity |
| **X-F30B pin 6** | **X-F02E (Receptacle) pin 8** | There should be continuity |
| **X-F30B pin 2** | **X-F02E (Receptacle) pin 9** | There should be continuity |

   A. If continuity is detected,continue with step **3**.

   B. If there is no continuity,locate and repair the broken connector.
3. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 03F0E6 520195-6 - Throttle valve (TVA): overcurrent error in the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) bridge H, of the throttle solenoid valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a short circuit this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit in the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in the wiring, short circuit.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**, internal short circuit.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | chassis ground | There should be no continuity |
| **X-F30B pin 5** | chassis ground | There should be no continuity |
| **X-F30B pin 6** | chassis ground | There should be no continuity |

   A. If there is no continuity,continue with step **3**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Check for a short circuit to battery working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-On condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 2** | Battery + | There should be no continuity |
| **X-F30B pin 5** | Battery + | There should be no continuity |
| **X-F30B pin 3** | Battery + | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit towards the battery is present.Locate and repair the shorted conductor.
4. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520195-15 03F0EF - Throttle valve (TVA): overtemperature error in the power stage

## Control Module: FPT ECU

***NOTE:*** *If this fault occurs for the first time, no action is required.*

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) bridge H, of the throttle solenoid valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a malfunction of the throttle solenoid valve (TVA) **Y-F30B** due to an excessive temperature or an error on the power status, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a malfunction in the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in the wiring.
2. Fault in the battery, voltage too high.
3. Fault in the engine control unit (ECU) **A-F02**, high internal temperature

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check the correct operation of the battery.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| Battery + | Battery – | it must be **12 V** |

   A. If it is correct, continue with step **3**.

   B. If it is not correct,repair or replace the battery.
3. Check the continuity of the wiring of the throttle valve solenoid valve (TVA) **Y-F30B**.

   Disconnect the wiring of the solenoid valve throttle valve (TVA) **Y-F30B**, connector **X-F102**.

   Disconnect the wiring from the ECU **A-F02** at connector **X-F02E**.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | **X-F02E (Receptacle) pin 16** | There should be continuity |
| **X-F30B pin 5** | **X-F02E (Receptacle) pin 98** | There should be continuity |
| **X-F30B pin 3** | **X-F02E (Receptacle) pin 97** | There should be continuity |
| **X-F30B pin 6** | **X-F02E (Receptacle) pin 8** | There should be continuity |
| **X-F30B pin 2** | **X-F02E (Receptacle) pin 9** | There should be continuity |

   A. If continuity is detected,go to **4**.

B. If there is no continuity,locate and repair the broken connector.

4. Check the correct operation of the engine control unit (ECU) **A-F02**.

   A. If it is working correctly, return the machine to service.

   B. If it is not working correctly, replace the engine control unit (ECU) **A-F02**.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520195-3 03F0E3 - Throttle valve (TVA): short circuit to battery on output 1 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) jumper H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a short circuit to battery on output 1, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery on output 1 of the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in the wiring, short circuit to battery.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 3** | Battery + | There should be no continuity |
| **X-F30B pin 5** | Battery + | There should be no continuity |
| **X-F30B pin 2** | Battery + | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit towards the battery is present.Locate and repair the shorted conductor.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 02F0E3 520194-3 - Throttle valve (TVA): short circuit to battery on output 2 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) jumper H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a short circuit to battery on output 2, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery on output 2 of the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in the wiring, short circuit to battery.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 3** | Battery + | There should be no continuity |
| **X-F30B pin 5** | Battery + | There should be no continuity |
| **X-F30B pin 2** | Battery + | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit towards the battery is present.Locate and repair the shorted conductor.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520195-4 03F0E4 - Throttle valve (TVA): short circuit to ground on output 1 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) jumper H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a short circuit to ground on output 1, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground on output 1 of the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Faulty wiring, short circuit to ground.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | chassis ground | There should be no continuity |
| **X-F30B pin 5** | chassis ground | There should be no continuity |
| **X-F30B pin 6** | chassis ground | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520194-4 02F0E4 - Throttle valve (TVA): short circuit to ground on output 2 of the power stage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) jumper H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a short circuit to ground on output 2, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground on output 2 of the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Faulty wiring, short circuit to ground.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | chassis ground | There should be no continuity |
| **X-F30B pin 5** | chassis ground | There should be no continuity |
| **X-F30B pin 6** | chassis ground | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520194-15 02F0EF - Throttle valve (TVA): plausibility error from overload on the power stage outputs

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the control circuit of the pulse width modulated (PWM) bridge H, of the throttle solenoid valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects a plausibility error which could be due to a short circuit to ground or a short circuit to battery, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a plausibility error due to a short circuit to ground or a short circuit to battery in the throttle solenoid valve (TVA) **Y-F30B**

**Possible failure modes:**

1. Fault in wiring, short circuit to ground or short circuit to battery.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | chassis ground | There should be no continuity |
| **X-F30B pin 5** | chassis ground | There should be no continuity |
| **X-F30B pin 6** | chassis ground | There should be no continuity |

   A. If there is no continuity,continue with step **3**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Check for a short circuit to battery working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-On condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 2** | Battery + | There should be no continuity |
| **X-F30B pin 5** | Battery + | There should be no continuity |
| **X-F30B pin 3** | Battery + | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit towards the battery is present.Locate and repair the shorted conductor.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 520194-5 02F0E5 - Throttle valve (TVA): voltage below the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** internally monitors the operation of the command circuit of the pulse width modulated (PWM) jumper H, of the throttle valve (TVA) **Y-F30B**, to detect electrical defects. If the ECU **A-F02** detects an excessively high output driver supply voltage, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an excessively high output driver supply voltage.

**Possible failure modes:**

1. Fault in the power supply of the vehicle.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, Continue to step **4**required.
2. Check the correct operation of the battery

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly, go to **3**required.
3. Check that the ECU control unit **A-F02** is operating correctly

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 02F0E7 520194-7 - Throttle valve (TVA): stuck in the closed position

## Control Module: FPT ECU

**Fault Description:**
**A-F02** The engine control unit (ECU) monitors the correct operation of the throttle solenoid valve (TVA) **Y-F30B**. If the position sensor inside the TVA sends the ECU a throttle valve position (TVA) **Y-F30B** which differs from the one requested, this fault occurs. The system then tries to release the actuator, open it or close the valve quickly. If it is not possible to release the actuator valve, the fault is activated.

**Cause:**
The ECU **A-F02** has detected a block in the throttle solenoid valve (TVA) **Y-F30B** in the closed position.

**Possible failure modes:**

1. Fault in the throttle solenoid valve (TVA) **Y-F30B** mechanically blocked, dirty.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B** error between the position of the valve and the sensor signal.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**, check the correct position, check that there is no dirt preventing the valve from opening and closing.

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 03F0E7 520195-7 - Throttle valve (TVA): stuck on open position

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the throttle solenoid valve (TVA) **Y-F30B**. If the position sensor inside the TVA sends the ECU a throttle valve position (TVA) **Y-F30B** which differs from the one requested, this fault occurs. The system then tries to release the actuator, open it or close the valve quickly. If it is not possible to release the actuator valve, the fault is activated.

**Cause:**
The ECU **A-F02** has detected a block in the throttle solenoid valve (TVA) **Y-F30B** in the open position.

**Possible failure modes:**

1. Fault in the throttle solenoid valve (TVA) **Y-F30B** mechanically blocked, dirty.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B** error between the position of the valve and the sensor signal.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**, check the correct position, check that there is no dirt preventing the valve from opening and closing.

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5419-3 2B1503 - Throttle valve (TVA): position sensor voltage above the maximum threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the throttle solenoid valve (TVA) **Y-F30B**. If the position sensor inside the TVA sends the ECU a throttle solenoid valve (TVA) **Y-F30B** position which differs from the one required, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to external source or throttle solenoid valve (TVA) **Y-F30B** faulty.

**Possible failure modes:**

1. Fault in the wiring, short circuit to external source.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.
3. The ECU **A-F02** has failed.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | Battery + | There should be no continuity |
| **X-F30B pin 5** | Battery + | There should be no continuity |
| **X-F30B pin 6** | Battery + | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5419-4 2B1504 - Throttle valve (TVA): position sensor voltage below the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the throttle solenoid valve (TVA) **Y-F30B**. If the position sensor inside the TVA sends the ECU a throttle solenoid valve (TVA) **Y-F30B** position which differs from the one required, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit ground or the throttle solenoid valve (TVA) **Y-F30B** is faulty.

**Possible failure modes:**

1. Faulty wiring, short circuit to ground.
2. Fault in the throttle solenoid valve (TVA) **Y-F30B**.
3. The ECU **A-F02** has failed.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**required.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**required.
2. Check for a short circuit to ground working on the wiring of the throttle solenoid valve (TVA) **Y-F30B**.

   With the wiring of the throttle solenoid valve (TVA) **Y-F30B**, connector **X-F30B** , connected and in a Key-Off condition,use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F30B pin 1** | chassis ground | There should be no continuity |
| **X-F30B pin 6** | chassis ground | There should be no continuity |
| **X-F30B pin 5** | chassis ground | There should be no continuity |

   A. If there is no continuity,go to **4**.

   B. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.
3. Check the correct operation of the throttle solenoid valve (TVA) **Y-F30B**

   A. If it is not working correctly,replace it and return the machine to service.

   B. If it is working correctly,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 4766-16 9E1210 - Temperature downstream of the oxidation catalyst is above the maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02 A-F02** monitors the exhaust temperature sensor downstream of the Diesel Oxidation Catalyst (DOC) **B-F33**. If the ECU **A-F02** determines that there is a temperature signal beyond the allowable threshold of the exhaust temperature sensor downstream of the DOC **B-F33**, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** to the last valid value detected or to a fixed replacement value, once the fault is validated.

**Cause:**
The ECU **A-F02** detects excessive temperature on the exhaust temperature sensor downstream of the DOC **B-F33**.

**Possible failure modes:**

1. Fault in the wiring of the exhaust temperature sensor downstream of the DOC **B-F33**.
2. Fault in the exhaust temperature sensor downstream of the DOC **B-F33**, accuracy.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **5**.
2. Check the temperature signal circuit of the exhaust temperature sensor at the exhaust downstream of the DOC **B-F33**.

   Disconnect the engine wiring from the ECU control unit **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F33 pin 1** | **X-F02V (Receptacle) pin 29** | There should be no continuity. |
| **X-F33 pin 2** | **X-F02V (Receptacle) pin 27** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33**, Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to **3**.
3. Check the correct operation f the exhaust temperature sensor downstream of the DOC **B-F33** following the procedure indicated **TEMPERATURE SENSOR - Test (50.74)** .

   A. If the sensor is okay, go to **5**.

   B. If the sensor is not working correctly, go to **4**.
4. Replace the exhaust temperature sensor downstream of the DOC **B-F33**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 4765-16 9D1210 - Temperature upstream of the oxidation catalyst is above the maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the exhaust temperature sensor upstream of the Diesel Oxidation Catalyst (DOC) **B-F32**. If the ECU **A-F02** determines that there is a temperature signal beyond the allowable threshold of the exhaust temperature sensor upstream of the DOC **B-F32**, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** to the last valid value detected or to a fixed replacement value, once the fault is validated.

**Cause:**
The ECU **A-F02** detects excessive temperature on the exhaust temperature sensor upstream of the DOC **B-F32**.

**Possible failure modes:**

1. Fault in the wiring of the exhaust temperature sensor upstream of the DOC **B-F32**.
2. Fault in the exhaust temperature sensor upstream of the DOC **B-F32**, accuracy.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **5**.
2. Check the temperature signal circuit of the exhaust temperature sensor at the upstream of the DOC **B-F32**.

   Disconnect the engine wiring from the ECU control unit **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F32 pin 1** | **X-F02V (Receptacle) pin 30** | There should be no continuity. |
| **X-F32 pin 2** | **X-F02V (Receptacle) pin 27** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F32**, Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.
3. Check the correct operation of the exhaust temperature sensor downstream of the DOC **B-F32** following the procedure indicated **TEMPERATURE SENSOR - Test (50.74)** .

   A. If the sensor is okay, go to step **5**.

   B. If the sensor is not working correctly, go to step **4**.
4. Replace the exhaust temperature sensor upstream of the DOC **B-F32**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 172-2 AC0002 - Plausibility error in temperature sensor 1

## Control Module: FPT ECU

**Fault Description:**
On engine start up, the Engine Control Unit (ECU) **A-F02** monitors up to five temperature sensors for mutual plausibility. If the temperature sensor **B-F65** assigned to position 1 of the plausibility check sends a non-plausible temperature value, this fault is generated.

**Cause:**
A non-plausible temperature value has been detected.

**Possible failure modes:**

1. Fault in the intake air temperature sensor **B-F65**, hardware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**.
2. Check the conditions of the temperature sensor **B-F65**.

   Disconnect the engine wiring (EN) from the temperature sensor **B-F65** connector **X-F65**

   With the ignition switch set to OFF, use a multimeter to measure the resistance of each temperature sensor **B-F65**:

| From | To | Value |
|---|---|---|
| **X-F65 pin 1** | **X-F65 pin 2** | The resistance should be **2 kΩ** |

   A. If the measured resistance is not within the permitted range, this indicates that the temperature sensor **B-F65** has failed internally. Replace sensor.

   B. If the measured resistance is within specification, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 AC000E 172-14 - Plausibility error in temperature sensor 2

## Control Module: FPT ECU

**Fault Description:**
At engine start-up, the Engine Control Unit (ECU) **A-F02** monitors up to five temperature sensors for mutual plausibility. If the pressure and temperature sensor of the intake manifold **B-F48** assigned to position 2 of the plausibility check sends a non-plausible temperature value, this fault is generated.

**Cause:**
A non-plausible temperature value has been detected.

**Possible failure modes:**

1. Faulty intake manifold pressure and temperature sensor **B-F48**, hardware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2** .

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **4** .
2. Check the conditions of the pressure and temperature sensor of the intake manifold **B-F48**.

   Disconnect the engine wiring (EN) from the intake manifold pressure and temperature sensor **B-F48** connector **X-F48**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance on the intake manifold pressure and temperature sensor **B-F48**:

| From | A | Value |
|---|---|---|
| **X-F48 (Plug) pin 1** | **X-F48 (Plug) pin 3** | This should be approximately **2.5 kΩ** at **20.0 °C** (**68.0 °F**). |

   A. If the measured resistance is not within specification, the intake manifold pressure and temperature sensor **B-F48** has failed internally. Replace the sensor.

   B. If the measured resistance is within specification, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damages are found and the display shows normal values, erase fault code.

# 295467 AB0002 171-2 - Plausibility error in temperature sensor 3

## Control Module: FPT ECU

**Fault Description:**
At engine start-up, the Engine Control Unit (ECU) **A-F02** monitors up to five temperature sensors for mutual plausibility. If the oil pressure and temperature sensor **B-F290** assigned to position 3 of the plausibility check sends a non-plausible temperature value, this fault is generated.

**Cause:**
A non-plausible temperature value has been detected.

**Possible failure modes:**

1. Faulty oil pressure and temperature sensor **B-F290**, hardware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **4**.
2. Check the conditions of the oil pressure and temperature sensor **B-F290**.

   Disconnect the engine wiring (EN) from the oil temperature and pressure sensor **B-F290**, connector **X-F290**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance on the oil pressure and temperature sensor **B-F290**:

| From | A | Value |
|---|---|---|
| **X-F290 (Receptacle) pin 1** | **X-F290 (Receptacle) pin 3** | This should be approximately **2.5 kΩ** at **20.0 °C** (**68.0 °F**). |

   A. If the measured resistance is not within specification, the oil pressure and temperature sensor **B-F290** has failed internally. Replace the sensor.

   B. If the measured resistance is within specification, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 7FEDE2 519551-2 - Plausibility error in one or more temperature sensors

## Control Module: FPT ECU

**Fault Description:**
At engine start up, the Engine Control Unit (ECU) **A-F02** monitors up to five temperature sensors for mutual plausibility. If the deviation concerns more than one sensor and it is not possible to clearly identify which of these indicates an incorrect value, this general fault is generated.

**Cause:**
A non-plausible temperature value has been detected.

**Possible failure modes:**

1. Fault in the fuel temperature sensor **B-F04**, hardware.
2. Fault in the intake air temperature sensor **B-F65**, hardware.
3. Faulty intake manifold pressure and temperature sensor **B-F48**, hardware.
4. Faulty oil pressure and temperature sensor **B-F20**, hardware.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2** .

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4** .
2. Check the conditions of each sensor.

   Disconnect the engine wiring (EN) from the fuel temperature sensor **B-F04** connector **X-F04**.

   Disconnect the engine wiring (EN) from the oil temperature and pressure sensor **B-F20**, connector **X-F20**.

   Disconnect the engine wiring (EN) from the intake manifold pressure and temperature sensor **B-F48** connector **X-F48**.

   Disconnect the engine wiring (EN) from the intake air temperature sensor **B-F65** connector **X-F65**.

   With the ignition switch **S-F200** set to OFF, use a multimeter to measure the resistance of each sensor:

| From | To | Value |
|---|---|---|
| **X-F04 (Plug) pin 1** | **X-F04 (Plug) pin 2** | The resistance should be **2 kΩ** |
| **X-F48 (Plug) pin 1** | **X-F48 (Plug) pin 3** | |
| **X-F20 (Plug) pin 1** | **X-F20 (Plug) pin 3** | |
| **X-F65 pin 1** | **X-F65 pin 2** | |

   A. If the resistance measured is not within the specified range, the sensor has failed internally. Replace sensor.

   B. If the measured resistance is within specification, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 168-3 A80003 - ECU internal voltage 5V, transfer box: Battery Voltage is too high

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the battery voltage using internal interfaces. If the ECU **A-F02** determines that the battery voltage is too high, this fault occurs.

**Cause:**
Battery voltage is too high.

**Possible failure modes:**

1. Faulty wiring of the power supply circuit.
2. Faulty battery and/or recharging system.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **6**.

2. Check the battery voltage.

   Engine running.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Battery terminal (+) | Battery terminal (-) | The value should be approximately **12 V** |

   A. If the voltage is not approximately **12 V**, go to **4**.

   B. If the value is approximately **12 V**, go to **3**.

3. Check the power supply circuit.

   Engine running.

   Disconnect the engine wiring from the ECU control unit **A-F02** at connector **X-F02V**.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 1** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 3** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 5** | Frame ground | It must be approx. **12 V** |

   With the engine off and the ignition switch set to OFF.

Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| Engine wiring side of connector **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| Engine wiring side of connector **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| Engine wiring side of connector **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If a value of approximately **12 V** is not detected, or if there is no continuity, go to **4**.

B. If a value of approximately **12 V** is detected and there is continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Check the charging system for proper operation.

   A. If the charging system is not functioning properly, repair the charging system as necessary.

   B. If the charging system is functioning properly, carry out an eddy current absorption test in order to measure the excessive current absorption by the battery. In case of excessive absorption, identify and repair as needed, then recommission the machine..

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 168-4 A80004 - ECU internal voltage 5V, transfer box: Battery voltage too low

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the battery voltage using internal interfaces. If the ECU **A-F02** determines that the battery voltage is too low, this fault occurs.

**Cause:**
Battery voltage is too low.

**Possible failure modes:**

1. Faulty wiring of the power supply circuit.
2. Faulty battery and/or recharging system.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **6**.
2. Check the battery voltage.

   Engine running.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Battery terminal (+) | Battery terminal (-) | The value should be approximately **12 V** |

   A. If the voltage is not approximately **12 V**, go to **4**.

   B. If the value is approximately **12 V**, go to **3**.
3. Check the power supply circuit.

   Engine running.

   Disconnect the engine wiring (EN) from the ECU control unit **A-F02** at connector **X-F02V**.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 1** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 3** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 5** | Frame ground | It must be approx. **12 V** |

   With the engine off and the ignition switch set to OFF.

Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If a value of approximately **12 V** is not detected, or if there is no continuity, go to **4**.

B. If a value of approximately **12 V** is detected and there is continuity, check the ECU **A-096** for the appropriate software and update if necessary.

4. Check the charging system for proper operation.

   A. If the charging system is not functioning properly, repair the charging system as necessary.

   B. If the charging system is functioning properly, carry out an eddy current absorption test in order to measure the excessive current absorption by the battery. In case of excessive absorption, identify and repair as needed, then recommission the machine..

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 EC0F03 4076-3 - Coolant temperature sensor : Engine high temperature

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the signal circuit of the coolant temperature sensor **B-F21**. If the ECU **A-F02** determines that the voltage in the temperature signal circuit is greater than expected, a replacement value is used, calculated according to a curve based on the difference between the oil temperature and the ambient temperature; then this fault occurs.

**Cause:**
The ECU **A-F02** has detected a too high voltage in the temperature signal circuit of the coolant temperature sensor **B-F21**.

**Possible failure modes:**

1. Faulty coolant temperature sensor **B-F21**, internal fault.
2. Faulty temperature signal circuit in the coolant temperature sensor **B-F21** short circuit towards a high voltage source or open circuit.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to step **6**.
2. Check the conditions of the coolant temperature sensor **B-F21**.

   Disconnect the engine wiring from the coolant temperature sensor **B-F21** at connector **X-F21**.

   Use a multimeter to measure the resistance of the coolant temperature sensor **B-F21**:

| From | To | Value |
|---|---|---|
| Coolant temperature sensor **X-F21 pin 1** | Coolant temperature sensor **X-F21 pin 2** | There must be a measurable quantity of resistance according to the effective coolant temperature, between **100 – 50,000 Ω**. |

   A. If there is a measurable amount of resistance, leave the connector disconnected and go to **3**.

   B. If there is infinite resistance, the coolant temperature sensor **B-F21** has failed internally. Replace sensor.
3. Check the circuit of the coolant temperature sensor **B-F21** for an interruption.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | **X-F21 pin 1** | There should be continuity. |

   A. If continuity is detected, leave the connectors disconnected and go to **4**.

B. If there is no continuity, it means that there is an open circuit in the engine wiring between the connector **X-F21 pin 1** of the coolant temperature sensor **B-F21** and the connector **X-F02E (Receptacle) pin 100** of the ECU **A-F02**.Locate and repair the conductor interruption.

4. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards another circuit (high voltage source).

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit (high voltage source) in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connectors disconnected and go to **5**.

5. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards the power supply.

   With the ignition switch set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards power supply in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. In the absence of voltage, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 4076-4 EC0F04 - Coolant temperature sensor : low engine temperature

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the signal circuit of the coolant temperature sensor **B-F21**. If the ECU **A-F02** determines that the voltage in the temperature signal circuit is lower than expected, a replacement value is used, calculated according to a curve based on the difference between the oil temperature and the ambient temperature; then this fault occurs.

**Cause:**
The ECU **A-F02** has detected a too low voltage in the temperature signal circuit of the coolant temperature sensor **B-F21**.

**Possible failure modes:**

1. Faulty coolant temperature sensor **B-F21**, internal fault.
2. Faulty temperature signal circuit in the coolant temperature sensor **B-F21** short circuit towards a low voltage source or short circuit.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Check the conditions of the coolant temperature sensor **B-F21**.

   Disconnect the engine wiring from the coolant temperature sensor **B-F21** at connector **X-F21**.

   Use a multimeter to measure the resistance of the coolant temperature sensor **B-F21**:

| From | To | Value |
|---|---|---|
| Coolant temperature sensor **X-F21 pin 1** | Coolant temperature sensor **X-F21 pin 2** | There must be a measurable quantity of resistance according to the effective coolant temperature, between **100 – 50,000 Ω**. |

   A. If there is a measurable amount of resistance, leave the connector disconnected and go to **3**.

   B. If there is no resistance, the coolant temperature sensor **B-F21** has failed internally. Replace sensor.
3. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch in the OFF position, use a multimeter to perform the following continuity check:

| From | A | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 99** | **X-F02E (Receptacle) pin 100** | There should be no continuity. |

   A. If there is no continuity, leave the connectors disconnected and go to **4**.

B. If there is continuity, there is a short circuit in the engine wiring between the coolant temperature sensor **B-F21** and the ECU **A-F02**.Locate and repair the shorted conductors.

4. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards another circuit (high voltage source).

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 99** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit (low voltage source) in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. If there is no continuity, leave the connectors disconnected and go to **5**.

5. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit to ground.

   With the ignition switch in the OFF position, use a multimeter to perform the following continuity check:

| From | A | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 99** | Frame ground | There should be no continuity. |

   A. If there is continuity, there is a short circuit to ground condition in the signal of the coolant temperature sensor **B-F21**.Locate and repair the shorted circuit.

   B. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 DE0C00 3294-0 - Clear fault memory: the internal counter of the ECU has exceeded the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The number of fault memory cancel requests is monitored. If the counter exceeds 250 requests, the fault memory cancellation is inhibited unless the counter is reset through a procedure protected by "seed and key" algorithm or if the system reaches at least 250 driving cycles without any request of fault memory cancellation.

# 295467 518644-10 F4E9EA - CAN Bus: Timeout errors in the CAN-Receive-Frame BC2EDC1 from Body Computer

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message BC2EDC1 from the vehicle control unit containing information on switch status or ignition request, Cruise Control, engine brake, vehicle speed limit, Trip, Pin code, MIL display, CC/PTO activation. If the ECU **A-F02** detects a timeout error of message BC2EDC1, this fault occurs.

**Cause:**
The ECU **A-F02** has sensed a timeout error of message BC2EDC1.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN fault or low voltage in vehicle control unit.
2. fault in the power supply voltage or ground, missing.
3. Faulty CAN wiring harness, open or short circuit.
4. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive.Go to step **7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to step **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.
4. Check the ECU **A-F02**grounding.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected in all the checks, go to step **5**.

5. Check the CAN circuit of the ECU **A-F02** for a short circuit.

   Disconnect the engine wiring from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | All other pins **X-F02V** | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | All other pins **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the conductor with a short circuit condition.

   B. If no continuity is detected, go to step **6**.

6. Check the ECU CAN circuit **A-F02** for an open circuit condition.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | CAN H terminal | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | CAN L terminal | There should be continuity. |

   A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

   B. If continuity is detected, check that the software of ECU **A-F02** is correct and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 F5E9E9 518645-9 - Timeout error of CAN-receive-frame BC2EDC2 from the body computer

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message BC2EDC2 from the vehicle control unit containing the information on the switch status or ignition request, engine brake, brake, PDF, clutch, neutral gear, vehicle speed limitation, heaters, engine start-up, engine stop, air conditioning system, cab tilting, fan, oil duration monitoring. If the ECU **A-F02** detects a timeout error of message BC2EDC2, this fault occurs.

**Cause:**
The ECU **A-F02** has sensed a timeout error of message BC2EDC2.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN fault or low voltage in vehicle control unit.
2. fault in the power supply voltage or ground, missing.
3. Faulty CAN wiring harness, open or short circuit.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.go to step **7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**required.

5. Check the CAN circuit of the ECU **A-F02** for a short circuit.

   Disconnect the engine wiring from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

   A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. If there is no continuity, go to **6**.

6. Check the ECU CAN circuit **A-F02** for an open circuit condition.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | CAN H terminal | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | CAN L terminal | There should be continuity. |

   A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

   B. If there is continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 1231-11 CF040B - CAN error: error on the CAN network node 1

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** is capable of connecting to and communicating on two separate CAN networks. Correct configuration and monitoring of the two twisted pair configured networks is also a function of the ECU **A-F02**. Node 1 of the CAN bus is the vehicle interface bus. The ECU **A-F02** provides a CAN terminating resistor for node 1 of the CAN Bus inside the ECU **A-F02**. There are three states for the CAN node: "active error", "passive error" and "bus off". When the CAN control unit detects that there are no CAN nodes connected, it switches to "passive error If the CAN control unit detects that a cable is reconnected or a new node is added, it switches to "active error If the CAN node is in short circuit or produces only incorrect information, the state switches to "bus off". If the CAN control unit of the ECU **A-F02** detects a "bus off" fault in node 1 of the CAN for more than 2 events, this fault occurs.

**Cause:**
The ECU **A-F02** has sensed a "Bus Off" state on node 1 of the CAN.

**Possible failure modes:**

1. Fault in the CAN configuration, incorrect phasing.
2. faulty CAN circuit wiring, open circuit, short circuit to ground or short circuit.
3. faulty ECU **A-F02**, terminating resistor or software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the terminating resistor inside the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be **120 Ω**. |

   A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is correct, go to **4**.
4. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

   Disconnect the phase 5 engine wiring from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the ON position, use a multimeter to check the voltage on the phase 5 engine wiring side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Chassis ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Chassis ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to **5**.

5. Check the CAN circuit of the ECU **A-F02** to check for a short circuit.

   Disconnect the phase 5 engine wiring from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

   A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Bend the relevant wiring to identify intermittent faults or short circuits in the cables. Operate the machine while you monitor the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 B3EEE0 519859-0 - Torque limitation: OBD limitation activated

## Control Module: FPT ECU

**Fault Description:**
This fault path is generated for information purposes only. Torque limitation has been activated due to a high concentration of NOx in the exhaust gas. This fault requires checking for other faults that involve torque limitation and which could be present in the relative memory. If this type of fault is present, follow the relative troubleshooting procedure.

# 295467 046710 467-10 1127-16 - Turbocharger boost pressure is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The pressure sensor **B-F48** sends status and feedback information at regular intervals to the engine control unit (ECU) **A-F02** relating to the operating status of the turbocharger. If the pressure sensor **B-F48** detects that the current pressure value of the turbocharger is higher than the set threshold, this fault occurs.

**Cause:**
The ECU **A-F02** detects that the signals of the turbocharger pressure control system deviate from their standard values.

**Possible failure modes:**

1. Fault in the turbocharger actuator.
2. Fault in the overpressure air pressure and temperature sensor **B-F48**.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. Go to step **6**.
2. Check the correct operation of the turbocharger speed sensor ().

   A. If the sensor is okay, continue to step **3**.

   B. If the sensor is not working correctly, replace as required.
3. Check the correct operation of the overpressure air temperature and pressure sensor **B-F48**.

   A. If the sensor is okay, continue to step **4**.

   B. If the sensor is not working correctly, replace as required.
4. Check the correct operation of the exhaust gas pressure sensor inside the exhaust baffle actuator control unit .

   A. If the sensor is okay, continue to step **5**.

   B. If the sensor is not working correctly, Replace the control unit.
5. Carry out checks to test the operation of the turbocharger actuator.

   A. If faults are identified, repair or replace as required.

   B. If the fault has not been resolved, continue to step **6**
6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 6FE8F3 518255-19 - Timeout error of CAN-receive-frame TSC1VE (control bit error)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1VE containing the information regarding torque / speed requested by the vehicle control unit to the ECU **A-F02**. If the ECU **A-F02** detects a checksum error for message TSC1VE, this error occurs. This fault requires no further actions except for checking the presence of other faults in the fault memory which could influence the CAN communication between the vehicle control unit and the ECU **A-F02**. If another fault is present, follow its troubleshooting procedure. If there are no other faults, check the ECU **A-F02** to search the appropriate software and reprogram if necessary.

# 295467 70E8FF 518256-31 - Timeout error of CAN-receive-frame TSC1VE, error condition

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1VE containing the information regarding torque / speed requested by the vehicle control unit to the ECU **A-F02**. If the ECU **A-F02** detects that the TSC1 control request is incorrect and the fault condition occurs constantly, this error occurs. This fault requires no further actions except for checking the presence of other faults in the fault memory which could influence the CAN communication between the vehicle control unit and the ECU **A-F02**. If another fault is present, follow its troubleshooting procedure. If there are no other faults, check the ECU **A-F02** to search the appropriate software and reprogram if necessary.

# 295467 518254-14 6EE8EE - Timeout error of CAN-receive-frame TSC1VE, counter error (lost frame)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1VE containing the information regarding torque / speed requested by the vehicle control unit to the ECU **A-F02**. The rolling counter logics is used to identify any errors due to the intermittent absence of CAN frames. If the ECU **A-F02** detects an error of the rolling counter (missing frame) for message TSC1VE and the fault condition occurs continuously, this error occurs. This fault requires no further actions except for checking the presence of other faults in the fault memory which could influence the CAN communication between the vehicle control unit and the ECU **A-F02**. If another fault is present, follow its troubleshooting procedure. If there are no other faults, check the ECU **A-F02** to search the appropriate software and reprogram if necessary.

# 295467 6FE8E9 518255-9 - Timeout error of CAN-receive-frame TSC1VE from vehicle control unit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1VE containing the information regarding torque/speed requested by the vehicle control unit. If the ECU **A-F02** detects a timeout error for message TSC1VE and the fault condition occurs continuously, this error occurs.

**Cause:**
The ECU **A-F02** has sensed a TSC1VE message timeout.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,.Go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the wiring from the ECU **A-F02** at connector **X-F02V_1**.

With the ignition switch in the ON position, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**. Locate and repair the shorted conductor.

B. In the absence of voltage, go to **7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity on the wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**. Locate and repair the shorted conductor.

B. If no continuity is detected, go to **8**.

8. Check the CAN circuit of the ECU **A-F02** for an open circuit.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | To the pin of CAN H of chassis control module control unit | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | To the pin of CAN L of chassis control module control unit | There should be continuity. |

A. If there is no continuity, there is an open circuit on the CAN network of the ECU **A-F02**. Locate and repair the broken conductor.

B. If continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 70E8E9 518256-9 - Timeout error of CAN-receive-frame TSC1VE from vehicle control unit (active mode)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02**can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1VE CAN message containing the information regarding the torque/speed request from the vehicle control unit.

**Cause:**
The ECU **A-F02** has sensed a TSC1VE message timeout.

**Possible failure modes:**

1. fault in the vehicle system, associated CAN faulty.
2. fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to step **8**.

8. Check the CAN circuit of the ECU **A-F02** for an open circuit.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | To the pin of CAN H of chassis control module control unit | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | To the pin of CAN L of chassis control module control unit | There should be continuity. |

A. If there is no continuity, there is an open circuit on the CAN network of the ECU **A-F02**. Locate and repair the broken conductor.

B. If there is continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 71E8E9 518257-9 - Timeout error of CAN-receive-frame TSC1VE from vehicle control unit (passive mode)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1VE CAN message containing the information regarding the torque/speed request from the vehicle control unit. If the ECU **A-F02** detects a timeout error for the TSC1VE message, and the fault occurs continuously, this fault occurs.

**Cause:**
The ECU **A-F02** has sensed a TSC1VE message timeout.

**Possible failure modes:**

1. fault in the vehicle system, associated CAN faulty.
2. fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase 5 (S5):

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to step **8**.

8. Check the CAN circuit of the ECU **A-F02** for a short circuit.

Disconnect the engine wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 518261-14 75E8EE - Timeout error of CAN-receive-frame VM2EDC, counter error or control bit error

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message VM2EDC which is the proprietary CAN message from the vehicle control unit to the ECU **A-F02** containing the minimum position and intermediate speed parameters. If the ECU **A-F02** detects a checksum error for message VM2EDC and the fault occurs constantly, this fault occurs. This fault requires no further actions except for checking the presence of other faults in the fault memory which could influence the CAN communication between the vehicle control unit and the ECU **A-F02**. If another fault is present, follow its troubleshooting procedure. If there are no other faults, check the ECU **A-F02** to search the appropriate software and reprogram if necessary.

# 295467 518249-9 69E8E9 - CAN communication error between vehicle control unit and engine control unit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN Bus is the main vehicle's interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN Bus inside the ECU **A-F02**. The ECU **A-F02** receives message CAN VM2EDC from the vehicle control unit containing information on the setpoint requested for low minimum, setpoint for high minimum, set of parameters for low minimum, set of parameters for high minimum, set of parameters for intermediate speed, intermediate feedback factor, in braking status.

**Cause:**
The ECU **A-F02** has sensed a VM2EDC message timeout.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN fault or low voltage in vehicle control unit.
2. fault in the power supply voltage or ground, missing.
3. Faulty CAN wiring harness, open or short circuit.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. go to step **7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the CAN circuit of the ECU **A-F02** for a short circuit.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If no continuity is detected, continue with **8**.

6. Check the CAN circuit of the ECU **A-F02** for an open circuit.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | To the pin of CAN H of chassis control module control unit | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | To the pin of CAN L of chassis control module control unit | There should be continuity. |

A. If there is no continuity, there is an open circuit on the CAN network of the ECU **A-F02**. Locate and repair the broken conductor.

B. If continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 9E0010 158-16 - Power stage for diagnostics disengaged due to high battery voltage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the battery voltage using internal interfaces. If the battery voltage is too high, this fault occurs.

**Cause:**
The ECU **A-F02** has detected the battery voltage is too high.

**Possible failure modes:**

1. Faulty wiring of the power supply circuit.
2. Faulty battery and/or recharging system.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Check the battery voltage.

   Motor in operation.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| Battery (+) terminal | Battery (–) terminal | It must be approx. **12 V** |

   A. If there is not approximately **12 V**, go to **4**.

   B. If the reading is approximately **12 V**, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If there is no continuity, Identify and restore power supply to ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**.

5. Check the charging system for proper operation.

   A. If the charging system is not functioning properly, repair the charging system as necessary.

   B. If the charging system is functioning properly, carry out an eddy current absorption test in order to measure the excessive current absorption by the battery. In case of excessive absorption, identify and repair as needed, then recommission the machine..

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 9E0012 158-18 - Power stage for diagnostics disengaged due to low battery voltage

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the battery voltage using internal interfaces. If the battery voltage is too low, this fault occurs.

**Cause:**
The ECU **A-F02** has detected that battery voltage is too low.

**Possible failure modes:**

1. Faulty wiring of the power supply circuit.
2. Faulty battery and/or recharging system.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Check the battery voltage.

   Motor in operation.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| Battery (+) terminal | Battery (–) terminal | It must be approx. **12 V** |

   A. If there is not approximately **12 V**, go to **4**.

   B. If the reading is approximately **12 V**, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If there is no continuity, Identify and restore power supply to ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**.

5. Check the charging system for proper operation.

   A. If the charging system is not functioning properly, repair the charging system as necessary.

   B. If the charging system is functioning properly, carry out an eddy current absorption test in order to measure the excessive current absorption by the battery. In case of excessive absorption, identify and repair as needed, then recommission the machine..

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 110-16 6E0010 - Engine coolant temperature has exceeded the pre-warning threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the engine coolant temperature. Two engine temperature thresholds are available to report a high engine temperature.

**Cause:**
The coolant temperature preventive warning threshold has been exceeded.

**Possible failure modes:**

1. Improper use, engine temperature too high (intensive use or high ambient temperature).
2. Faulty engine cooling system, coolant low, thermostat stuck closed, restricted cooling package etc.

# 295467 6E0000 110-0 - Engine coolant temperature has exceeded the warning threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the engine coolant temperature. Two engine temperature thresholds are available to report a high engine temperature. If the alarm threshold is exceeded, this fault occurs.

**Cause:**
The coolant temperature warning threshold has been exceeded.

**Possible failure modes:**

1. Improper use, engine temperature too high (intensive use or high ambient temperature).
2. Faulty engine cooling system, coolant low, thermostat stuck closed, restricted cooling package etc.

# 295467 170E0E 3607-14 - Engine speed limitation via fuel injection cut off is active

## Control Module: FPT ECU

**Fault Description:**
This is only an informative fault and no corrective actions are required; this fault has been generated by another active fault. The engine control unit (ECU) **A-F02** interrupts the fuel injection in order to limit the engine speed at a controllable range. This procedure is activated whenever the engine speed exceeds the limit threshold and if certain faults are found inside the ECU **A-F02** regarding the reliability of the accelerator pedal signal, fuel injection parameters, or engine speed. IF this fault occurs, this fuel injection interruption procedure activates.

# 295467 190-0 BE0000 - Engine overspeed condition identified

## Control Module: FPT ECU

**Fault Description:**
Engine speed is monitored and a fault is reported in the event of overspeed. In the event of an error in the Engine Control Unit (ECU) **A-F02**or in certain operating conditions, for example when driving downhill, the engine could run with a particularly high and unacceptable speed. During downhill driving, the fault does not indicate the presence of an error, but simply informs the operator of "abnormal use" of the engine. If the engine speed exceeds the threshold, this fault is generated. No corrective action is required, except in cases where the fault/information is repeated frequently. In this case, check the driving conditions of the vehicle, the measured values relating to the engine speed and the injection system to check the set point of the quantity and the actual value at the time the fault is reported; also check for other errors associated with the ECU **A-F02**.

# 295467 AB0003 171-3 - Ambient temperature sensor voltage is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the intake air temperature sensor **B-F65**checking for any short circuits towards a high voltage source or an open circuit. If the ECU **A-F02** determines the presence of a short circuit towards a high voltage source or an open circuit in the temperature signal circuit of the intake air temperature sensor **B-F65**, this fault occurs. If this fault occurs, the ambient temperature value is locked by the ECU **A-F02** on the last valid value detected or on a default replacement value once the fault is validated.

**Cause:**
The ECU **A-F02** has detected high voltage in the intake air temperature signal circuit **B-F65**.

**Possible failure modes:**

1. Fault in the temperature signal of the intake air temperature sensor **B-F65**, short circuit towards a high voltage source or open circuit.
2. Fault in the intake air temperature sensor **B-F65**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Check the temperature signal circuit of the intake air temperature sensor **B-F65** for an open circuit.

   Disconnect the engine wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 76** | **X-F65 pin 1** | There should be continuity. |

   A. If continuity is detected, leave the connectors disconnected and go to **3**.

   B. If there is no continuity, this indicates an open circuit in the engine wiring between the connector **X-F02V (Receptacle) pin 76** and the connector **X-F65 pin 1**.Locate and repair the broken conductor.
3. Check the temperature signal circuit of the intake air temperature sensor **B-F65** for a short circuit to another circuit.

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 76** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If continuity is detected, this indicates a short circuit towards another circuit in the temperature signal circuit of the intake air temperature sensor between cable **X-F65 pin 1** and another cable Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connectors disconnected and go to **4**.

4. Check the temperature signal circuit of the intake air temperature sensor **B-F65** for a short circuit to voltage.

   With the ignition switch set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 76** | Chassis ground | There should be no voltage. |

   A. If voltage is detected, this indicates a short circuit towards a voltage source in the temperature signal circuit of the intake air temperature sensor **B-F65** and another wire. Locate and repair the shorted conductors.

   B. In the absence of voltage, Go to **5**.

5. Replace the intake air temperature sensor **B-F65**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 AB0004 171-4 - Ambient temperature sensor voltage is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature signal circuit of the intake air temperature sensor **B-F65**. If the ECU **A-F02** determines that the voltage in the temperature signal circuit of the intake air temperature sensor **B-F65** is below the expected value, this fault occurs. If this fault occurs, the ambient temperature value is blocked by the ECU **A-F02** at the last valid value detected or at a default value, once the fault is validated.

**Cause:**
The ECU **A-F02** has detected low voltage in the temperature signal circuit of the intake air temperature sensor **B-F65**.

**Possible failure modes:**

1. Fault in the temperature signal of the intake air temperature sensor **B-F65**; short circuit to ground.
2. Fault in the intake air temperature sensor **B-F65**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **4**.
2. Check the temperature signal circuit of the intake air temperature sensor **B-F65** for a short circuit to ground.

   Disconnect the engine wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 76** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 76** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If continuity is detected during one of the checks, this indicates a short circuit to ground or a short circuit towards another circuit in the temperature signal circuit of the intake air temperature sensor between cable **X-F65 pin 1** and another.Locate and repair the damaged or shorted conductor towards another conductor.

   B. If there is no continuity in both checks, Go to **3**.
3. Replace the intake air temperature sensor **B-F65**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 636-2 7C0202 - Camshaft speed sensor pattern is not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** assesses the signal received by the camshaft and crankshaft speed sensors. The angle and speed, the quality and plausibility of the signal are determined. If the ECU **A-F02** determines that the camshaft signal does not match the correct model (edge distance, level) or all camshafts edges required during the engine revolutions are not detected for more than six times, this fault occurs. The ECU **A-F02** uses various monitoring strategies during engine start-up and the normal operation of the engine. If the problem is detected at engine start-up, a redundant synchronisation of the angular system is carried out using only the crankshaft increment signal and the test injections to determine the engine phase. If this procedure is not carried out correctly, the injection is interrupted and the system waits for a restart.

**Cause:**
The ECU **A-F02** has detected a camshaft signal implausibility for more than six times.

**Possible failure modes:**

1. Faulty phasing of the camshaft timing gear plate (phonic wheel).
2. Faulty camshaft sensor **B-F19**, internal fault.
3. Fault in the circuit of the camshaft sensor signal **B-F19**, intermittent open circuit, short circuit, or short circuit to ground.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.

2. Check the circuit of the camshaft sensor signal **B-F19** for open circuit, short circuit, or short circuit to ground.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Disconnect the engine wiring from the camshaft sensor **B-F19**, connector **X-F19**.

   With the ignition switch **SW-F215** in the OFF position, use a multimeter to carry out the following continuity checks by moving the wiring. In this way it is easier to locate any intermittent connections:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 51** | **X-F19 pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 52** | **X-F19 pin 2** | There should be continuity. |
| **X-F02E (Receptacle) pin 51** | chassis ground | There should be no continuity. |
| **X-F02E (Receptacle) pin 52** | chassis ground | There should be no continuity. |
| **X-F02E (Receptacle) pin 51** | All other pins in connector **X-F02V_2** | There should be no continuity. |
| **X-F02E (Receptacle) pin 52** | All other pins in connector **X-F02V_2** | There should be no continuity. |

   A. If the values are not correct while moving or shaking the wiring, this indicates an open circuit, a short circuit, or a short circuit to ground in the signal circuit of the camshaft sensor **B-F19**. Locate and repair the damage to the faulty conductor or conductors.

   B. If the values are correct, leave both connectors disconnected and go to **3**.

3. Check the signal circuit of the camshaft sensor **B-F19** for an intermittent short circuit towards a voltage source.

   With the ignition switch **SW-F215** in the ON position, use a multimeter to carry out the following voltage checks by moving the wiring. In this way it is easier to locate any intermittent connections:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 51** | Chassis ground | There should be no voltage. |
| **X-F02E (Receptacle) pin 52** | Chassis ground | There should be no voltage. |

   A. If there is voltage during one or both checks, there is a short circuit towards a voltage source in the signal circuit of the camshaft sensor **B-F19**. Locate and repair the shorted conductors.

   B. If there is no voltage during both checks, go to **4**.

4. Check the integrity of the sensor of the camshaft **B-F19**.

   Make sure that the sensor installed of the camshaft is the correct one and that it is correctly mounted, and that the sensor is not loose or moving.

   Check the alignment of the camshaft timing gear plate (phonic wheel).

   A. In case of assembly or alignment problems, repair or replace as required.

   B. If no issues are found, go to **5**.

5. Replace the camshaft sensor **B-F19**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. if there are no damages and the display indicates only normal readings, delete the fault code.

# 295467 636-9 7C0209 - Camshaft speed sensor values are not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** assesses the signal received by the camshaft and crankshaft speed sensors. The angle and speed, the quality and plausibility of the signal are determined. If the ECU determines that the camshaft **B-F19** signal is not detected for more than four times during engine revolutions, this fault occurs. The ECU **A-F02** uses various monitoring strategies during engine start-up and the normal operation of the engine. If the problem is detected at engine start-up, a redundant synchronisation of the angular system is carried out using only the crankshaft increment signal and the test injections to determine the engine phase. If this procedure is not carried out correctly, the injection is interrupted and the system waits for a restart.

**Cause:**
The ECU **A-F02** has not detected a camshaft signal for more than four times.

**Possible failure modes:**

1. Faulty camshaft sensor **B-F19**, improperly aligned or mounted.
2. Faulty camshaft sensor cable **B-F19**, open circuit.
3. Faulty camshaft sensor **B-F19**, internal fault.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **5**.
2. Check the signal circuit of the camshaft sensor **B-F19** for an interruption.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Disconnect the engine wiring from the camshaft sensor **B-F19**, connector **X-F19**.

   With the ignition switch **SW-F215** in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Reading |
|---|---|---|
| **X-F02E (Receptacle) pin 51** | **X-F19 pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 52** | **X-F19 pin 2** | There should be continuity. |

   A. If there is continuity during one or both checks, there is an open circuit in the signal circuit of the camshaft sensor **B-F19**.Locate and repair the broken conductor.

   B. If there is continuity in both checks, leave both connectors disconnected and go to **3**.
3. Check the integrity of the sensor of the camshaft **B-F19**.

   Make sure that the sensor installed of the camshaft is the correct one and that it is correctly mounted, and that the sensor is not loose or moving.

   Check the alignment of the camshaft timing gear plate (phonic wheel).

   A. In case of assembly or alignment problems, repair or replace as required.

B. If no issues are found, go to step **4**.

4. Replace the camshaft sensor **B-F19**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. if there are no damages and the display indicates only normal readings, erase fault code.

# 295467 636-31 7C021F - Camshaft and crankshaft speed sensor values are not plausible compared to one another

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the camshaft position sensor **B-F19** and the crankshaft sensor **B-F23** characteristics for angle, speed determination, signal plausibility, and quality.

**Cause:**
The ECU **A-F02** has determined that the offset between the crankshaft signal and the first expected camshaft end is lower than or greater than the correct value for more than four consecutive cycles.

**Possible failure modes:**

1. Faulty engine timing, incorrectly timed.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the engine verifying the correct phasing of the camshaft.

   Check the camshaft phasing.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 7D0202 637-2 - Crankshaft speed sensor pattern is not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** evaluates the signals received from the camshaft and crankshaft speed sensors. The angle and speed, the quality and plausibility of the signal are determined. If engine speed exceeds a set value when the engine is running, the ECU **A-F02** determines that the crankshaft signal is not plausible for more than eight times, the crankshaft signal is considered as disturbed and this fault occurs.

**Cause:**
The ECU **A-F02** has determined the presence of a disturbed signal of the crankshaft sensor **B-F23**.

**Possible failure modes:**

1. Faulty crankshaft sensor **B-F23**, incorrectly aligned or mounted.
2. Faulty signal wiring of the crankshaft sensor **B-F23**, intermittent open circuit.
3. Faulty crankshaft sensor **B-F23**, internal fault.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **5**.

2. Check the signal circuit of the crankshaft sensor **B-F23** for an interruption.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Disconnect the engine wiring (EN) from the crankshaft sensor **B-F23**, connector **X-F23**.

   With the ignition switch **SW-F215** in the OFF position, use a multimeter to carry out the following continuity checks by moving the wiring. In this way it is easier to locate any intermittent connections:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 20** | **X-F23 (Receptacle) pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 21** | **X-F23 (Receptacle) pin 2** | There should be continuity. |

   A. If there is a loss of continuity during one or both checks, there is an intermittent open circuit in the signal circuit of the crankshaft sensor **B-F23**.Locate and repair the broken conductor.

   B. If there is no loss of continuity during both checks, leave both connectors disconnected and go to **3**.

3. Check the integrity of the crankshaft sensor **B-F23**.

   Make sure that the sensor installed of the crankshaft is the correct one and that it is correctly mounted, and that the sensor is not loose or moving.

   A. If there are assembly problems, repair or replace as required.

   B. If no issues are found, go to **4**.

4. Replace the crankshaft sensor **B-F23**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. if there are no damages and the display indicates only normal readings, delete the fault code.

# 295467 637-9 7D0209 - Crankshaft speed sensor values are not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** assesses the signals received by the camshaft and crankshaft speed sensors. The angle and speed, the quality and plausibility of the signal are determined. If engine speed exceeds a set value when the engine is running, the ECU **A-F02** determines that the signal of the crankshaft sensor **B-F23** is not plausible for at least two revolutions of the camshaft and that the signal of the camshaft sensor **B-F19** has been tested and is plausible, this fault occurs.

**Cause:**
The ECU **A-F02** has not detected a plausible signal of the crankshaft sensor **B-F23** for at least two camshaft revolutions.

**Possible failure modes:**

1. Faulty crankshaft sensor **B-F23**, assembly related fault.
2. Faulty crankshaft sensor **B-F23**, internal fault.
3. Faulty circuit of the crankshaft sensor signal **B-F23**, intermittent open circuit, short circuit, or short circuit to ground.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Check the circuit of the crankshaft sensor signal **B-F23** for open circuit, short circuit, or short circuit to ground.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Disconnect the engine wiring from the crankshaft sensor **B-F23**, at connector **X-F23**.

   With the ignition switch **SW-F215** in the OFF position, use a multimeter to carry out the following continuity checks by moving the wiring. In this way it is easier to locate any intermittent connections:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 20** | **X-F23 (Receptacle) pin 1** | There should be continuity. |
| **X-F02E (Receptacle) pin 21** | **X-F23 (Receptacle) pin 2** | There should be continuity. |
| **X-F02E (Receptacle) pin 20** | chassis ground | There should be no continuity. |
| **X-F02E (Receptacle) pin 21** | chassis ground | There should be no continuity. |
| **X-F02E (Receptacle) pin 20** | all other pins in connector **X-F02E** | There should be no continuity. |
| **X-F02E (Receptacle) pin 21** | all other pins in connector **X-F02E** | There should be no continuity. |

   A. If the values are not correct while moving or shaking the wiring, there is an open circuit, a short circuit, or a short circuit towards ground in the signal of the crankshaft sensor **B-F23**. Locate and repair the damage to the faulty conductor or conductors.

   B. If the values are correct, leave both connectors disconnected and go to **3**.
3. Check the signal circuit of the crankshaft sensor **B-F23** for an intermittent short circuit towards a voltage source.

With the ignition switch **SW-F215** in the ON position, use a multimeter to carry out the following voltage checks by moving the wiring. In this way it is easier to locate any intermittent connections:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 20** | Chassis ground | There should be no voltage. |
| **X-F02E (Receptacle) pin 21** | Chassis ground | There should be no voltage. |

A. If there is voltage during one or both checks, there is a short circuit towards a voltage source in the signal circuit of the crankshaft sensor **B-F23**. Locate and repair the shorted conductors.

B. If there is no voltage during both checks, go to **4**.

4. Check the integrity of the sensor of the camshaft **B-F19**.

   Make sure that the sensor installed of the crankshaft is the correct one and that it is correctly mounted, and that the sensor is not loose or moving.

   A. In case of assembly or alignment problems, repair or replace as required.

   B. If no issues are found, go to **5**.

5. Replace the crankshaft sensor **B-F23**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. if there are no damages and the display indicates only normal readings, delete the fault code.

# 295467 BE1400 5310-0 - Hydrocarbon level 1 exceeded

## Control Module: FPT ECU

**Fault Description:**
This fault indicates a warning for component protection caused from excessive Hydrocarbon (HC) levels that have accumulated in the exhaust system.
This may occur even when the engine is left to run at a low load level for a prolonged period of time or idling at low temperatures.
To delete this fault, follow the maintenance instructions for the Selective Catalytic Reduction (SCR) exhaust gas treatment system, or run the engine with a high load to increase the temperature of the engine and exhaust gases. With higher operating temperatures the accumulation of unburnt hydrocarbons will be limited or reduced.

# 295467 BE140E 5310-14 - Hydrocarbon level does not fall far enough after reaching level 1

## Control Module: FPT ECU

**Fault Description:**
This fault indicates a second warning relating to the components protection and is caused by excessive levels of hydrocarbon (HC) accumulated in the exhaust system. This fault occurs after the engine has been restarted and has been left running, and the level of hydrocarbon (HC) has not dropped below the correct value (reset level) of liquid HC in the exhaust system. To delete this fault follow the maintenance instructions for the exhaust treatment of the selective catalytic reduction system (SCR).

# 295467 9D120E 4765-14 - DOC upstream temperature sensor signal drift at cold start

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the signal detected by the exhaust gas temperature sensor upstream of the diesel oxidation catalyst (DOC) **B-F32** and compares its values with those measure by other 3 temperature sensors at the exhaust. If the value measured by the exhaust gas temperature sensor upstream of the DOC **B-F32** differs by more than the maximum permitted limit defined by the ECU **A-F02**, this fault occurs.

**Cause:**
The ECU **A-F02** determines that the signal of the exhaust gas temperature sensor upstream of the DOC **B-F32** has drifted during a cold start.

**Possible failure modes:**

1. Abrupt variations of the ambient temperature surrounding the exhaust gas temperature sensor upstream of the DOC **B-F32**.
2. Faulty exhaust gas temperature sensor upstream of the DOC **B-F32**, internal or wiring fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Use the operator display or the diagnostic instrument to check the status of the following correlated faults.

   **6297-31 4765-3 1899-1F 18991F – Diagnostic fault check for SCR high in oxidation catalyst upstream temperature**

   **4765-4 2999-1F 10649-31 29991F – Diagnostic fault check for SCR low in oxidation catalyst upstream temperature**

   **352C-1F 13612-31 520365-2 352C1F 4766-14 – Upstream oxidation catalyst temperature sensor comparison to a calculated temperature value failure**

   A. If any of the listed faults are active, carry out the diagnostics, then check that the faults have been resolved.

   B. If neither of the listed faults is active, go to **3**.
3. Use the diagnostic instrument to compare the value measured by the exhaust gas temperature sensor upstream of the DOC **B-F32** with the values measured by the exhaust gas temperature sensor upstream of the DPF **B-F33**, by the exhaust gas temperature sensor upstream of the Selective Catalytic Reduction system (RCS) **B-F38**, and by the temperature sensor downstream of the SCR system **B-F39**. Monitor any possible signal drift caused by rapid variations of the ambient temperature. The sensors must have similar characteristics.

   Monitoring must be done after a cold soak condition to avoid any residual heat.

   A. If there are no failures found, Go to **4**.

   B. If any faults are found, check that they are not caused by sudden changes in ambient temperature.
4. Check the integrity of the circuit of the exhaust gas temperature sensor upstream of the DOC **B-F32**.

Disconnect the engine wiring from the exhaust gas temperature sensor upstream of the DOC **B-F32** at connector **X-F32**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

Inspect the relative wiring and connectors checking for damaged, bent, or displaced pins, corroded terminals, or open wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave connector **X-F32** disconnected and go to **5**.

5. Check the correct operation of the exhaust gas temperature sensor upstream of the DOC **B-F32** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to **5**.

6. Replace the exhaust gas temperature sensor upstream of the DOC **B-F32**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   Perform an engine cold start to verify that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 4766-2 9E1202 - SCR upstream temperature sensor signal drift at cold start

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the exhaust gas temperature sensor signal upstream of the DPF **B-F33**. If the ECU **A-F02** determines that this fault has not been deactivated due to another fault – not at high altitudes – and that the last driving cycle was not cold, and the temperature measured by the exhaust gas temperature sensor upstream of the DPF **B-F33** differs from the value measured by the exhaust gas temperature sensor upstream of the DOC **B-F32**, by the exhaust gas temperature sensor upstream of the SCR system **B-F38** and by the exhaust gas temperature sensor downstream of the SCR system **B-F39**, this fault occurs.

**Cause:**
The ECU **A-F02** determines that the signal of the exhaust gas temperature sensor upstream of the DPF **B-F33** has drifted during a cold start.

**Possible failure modes:**

1. Abrupt variations of the ambient temperature surrounding the exhaust gas temperature sensor upstream of the DPF **B-F33**.
2. Fault in the exhaust gas temperature sensor upstream of the DPF **B-F33**, internal fault or fault in the wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **6**.
2. Use the operator display or the diagnostic instrument to check the status of the following correlated faults.

   **4766-3 – High check in signal range**

   **4766-4 – Low check in signal range**

   **3F1C-1F 3F1C1F 3246-2 3242-14 16156-31 – SCR upstream temperature sensor signal drift at cold start**

   A. If any of the listed faults are active, carry out the diagnostics, then check that the faults have been resolved.

   B. If neither of the listed faults is active, Go to **3**.
3. Use the diagnostic instrument to compare the value measured by the exhaust gas temperature sensor upstream of the DPF **B-F33** with the values measured by the exhaust gas temperature sensor upstream of the SCR system **B-F38**, by the exhaust gas temperature sensor upstream of the DOC **B-F32** and by the exhaust gas temperature sensor downstream of the SCR system **B-F39**. Monitor any possible signal drift caused by rapid variations of the ambient temperature. The sensors must have similar characteristics.

   Monitoring must be done after a cold soak condition to avoid any residual heat.

   A. If there are no failures found, Go to **4**.

   B. If any faults are found, check that they are not caused by sudden changes in ambient temperature.
4. Check the integrity of the circuit of the exhaust gas temperature sensor upstream of the DPF **B-F33**.

Disconnect the engine wiring from the exhaust gas temperature sensor upstream of the DPF **B-F33** at connector **X-F113**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

Inspect the relative wiring and connectors checking for damaged, bent, or displaced pins, corroded terminals, or open wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector **X-F33** disconnected and go to **5**.

5. replace the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   Perform an engine cold start to verify that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 4766-14 9E120E - Upstream oxidation catalyst temperature sensor comparison to a calculated temperature value failure

## Control Module: FPT ECU

***NOTE:*** *since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the value detected by the temperature sensor at the exhaust upstream of the diesel oxidation catalyst (DOC) **B-F32**. If the ECU **A-F02** detects that the value detected by the temperature sensor at the exhaust upstream of the DOC **B-F32** is above or below a certain operating limit - which depends on engine rpm, the load, and environmental conditions - established by the ECU **A-F02**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an excessive difference between measured and calculated temperature values.

**Possible failure modes:**

1. Faulty engine operation, incorrect injection pressure or incorrect injection start.
2. Fault in the wiring of the circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32**; insulation damaged, corroded connection, etc.
3. Gas recovery rate from EGR.
4. Fault in the temperature sensor at the exhaust upstream of the DOC **B-F32**, internal fault.
5. Faulty ECU **A-F02**software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **5**.
2. Check the conditions of the temperature sensor at the exhaust upstream of the DOC **B-F32**.

   Disconnect the engine wiring of the vehicle from the temperature sensor at the exhaust upstream of the DOC **B-F32**, connector **X-F32**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the temperature sensor at the exhaust upstream of the DOC **B-F32**.

| From | To | Value |
|---|---|---|
| **X-F32 pin 1** | **X-F32 pin 2** | The value must be between **169.7 – 738.2 Ω** dependant upon the temperature at the exhaust **-40 – 800 °C** (**-40 – 1472 °F**). |

   A. If the measured resistance is not within specification, the temperature sensor at the exhaust upstream of the DOC has failed internally **B-F32**. Replace sensor.

   B. If the measured resistance is within specification, leave the connector disconnected **X-F32** and go to step **3**.
3. Check the integrity of the circuit of the exhaust gas temperature sensor upstream of the DOC **B-F32**.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Inspect the wiring and relative connectors checking for damaged, bent, or displaced pins, corroded terminals, or open or stripped wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector disconnected **X-F32** and go to step **5**.

4. Check the correct operation of the temperature sensor at the exhaust upstream of the DOC **B-F32** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to step **4**.

5. Replace the exhaust gas temperature sensor upstream of the DOC **B-F32**.

   Carry out the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Use the diagnostic tool to check again the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, Check that the ECU software **A-F02** is correct and update, if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 AA0C1F 3242-31 - Upstream SCR temperature sensor comparison to a calculated temperature value failure

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the value measured by the exhaust gas temperature sensor upstream of the DPF **B-F33**. If the ECU **A-F02** determines that the value measured by the exhaust gas temperature sensor upstream of the DPF **B-F33** is higher or lower than a certain operational limit (which depends on the engine speed, on the load, and on ambient conditions) set by the ECU **A-F02**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an excessive difference between measured and calculated temperature values.

**Possible failure modes:**

1. Faulty engine operation, incorrect injection pressure or incorrect injection start.
2. Faulty wiring in the circuit of the exhaust gas temperature sensor upstream of the DPF **B-F33**; damaged insulation, corroded connection, etc.
3. Gas recovery rate from EGR.
4. Fault in the exhaust gas temperature sensor upstream of the DPF **B-F33**, internal fault.
5. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. go to step **5**.
2. Check the conditions of the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   Disconnect the engine wiring from the exhaust gas temperature sensor upstream of the DPF **B-F33** at connector **X-F33**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the exhaust gas temperature sensor upstream of the DPF **B-F33**:

| From | To | Value |
|---|---|---|
| **X-F33 pin 1** | **X-F33 pin 2** | The value must be between **169.7 – 738.2 Ω** dependant upon the temperature at the exhaust **-40 – 800 °C** (**-40 – 1472 °F**). |

   A. If the measured resistance is not within the specified range, this indicates a fault inside the exhaust gas temperature sensor upstream of the DPF **B-F33**. Replace the sensor.

   B. If the measured resistance is within specification, leave the connector **X-F33** disconnected and go to step **3**.
3. Check the integrity of the circuit of the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Inspect the wiring and relative connectors checking for damaged, bent, or displaced pins, corroded terminals, or open or stripped wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector **X-F33** disconnected and go to step **4**.

4. replace the exhaust gas temperature sensor upstream of the DPF **B-F33**.

   Then use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration.

   Carry out the SCR fault verification.

   Use the diagnostic tool to check again the status of this fault.

   A. If the fault has been corrected, return the machine to service.

   B. If the fault has not been corrected, check that the software of ECU **A-F02** is correct and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 61001F 97-31 - Water In Fuel Level Sensor Defect Detection

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the voltage output from the water sensor in the fuel **B-F217** in order to determine the presence of any water in the fuel supply. If water is detected in the fuel, warnings will be displayed to the operator about the risk of damaging the engine if continuing to use the unit. A ground signal from the water sensor in the fuel **B-F217** indicates the presence of water.

**Cause:**
This fault code is displayed to warn the operator that the ECU **A-F02** has detected excess water in the fuel system or a fault in the water in fuel sensor circuit.

**Possible failure modes:**

1. Excess water in the fuel supply.
2. Faulty water in fuel sensor **B-F217**, wiring or internal (mechanical and/or electrical) fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is still present and remains active, continue with step **2**.

   B. If the fault is no longer present or is in an inactive state, continue with **7**.
2. Check fuel for water contamination.

   A. If there is water contamination, continue with step **3**.

   B. If there is no water contamination, continue with **4**.
3. Check the correct operation of the water in fuel sensor **B-F217**.

   Purge fuel supply system, replace fuel filter(s) and refill with fuel that is free of water contamination.

   Start and run the engine for 5 minutes.

   Check for code to return to active status.

   A. If code returns in an active status, replace water in fuel sensor **B-F217**.

   B. If code remains inactive, return the machine to service.
4. Check for open, short, and grounded circuit conditions in the water in fuel sensor **B-F217** circuit.

   Disconnect the water in fuel sensor **B-F217** at connector **X-F217**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Reading |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | **X-F02V (Receptacle) pin 70** | There should be continuity. |
| **X-F217 (Receptacle) pin 2** | **X-F02V (Receptacle) pin 88** | There should be continuity. |
| **X-F217 (Receptacle) pin 3** | **X-F02V (Receptacle) pin 75** | There should be continuity. |

Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 70** | **X-F02V** all other pins | There should be no continuity |
| **X-F02V (Receptacle) pin 88** | **X-F02V** all other pins | There should be no continuity |
| **X-F02V (Receptacle) pin 75** | **X-F02V** all other pins | There should be no continuity |

Then use a multimeter to perform the following tests on the engine wiring phase 5 (S5):

| From | A | Value |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | Ground | There should be no continuity |
| **X-F217 (Receptacle) pin 2** | Ground | There should be no continuity |
| **X-F217 (Receptacle) pin 3** | Ground | There should be no continuity |

A. If the results are not as expected for any of the wiring tests listed above, there is an open, short or grounded circuit condition in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

B. If the results are as expected in all of the wiring tests listed above, the wiring is okay. Leave the connectors disconnected and go to **5**.

5. Check the power supply voltage of the water in fuel sensor **B-F217**.

With the ignition switch in the ON position, use a multimeter to perform the following test on the wiring side of the water in fuel sensor:

| From | To | Reading |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | Grounding | There should be ignition switch voltage. |

A. If there is ignition switch voltage present, continue with step **6**.

B. If no voltage is detected in the ignition switch, there is an open circuit or a short circuit to ground between **X-F217 (Receptacle) pin 1** and **X-F02V (Receptacle) pin 70**. Locate and repair the open circuit or the short circuit in the wiring.

6. Replace the water in fuel sensor **B-F217**, then check to see if this fault has been resolved.

A. If the fault has been resolved, return the machine to service.

B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damages are found and the display shows normal values, erase fault code.

# 295467 174-3 AE0003 - Fuel Temperature Sensor voltage is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the fuel temperature sensor **B-F290** to check for a short circuit towards a high voltage source or an open circuit. If the ECU **A-F02** determines the presence of a short circuit towards a high voltage source or an interruption in the temperature signal circuit of the fuel temperature sensor **B-F290**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a too high voltage in the temperature signal circuit of the fuel temperature sensor **B-F290**.

**Possible failure modes:**

1. Faulty temperature signal wire of the fuel temperature sensor **B-F290**, short circuit towards a high voltage source or open circuit.
2. Faulty fuel temperature sensor **B-F290**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **6**.

2. Check the temperature signal circuit of the fuel temperature sensor **B-F290** for an interruption.

   Disconnect the engine wiring from the fuel temperature sensor **B-F290** at connector **X-F290**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 36** | **X-F290 pin 1** | There should be continuity. |

   A. If there is continuity, leave connectors **X-F290** and **X-F02E** disconnected and go to **3**.

   B. If there is no continuity, this indicates an open circuit condition in the engine wiring between the connector **X-F02E (Receptacle) pin 36** and the connector **X-F290 pin 1**.Locate and repair the broken conductor.

3. Check the temperature signal circuit of the fuel temperature sensor **B-F290** for a short circuit towards another circuit.

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 36** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit of the temperature signal circuit of the fuel temperature sensor **B-F290**. Locate and repair the shorted conductors.

   B. If there is no continuity, leave the connectors disconnected and go to **4**.

4. Check the temperature signal circuit of the fuel temperature sensor **B-F290** for a short circuit towards a voltage source.

   With the ignition switch set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 36** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards a voltage source in the temperature signal circuit of the fuel temperature sensor **X-F02E (Receptacle) pin 36**.Locate and repair the shorted conductors.

   B. In the absence of voltage, go to step **5**.

5. Replace the fuel temperature sensor **B-F290**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is found and the display shows normal values, erase fault code.

# 295467 174-4 AE0004 - Fuel Temperature Sensor voltage is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature signal circuit of the fuel temperature sensor **B-F290**. If the ECU **A-F02** senses that the voltage in the temperature signal circuit of the fuel temperature sensor **B-F290** is below the expected value, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a too low voltage in the temperature signal circuit of the fuel temperature sensor **B-F290**.

**Possible failure modes:**

1. Faulty temperature signal wire of the fuel temperature sensor **B-F290**, short circuit to ground.
2. Faulty fuel temperature sensor **B-F290**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **4**.
2. Check the temperature signal circuit of the fuel temperature sensor **B-F290** for a short circuit to ground.

   Disconnect the engine wiring from the fuel temperature sensor **B-F290** at connector **X-F290**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   With the ignition switch in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 36** | Frame ground | There should be no continuity. |
| **X-F02E (Receptacle) pin 36** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity during one of the checks, there is a short circuit to ground or towards another circuit of the temperature signal circuit of the fuel temperature sensor **B-F290**.Locate and repair the broken or shorted conductor.

   B. If there is no continuity in both checks, go to **3**.
3. Replace the fuel temperature sensor **B-F290**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is found and the display shows normal values, erase fault code.

# 295467 ED0A01 2797-1 - Injector: voltage too low

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the injectors for various electric problems.

**Cause:**
The supercharging voltage diagnostics threshold has not been reached

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**age.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **3**age.

2. Check the correct operation of the ECU **A-F02**.

   Connect the diagnostic instrument to the engine control unit (ECU) **A-F02**, delete the error and check if the fault code returns active.

   A. If code returns in an active status, replace the ECU **A-F02**.

   B. If code remains inactive, return the machine to service.

3. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 8B0205 651-5 - Injector: open circuit of injector 1 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During evaluation of the cylinder 1 injector **Y-F11_1**, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 1 injection nozzle **Y-F11_1** solenoid windings, open circuit.
2. Faulty wiring of cylinder 1 injector circuit **Y-F11_1**, broken or interrupted conductor, high voltage or low voltage side (damaged wiring).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the open circuit condition.

   Disconnect the connector **X-F02E** on the wiring of the control unit of the ECU **A-F02**.

   Disconnect the connector of the wiring **X-F3YZ** from the connector of the injector cover (valves) **X-F3YZ-1**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 64** | **X-F3YZ (Plug) pin A** | There should be continuity |
| **X-F02E (Receptacle) pin 85** | **X-F3YZ (Plug) pin B** | There should be continuity |

   A. If continuity is detected, leave connectors **X-F02E** and **X-F3YZ** disconnected and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 1 injector **Y-F11_1**, high side terminal, at connector **X-F11_1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_1 pin 1**(high voltage side terminal) | **X-F3YZ-1 (Plug) pin A** | There should be continuity |

   A. If continuity is detected, leave the injector wiring connector **X-F11_1** disconnected from the injector of cylinder 1 **Y-F11_1** and go to step **6**.

B. If there is no continuity, there is an open circuit, Locate and repair the broken conductor.

4. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 1 injector **Y-F11_1**, low side terminal, at connector **X-F11_1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_1 pin 2**(low side terminal) | **X-F3YZ-1 (Plug) pin B** | There should be continuity |

   A. If continuity is detected, Locate and repair the broken conductor.

   B. If there is no continuity, there is an open circuit, repair or replace, as required; if the fault code persists contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8D0205 653-5 - Injector: open circuit of injector 2 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 3 injector **Y-F11_3** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 3 injection nozzle **Y-F11_3** solenoid windings, open circuit.
2. Faulty wiring of cylinder 3 injector circuit **Y-F11_3**, broken or interrupted conductor, high voltage or low voltage side (damaged wiring).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the open circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Disconnect the connector of the wiring **X-F3YZ** from the connector of the injector cover (valves) **X-F3YZ-1**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 45** | **X-F3YZ (Plug) pin C** | There should be continuity |
| **X-F02E (Receptacle) pin 24** | **X-F3YZ (Plug) pin D** | There should be continuity |

   A. If continuity is detected, leave connectors **X-F02E** and **X-F3YZ** disconnected and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 3 injector **Y-F11_3**, high side terminal, at connector **X-F11_3**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_3 pin 1**(high voltage side terminal) | **X-F3YZ-1 (Plug) pin D** | There should be continuity |

   A. If continuity is detected, leave the injector wiring connector **X-F11_3** disconnected from the injector of cylinder 3 **Y-F11_3** and go to step **6**.

B. If there is no continuity, there is an open circuit, Locate and repair the broken conductor.

4. Determine the location of the open circuit condition.

   Remove the injector cover (valve) and disconnect the injector wiring from the cylinder 3 injector **Y-F11_3**, low side terminal, at connector **X-F11_3**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_3 pin 2**(low side terminal) | **X-F3YZ-1 (Plug) pin C** | There should be continuity |

   A. If continuity is detected, Locate and repair the broken conductor.

   B. If there is no continuity, there is an open circuit, repair or replace, as required; if the fault persist contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8E0205 654-5 - Injector: open circuit of injector 3 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 4 injection nozzle **Y-F11_4** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 4 injection nozzle **Y-F11_4** solenoid windings, open circuit.
2. Faulty wiring of cylinder 4 injector circuit **Y-F11_4**, broken or interrupted conductor, high voltage or low voltage side (damaged wiring).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the open circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Disconnect the connector of the wiring **X-F3YZ** from the connector of the injector cover (valves) **X-F3YZ-1**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 66** | **X-F3YZ (Plug) pin E** | There should be continuity |
| **X-F02E (Receptacle) pin 87** | **X-F3YZ (Plug) pin F** | There should be continuity |

   A. If continuity is detected, leave connectors **X-F02E** and **X-F3YZ** disconnected and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 4 injector **Y-F11_4**, high side terminal, at connector **X-F11_4**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_4 pin 1**(high voltage side terminal) | **X-F3YZ-1 (Plug) pin E** | There should be continuity |

   A. If continuity is detected, leave the injector wiring connector **X-F11_4** disconnected from the injector of cylinder 4 **Y-F11_4** and go to step **6**.

B. If there is no continuity, there is an open circuit, Locate and repair the broken conductor.

4. Determine the location of the open circuit condition.

   Remove the injector cover (valve) and disconnect the injector wiring from the cylinder 4 injector **Y-F11_4**, low side terminal, at connector **X-F11_4**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_4 pin 2**(low side terminal) | **X-F3YZ-1 (Plug) pin F** | There should be continuity |

   A. If continuity is detected, Locate and repair the broken conductor.

   B. If there is no continuity, there is an open circuit, repair or replace, as required; if the fault persist contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8C0205 652-5 - Injector: open circuit of injector 4 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 2 injector **Y-F11_2** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Fault in cylinder 2 injector **Y-F11_2** solenoid windings, open circuit.
2. Faulty wiring of cylinder 2 injector circuit **Y-F11_2**, broken or interrupted conductor, high voltage or low voltage side (damaged wiring).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the open circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Disconnect the connector of the wiring **X-F3YZ** from the connector of the injector cover (valves) **X-F3YZ-1**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 43** | **X- F3YZ (Plug) pin G** | There should be continuity |
| **X-F02E (Receptacle) pin 22** | **X-F3YZ (Plug) pin H** | There should be continuity |

   A. If continuity is detected, leave connectors **X-F02E** and **X-F3YZ** disconnected and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 2 injector **Y-F11_2**, high side terminal, at connector **X-F11_2**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_2 pin 1**(high voltage side terminal) | **X-F3YZ-1 (Plug) pin H** | There should be continuity |

   A. If continuity is detected, leave the injector wiring connector **X-F11_2** disconnected from the injector of cylinder 2 **Y-F11_2** and go to step **6**.

B. If there is no continuity, there is an open circuit, Locate and repair the broken conductor.

4. Determine the location of the open circuit condition.

   Remove the injector cover (valve) and disconnect the injector wiring from the cylinder 2 injector **Y-F11_2**, low side terminal, at connector **X-F11_2**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_1 pin 2**(low side terminal) | **X- F3YZ (Plug) pin G** | There should be continuity |

   A. If continuity is detected, Locate and repair the broken conductor.

   B. If there is no continuity, there is an open circuit, repair or replace, as required; if the fault persist contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 2797-4 ED0A04 - Injector: short circuit of the HDEV power stage (first bank)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors in the bank 1 cylinder (cylinder 1 and 3). When the specific combination of errors is detected, this fault occurs.

**Cause:**
During cylinder bank 1 evaluation, the pattern for a short circuit condition was detected.

**Possible failure modes:**

1. Fault in the windings of the bank 1 injector solenoid ( **Y-F11_1** or **Y-F11_3**), short circuit to ground.
2. Fault in the wiring of the bank 1 injector ( **Y-F11_1** or **Y-F11_3**), short circuit to ground (wiring damaged).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **8**.
2. Check the wiring of the cylinder 1 injector **Y-F11_1** control circuit to check for a short circuit to ground.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 64** | Chassis ground | There should be no continuity |

   A. If there is no continuity, leave connector **X-F02E** disconnected and go to step **8**.

   B. If there is continuity, go to **3** .
3. Determine location of the short circuit to ground condition.

   Disconnect the connector of the engine wiring **X-F3YZ** from the connector of the cover (valves).

   Use a multimeter to measure the continuity on the injector cover side (valve):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Receptacle) pin A** | Chassis ground | There should be no continuity |

   A. If continuity to chassis ground is not detected, leave connector **X-F3YZ** disconnected and go to **4**.

   B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.
4. Determine location of the short circuit to ground condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 1 injector **Y-F11_1**, high side terminal, at connector **X-F11_1**.

   Use a multimeter to measure the continuity on the injector:

| From | To | Value |
|---|---|---|
| **X-F11_1 pin 1** (high voltage side terminal) | Chassis ground | There should be no continuity |

A. If there is no continuity, this indicates that the cylinder 1 injector solenoid coil is faulty, replace the injector.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

5. Check the wiring of the cylinder 3 injector **Y-F11_3** control circuit to check for a short circuit to ground.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 24** | Chassis ground | There should be no continuity |

A. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If there is continuity, go to **9**.

6. Determine location of the short circuit to ground condition.

   Disconnect the connector of the engine wiring **X-F3YZ** from the connector of the cover (valves).

   Use a multimeter to measure the continuity on the injector cover side (valve):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Receptacle) pin D** | Chassis ground | There should be no continuity |

A. If continuity to chassis ground is not detected, leave the connector **X-F3YZ** disconnected and go to **6**.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

7. Determine location of the short circuit to ground condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 3 injector **Y-F11_3**, high side terminal, at connector **X-F11_3**.

   Use a multimeter to measure the continuity on the injector:

| From | To | Value |
|---|---|---|
| **X-F11_3 pin 1** (high voltage side terminal) | Chassis ground | There should be no continuity |

A. If there is no continuity, this indicates that the cylinder 3 injector solenoid coil is faulty, replace the injector.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

8. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 EE0A04 2798-4 - Injector: short circuit of the HDEV power stage (second bank)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors in the bank 2 cylinder (cylinder 2 and 4). When the specific combination of errors is detected, this fault occurs.

**Cause:**
During cylinder bank 2 evaluation, the pattern for a short circuit condition was detected.

**Possible failure modes:**

1. Fault in the windings of the bank 2 injector solenoid ( **Y-F11_4** or **Y-F11_2**), short circuit to ground.
2. Fault in the wiring of the bank 2 injector ( **Y-F11_4** or **Y-F11_2**), short circuit to ground (wiring damaged).
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **8**.
2. Check the wiring of the cylinder 4 injector **Y-F11_4** control circuit to check for a short circuit to ground.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 66** | Chassis ground | There should be no continuity |

   A. If there is no continuity, leave connector **X-F02E** disconnected and go to step **8**.

   B. If there is continuity, go to **3** .
3. Determine location of the short circuit to ground condition.

   Disconnect the connector of the engine wiring **X-F3YZ** from the injector cover (valves).

   Use a multimeter to measure the continuity on the injector cover side (valve):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Receptacle) pin E** | Chassis ground | There should be no continuity |

   A. If continuity to chassis ground is not detected, leave connector **X-F3YZ** disconnected and go to **4**.

   B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.
4. Determine location of the short circuit to ground condition.

   Remove the injector cover (valve) and disconnect the injector wiring (IN4) from the cylinder 4 injector **Y-F11_4**, high side terminal, connector **X-F11_4**.

   Use a multimeter to measure the continuity on the injector:

| From | To | Value |
|---|---|---|
| **X-F11_4 pin 1** (high voltage side terminal) | Chassis ground | There should be no continuity |

A. If there is no continuity, this indicates that the cylinder 4 injector solenoid coil is faulty, replace the injector.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

5. Check the wiring of the cylinder 2 injector **Y-F11_2** control circuit to check for a short circuit to ground.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 22** | Chassis ground | There should be no continuity |

A. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If there is continuity, go to **9**.

6. Determine location of the short circuit to ground condition.

   Disconnect the connector of the engine wiring **X-F3YZ** from the injector cover (valves).

   Use a multimeter to measure the continuity on the injector cover side (valve):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Receptacle) pin H** | Chassis ground | There should be no continuity |

A. If continuity to chassis ground is not detected, leave the connector **X-F3YZ** disconnected and go to **6**.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

7. Determine location of the short circuit to ground condition.

   Remove the injector cover (valve) and disconnect the injector wiring (IN2) from the cylinder 2 injector **Y-F11_2**, high side terminal, connector **X-F11_2**.

   Use a multimeter to measure the continuity on the injector:

| From | To | Value |
|---|---|---|
| **X-F11_2 pin 1** (high voltage side terminal) | Chassis ground | There should be no continuity |

A. If there is no continuity, this indicates that the cylinder 2 injector solenoid coil is faulty, replace the injector.

B. If there is continuity, a short circuit to ground is present. Locate and repair the shorted circuit.

8. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 651-4 8B0204 - Injector: short circuit on the low level check in injector 1 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 1 injector **Y-F11_1** evaluation, the pattern for a low side short circuit was detected.

**Possible failure modes:**

1. Faulty wiring of cylinder 1 injector **Y-F11_1**, low side circuit in short circuit towards a high voltage source (wiring damaged).
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active, go to **3**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **8**.
2. Check the low side control circuit of cylinder 1 injector **Y-F11_1** for a short circuit towards a high voltage source.

   Disconnect the ECU **A-F02** from the engine wiring, connector **X-F02E**.

   Use a multimeter to check the continuity on the wiring side (EN):

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 64** | All other pins in **X-F02E** | There should be no continuity |
| ***NOTE:*** *the resistance measured in the injector coil is a very small value, typically between* ***0.2 – 0.5 Ω****, present between* ***X-F02E (Receptacle) pin 64*** *and* ***X-F02E (Receptacle) pin 85****.* | | |

   A. If continuity is detected, this indicates a short circuit to a high voltage source, locate and repair the shorted conductors.

   B. If there is no continuity, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 8D0204 653-4 - Injector: short circuit on the low level check in injector 2 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 3 injector **Y-F11_3** evaluation, the pattern for a low side short circuit was detected.

**Possible failure modes:**

1. Faulty wiring of cylinder 3 injector **Y-F11_3**, low side circuit in short circuit towards a high voltage source (wiring damaged).
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active, pass on to point **3**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **8**.
2. Check the low side control circuit of cylinder 3 injector **Y-F11_3** for a short circuit towards a high voltage source.

   Disconnect the ECU **A-F02** from the engine wiring, connector **X-F02E**.

   Use a multimeter to check for continuity on the EN harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 45** | All other pins in **X-F02E** | There should be no continuity |
| ***NOTE:*** *the resistance measured in the injector coil is a very small value, typically between* ***0.2 – 0.5 Ω****, present between* ***X-F02E (Receptacle) pin 45*** *and* ***X-F02E (Receptacle) pin 24****.* | | |

   A. If continuity is detected, this indicates a short circuit to a high voltage source, Locate and repair the shorted conductors.

   B. If no continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 654-4 8E0204 - Injector: short circuit on the low level check in injector 3 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 4 injector **Y-F11_4** evaluation, the pattern for a low side short circuit was detected.

**Possible failure modes:**

1. Faulty wiring of cylinder 4 injector **Y-F11_4**, low side circuit in short circuit towards a high voltage source (wiring damaged).
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active, pass on to point **3**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **8**.
2. Check the low side control circuit of cylinder 4 injector **Y-F11_4** for a short circuit towards a high voltage source.

   Disconnect the ECU **A-F02** from the engine wiring, connector **X-F02E**.

   Use a multimeter to check for continuity on the EN harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 87** | All other pins in **X-F02E** | There should be no continuity |
| ***NOTE:** the resistance measured in the injector coil is a very small value, typically between **0.2 – 0.5 Ω**, present between **X-F02E (Receptacle) pin 87** and **X-F02E (Receptacle) pin 66**.* | | |

   A. If continuity is detected, this indicates a short circuit to a high voltage source, Locate and repair the shorted conductors.

   B. If no continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8C0204 652-4 - Injector: short circuit on the low level check in injector 4 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 2 injector **Y-F11_2** evaluation, the pattern for a low side short circuit was detected.

**Possible failure modes:**

1. Faulty wiring of cylinder 2 injector **Y-F11_2**, low side circuit in short circuit towards a high voltage source (wiring damaged).
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,pass on to point **3**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **8**.
2. Check the cylinder 2 injector **Y-F11_2** high side control circuit for a short circuit to ground condition.

   Disconnect the ECU **A-F02** from the engine wiring, connector **X-F02E**.

   Use a multimeter to check for continuity on the EN harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 43** | All other pins in **X-F02E** | There should be no continuity |
| ***NOTE:*** *the resistance measured in the injector coil is a very small value, typically between* ***0.2 – 0.5 Ω****, present between* ***X-F02E (Receptacle) pin 22*** *and* ***X-F02E (Receptacle) pin 43****.* | | |

   A. If continuity is detected, this indicates a short circuit to a high voltage source, Locate and repair the shorted conductors.

   B. If no continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 651-3 8B0203 - Injector: short circuit between the low level check and the high level check in injector 1 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During evaluation of the cylinder 1 injector **Y-F11_1**, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 1 injector **Y-F11_1** solenoid windings, short circuit.
2. Faulty wiring of cylinder 1 injector **Y-F11_1** circuit, broken or disconnected conductor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the short circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 64** | **X-F02E (Receptacle) pin 85** | There should be no continuity |

   A. If there is no continuity, leave the connector **X-F02E** disconnected and go to step **3**.

   B. If continuity is detected, Locate and repair the broken conductor.
3. Determine the location of the short circuit condition.

   Disconnect **X-F3YZ** and **X-F3YZ-1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Plug) pin A** | **X-F3YZ (Plug) pin B** | There should be no continuity |
| **X-F3YZ-1 (Plug) pin A** | **X-F3YZ-1 (Plug) pin B** | There should be no continuity |

   A. If there is no continuity, leave connectors **X-F3YZ** and **X-F3YZ-1** disconnected and go to step **6**.

   B. If there is continuity, there is a short circuit, Locate and repair the broken conductor.
4. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 1 **Y-F11_1** injector, connector **X-F11_1**.

Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_1 pin 1**(high side terminal) | **X-F11_1 pin 2** (low side terminal) | There should be no continuity |

A. If continuity is detected, Locate and repair the broken conductor.

B. If there is no continuity, contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 653-3 8D0203 - Injector: short circuit between the low level check and the high level check in injector 2 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 3 injector **Y-F11_3** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 3 injector **Y-F11_3** solenoid windings, short circuit.
2. Faulty wiring of cylinder 3 injector **Y-F11_3** circuit, broken or disconnected conductor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the short circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 45** | **X-F02E (Receptacle) pin 24** | There should be no continuity |

   A. If there is no continuity, leave the connector **X-F02E** disconnected and go to step **3**.

   B. If continuity is detected, Locate and repair the broken conductor.
3. Determine the location of the short circuit condition.

   Disconnect **X-F3YZ** and **X-F3YZ-1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Plug) pin C** | **X-F3YZ (Plug) pin D** | There should be no continuity |
| **X-F3YZ-1 (Plug) pin C** | **X-F3YZ-1 (Plug) pin D** | There should be no continuity |

   A. If there is no continuity, leave connectors **X-F3YZ** and **X-F3YZ-1** disconnected and go to step **6**.

   B. If there is continuity, there is a short circuit, Locate and repair the broken conductor.
4. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 3 **Y-F11_3** injector, connector **X-F11_3**.

Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_3 pin 1**(high side terminal) | **X-F11_3 pin 2** (low side terminal) | There should be no continuity |

A. If continuity is detected, Locate and repair the broken conductor.

B. If there is no continuity, contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 654-3 8E0203 - Injector: short circuit between the low level check and the high level check in injector 3 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 4 injection nozzle **Y-F11_4** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 4 injector **Y-F11_4** solenoid windings, short circuit.
2. Faulty wiring of cylinder 4 injector **Y-F11_4** circuit, broken or disconnected conductor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the short circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 66** | **X-F02E (Receptacle) pin 87** | There should be no continuity |

   A. If there is no continuity, leave the connector **X-F02E** disconnected and go to step **3**.

   B. If continuity is detected, Locate and repair the broken conductor.
3. Determine the location of the short circuit condition.

   Disconnect **X-F3YZ** and **X-F3YZ-1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Plug) pin E** | **X-F3YZ (Plug) pin F** | There should be no continuity |
| **X-F3YZ-1 (Plug) pin E** | **X-F3YZ-1 (Plug) pin F** | There should be no continuity |

   A. If there is no continuity, leave connectors **X-F3YZ** and **X-F3YZ-1** disconnected and go to step **6**.

   B. If there is continuity, there is a short circuit, Locate and repair the broken conductor.
4. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 4 **Y-F11_4** injector, connector **X-F11_4**.

Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_4 pin 1**(high side terminal) | **X-F11_4 pin 2** (low side terminal) | There should be no continuity |

A. If continuity is detected, Locate and repair the broken conductor.

B. If there is no continuity, contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8C0203 652-3 - Injector: short circuit between the low level check and the high level check in injector 4 (in firing order)

## Control Module: FPT ECU

**Fault Description:**
Hardware errors in the injectors and the respective supply stages of the Engine Control Unit (ECU) **A-F02** are examined in the ECU **A-F02**. The ECU **A-F02** diagnostics procedure uses a detection scheme to identify the specific errors. When the specific combination of errors is detected, the associated fault occurs.

**Cause:**
During cylinder 2 injector **Y-F11_2** evaluation, the pattern for an open circuit was detected.

**Possible failure modes:**

1. Faulty cylinder 2 injector **Y-F11_2** solenoid windings, short circuit.
2. Faulty wiring of cylinder 2 injector **Y-F11_2** circuit, broken or disconnected conductor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to verify the status of the fault and carry out the cylinder exclusion test.

   A. If the fault is still present and active,go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Determine the location of the short circuit condition.

   Disconnect the connector **X-F02E** of the wiring of the ECU **A-F02**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 43** | **X-F02E (Receptacle) pin 22** | There should be no continuity |

   A. If there is no continuity, leave the connector **X-F02E** disconnected and go to step **3**.

   B. If continuity is detected, Locate and repair the broken conductor.
3. Determine the location of the short circuit condition.

   Disconnect **X-F3YZ** and **X-F3YZ-1**.

   Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F3YZ (Plug) pin G** | **X-F3YZ-1 (Plug) pin G** | There should be no continuity |
| **X-F3YZ-1 (Plug) pin G** | **X-F3YZ-1 (Plug) pin H** | There should be no continuity |

   A. If there is no continuity, leave connectors **X-F3YZ** and **X-F3YZ-1** disconnected and go to step **6**.

   B. If there is continuity, there is a short circuit, Locate and repair the broken conductor.
4. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector wiring from the cylinder 2 **Y-F11_2** injector, connector **X-F11_2**.

Use a multimeter to check the continuity in the injector wiring (valves cover):

| From | To | Value |
|---|---|---|
| **X-F11_2 pin 1**(high side terminal) | **X-F11_2 pin 2** (low side terminal) | There should be no continuity |

A. If continuity is detected, Locate and repair the broken conductor.

B. If there is no continuity, contact the Technical Help Desk.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 C4150E 5572-14 - ECU internal failure - NTP error in ADC monitoring

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** uses a No-load Test Pulse (NTP) operation to check the efficiency of the Analog to Digital Converter (ADC). If an error is detected during this test, this fault will occur.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 C4151F 5572-31 - ECU internal failure - ADC test

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the efficiency of the Analog to Digital Converter (ADC). A fixed incoming test voltage is sent to the ADC and converted. The ECU **A-F02** monitors this test and counts the number of times that the value is not in the specified range. If the counter exceeds 15 times, this fault occurs.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 518203-31 3BE8FF - ECU internal failure - Injection cut off requested by test path

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** includes the so-called redundant stop paths which deactivate all injection supply phases in case some errors inside the ECU **A-F02** are found. In order to check the correct operation of the stop procedure, each path is activate for a short time during the ECU boot, then the fuel injection supply phase is activated. However, since the stop procedure is active, there is no injection if the procedure operates correctly.

**Cause:**
The ECU **A-F02** has failed internally.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 32041F 1074-31 - Position sensor rationality failure

## Control Module: FPT ECU

**Fault Description:**
This function calculates the activation status of the engine brake actuators based on the activation status of the low and high side power supply phases. It also provides information regarding the diagnostic error relating to the engine brake power supply phases. The supply phases of the exhaust baffle are monitored and a plausibility error is detected relative to the release of the exhaust baffle between level 1 and level 2.

**Cause:**
The ECU **A-F02** has failed internally.

**Solution:**

1. Check that the ECU software **A-F02** is correct and re-flash.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 00E8EE 518144-14 - Diagnostic fault check to report the engine speed error

## Control Module: FPT ECU

**Fault Description:**
A redundant check of the engine speed is carried out to monitor functionality at software level 2. The monitoring inside the engine control unit (ECU) **A-F02** takes place on 3 levels: level 1 is the functions level (component monitoring, engine control), level 2 is the function monitoring level (detects the faulty processes of the level 1 functions) and level 3 is the monitoring level of the control unit (checks the correctness of the processing of ECU **A-F02** programme commands). The difference between the engine speed calculated by level 1 and the engine speed calculated by level 2 is higher than the correct threshold or there is an error in the debounce signal.

**Cause:**
The ECU **A-F02** has failed internally.

**Solution:**

1. Check that the ECU software **A-F02** is correct and re-flash.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 5441-2 411502 - Fuel injection energizing time is not plausible

## Control Module: FPT ECU

**Fault Description:**
The plausibility of the injector energising time request is monitored by the monitoring software (level 2) of the engine control unit (ECU). Level 2 of the ECU **A-F02** monitors the level 1 software of the ECU (functional software).

**Cause:**
The ECU **A-F02** has failed internally.

**Solution:**

1. Check that the ECU software **A-F02** is correct and re-flash.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 5441-31 41151F - Fuel injection energizing phase not plausible

## Control Module: FPT ECU

**Fault Description:**
The plausibility of the injector excitation time start is monitored by the monitoring software (level 2) of the engine control unit (ECU). The level 2 of the ECU monitors the software of level 1 of the ECU (functional software). If the system detects a non-plausible excitation start up of the main injection, of the pilot injection, or of the post-injection and the detection is not inhibited by another fault, this fault occurs.

**Cause:**
The ECU **A-F02** has failed internally.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 156-14 9C000E - Fuel injection energizing phase is not plausible (ZFC calibration)

## Control Module: FPT ECU

**Fault Description:**
The plausibility of the excitation start time of the injectors is monitored by the monitoring software (level 2) of the Engine Control Unit (ECU) **A-F02**. The ECU level 2 monitors the software of the ECU level 1 (functional software). If there is an implausible calibration of the quantity of fuel at zero, this fault occurs. Replace the ECU **A-F02**.

# 295467 06E8FF 518150-31 - Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI2 shut-off

## Control Module: FPT ECU

**Fault Description:**
Engine performance is supported by the addition of the pilot injections, main injections and three post-injections. The engine control unit (ECU) **A-F02** monitors the amount of fuel not supplied (shut off) during the post-injection 2 phase in normal mode. Replace the ECU **A-F02** if necessary.

# 295467 518151-31 07E8FF - Diagnostic fault check to report the plausibility error in PoI3 efficiency factor

## Control Module: FPT ECU

**Fault Description:**
The engine performance is supported by the addition of pilot injections, main injections, and post-injections. The engine control unit (ECU) **A-F02** monitors these injections and compares their values against a model. If the post-injection 3 efficiency is not within the relative range of plausible values, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 518219-31 4BE8FF - Internal error: Error in the total injection quantity at level 1

## Control Module: FPT ECU

**Fault Description:**
The engine performance (torque generation) is supported by the addition of pilot injections, main injections, and post-injections. The engine control unit (ECU) **A-F02** monitors these injections and compares their values against a model. If the injection (level 1) is not within the relative range of plausible values, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 4CE8FF 518220-31 - Internal error: Error in the total injection quantity at level 2

## Control Module: FPT ECU

**Fault Description:**
Engine performance (torque generation) is supported by the addition of pilot injections, main injections and post-injections. The Engine Control Unit (ECU) **A-F02** monitors these injections and compares their values against a model. If the injection (level 2) does not fall within the range of plausible values, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 1116-31 5C041F - Diagnostic fault check to report the error due to injection quantity correction

## Control Module: FPT ECU

**Fault Description:**
Engine performance is supported by the addition of pilot injections, main injections and three post-injections. The Engine Control Unit (ECU) **A-F02** monitors the efficiency of these injections and corrects the amount injected if necessary. If the ECU **A-F02** detects that the corrections of the injection quantity is excessive, there is a calibration error and this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 C11402 5313-2 - Diagnostic fault check to report the plausibility error in rail pressure monitoring

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the fuel line pressure to ensure that the engine performances are correct and that there are no safety problems. The pressure in the fuel line is monitored by the ECU **A-F02** to check that the ECU **A-F02** operates correctly. If the ECU **A-F02** detects a non-plausible line pressure during the monitoring phase, the ECU **A-F02** is not operating correctly and this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 49E8FF 518217-31 - ECU internal error - Error detected by the start monitoring system

## Control Module: FPT ECU

**Fault Description:**
The start-up behaviour of the engine is a fundamental safety function. Therefore, an additional monitoring check (level 2) is performed to see if the Engine Control Unit (ECU) **A-F02** is working properly. If level 2 detects an implausible behaviour of the start request while level 1 monitoring does not detect any problems, the ECU **A-F02** is not working properly and this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 518162-31 12E8FF - ECU internal fault - Injector activation time too long

## Control Module: FPT ECU

**Fault Description:**
The torque request of the engine control unit (ECU) **A-F02** can be influenced by many vehicle functions which, in some cases, are incremental, sometimes as a maximum limit, sometimes as a minimum limit. This complex structure can lead to a torque request above the acceptable value for the engine, therefore the total engine torque requested is compared to a maximum engine torque permitted, calculated using a redundant procedure.

**Cause:**
Fault inside the ECU **A-F02** or calibration error.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, Contact the THD.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **2**age.

2. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 518161-31 11E8FF - ECU internal fault - Plausibility error in the torque values

## Control Module: FPT ECU

**Fault Description:**
The torque request of the engine control unit (ECU) **A-F02** can be influenced by various functions of the vehicle which, in some cases, are incremental, sometimes as maximum limit, sometimes as minimum limit. This complex structure may lead to a torque request above the acceptable value for the engine, therefore the total requested engine torque is compared against the maximum permitted engine torque calculated through a redundant procedure. The difference between the effective torque and the permitted torque composes the torque integral. If the integral value accumulated exceeds the maximum threshold determined by the ECU **A-F02**, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 3CE8FF 518204-31 - Internal error ECU- selective monitoring

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the circuit to check for internal faults during the driving cycle. The ECU **A-F02** can select specific components to be monitored with determined parameters of the driving cycle. If an excessive number of monitored parameters are not within specifications, this code occurs. If necessary replace the ECU **A-F02**.

# 295467 B30C02 3251-2 - DPF pressure sensor - Pressure plausibility error

## Control Module: FPT ECU

**Fault Description:**
The Engine control unit (ECU) **A-F02** monitors operation of the diesel particulate filter (DPF) delta pressure sensor **B-F34**. If during the after-run of the ECU **A-F02**, after turning off, the monitoring is not disabled by another fault and the signal of the delta pressure sensor of the DPF **B-F34** is below the correct value, this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the signal of the delta pressure sensor of the DPF **B-F34** is below the permitted tolerance value.

**Possible failure modes:**

1. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Use the diagnostic instrument to check for other faults relating to the DPF delta pressure sensor **B-F34**.

   A. If another fault is present, resolve it. Then determine if this fault is also resolved.

   B. If there are no other faults present, continue with step **2**.
2. Replace the DPF delta pressure sensor **B-F34**.

   Use the diagnostic instrument to check that this fault has been resolved .

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 61E8FF 518241-31 - ECU internal failure - "ABE active" signalled

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the communication, inside the ECU **A-F02**, between the supply stages and the voltage power supply of the supply stage. Replace the ECU **A-F02** if necessary.

# 295467 1648-12 70060C - ECU has an internal fault: "WDA active" reported due to errors in query/response communication

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors communication inside the ECU **A-F02** between the power supply phases and the power unit of the power supply phase. If unexpected communication is detected during monitoring (a wire is active when it should not be), this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 62E8FF 518242-31 - ECU internal failure - "Errorpin active" signalled

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the communication, inside the ECU **A-F02**, between the supply stages and the voltage power supply of the supply stage. If the supply stages are interrupted due to an active pin error, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 700603 1648-3 - ECU internal failure - 'ABE active' reported due to overvoltage detection

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the communication, inside the ECU **A-F02**, between the power supply phases and the voltage power supply of the supply phase. If the ECU **A-F02** detects high voltage while the stop circuit test is not active, this fault occurs. Replace the ECU **A-F02** if necessary.

# 295467 9D121F 4765-31 - Temperature monitoring on OxiCat catalyst: incorrect assembly of temperature sensor

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the Diesel Oxidation Catalyst (DOC) **B-F32** upstream exhaust temperature sensor and the DOC **B-F33** downstream exhaust temperature sensor and reports that the sensor positions have been inverted.

**Cause:**
The ECU **A-F02** has determined that the position of the DOC **B-F32** upstream exhaust temperature sensor and the DOC **B-F33** downstream exhaust temperature have been inverted.

**Possible failure modes:**

1. Fault due to incorrect position of the DOC upstream exhaust temperature sensor **B-F32** and the DOC downstream exhaust temperature sensor **B-F33**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the position of the DOC upstream exhaust temperature sensor **B-F32**.

   Disconnect the phase 5 engine wiring (S5) from the exhaust gas temperature sensor upstream of the DOC **B-F32** at connector **X-F32**.

   Inspect the connector and the respective wiring to verify the correct positioning of the DOC upstream exhaust temperature sensor **B-F32**.

   A. If the position is not correct, switch over the sensors.

   B. If the position is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 6C0010 108-16 - Boost pressure: high physical value

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** analyses the signal of the ambient air pressure sensor to identify any implausible values using different criteria. If any faults are present, the signals are set as invalid and the fault is generated. The measured pressure is checked to see if it is plausible. The ambient air pressure sensor is located inside the ECU **A-F02**. If the ECU **A-F02** detects an ambient pressure higher than the correct value, this fault occurs. If the ECU **A-F02** is not at an extremely low altitude (below sea level), as this fault is caused by an internal fault, replace the ECU **A-F02**.

# 295467 6C0012 108-18 - Boost pressure: low physical value

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** analyses the signal of the ambient air pressure sensor to identify any implausible values using different criteria. If any faults are present, the signals are set as invalid and the fault is generated. The measured pressure is checked to see if it is plausible. The ambient air pressure sensor is located inside the ECU **A-F02**. If the ECU **A-F02** detects an ambient pressure lower than the correct pressure, this fault occurs. If the ECU **A-F02** is not at an extremely high altitude, as this fault is caused by an internal fault, replace the ECU **A-F02**.

# 295467 6C0003 108-3 - Turbocharger boost pressure is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** analyses the signal of the ambient air pressure sensor to identify any implausible values using different criteria. If any faults are present, the signals are set as invalid and the fault is generated. The measured pressure is checked to see if it is plausible. The ambient air pressure sensor is located inside the ECU **A-F02**. If the diagnostic information of the serial processor interface ECU **A-F02** report a continuous status of "value too high", this fault occurs. As this fault is caused by an internal fault, the ECU must be replaced **A-F02**.

# 295467 6C0004 108-4 - Turbocharger boost pressure is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** analyses the signal of the ambient air pressure sensor to identify any implausible values using different criteria. If any faults are present, the signals are set as invalid and the fault is generated. The measured pressure is checked to see if it is plausible. The ambient air pressure sensor is located inside the ECU **A-F02**. If the diagnostic information of the ECU **A-F02** of the serial processor interface (SPI) report a continuous status of "value too low", this fault occurs. As this fault is caused by an internal fault, the ECU must be replaced **A-F02**.

# 295467 108-2 6C0002 - Turbocharger boost pressure: value not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** analyses the signal of the ambient air pressure sensor to identify any implausible values using different criteria. If any faults are present, the signals are set as invalid and the fault is generated. The measured pressure is checked to see if it is plausible. The ambient air pressure sensor is located inside the ECU **A-F02**. If the ambient air pressure sensor inside the ECU **A-F02** reports an implausible status consistently for a set time, this fault occurs. As this fault is caused by an internal fault, the ECU must be replaced **A-F02**.

# 295467 3251-15 B30C0F - DPF pressure sensor: Pressure value on the DPF higher than expected

## Control Module: FPT ECU

**Fault Description:**
If the exhaust gas return pressure reaches values which are too high due to a high level of soot, the system switches to an "alarm status" and the fault is activated. This can reduce engine power to protect the diesel particulate filter (DPF) from damage. The engine control unit **A-F02** monitors exhaust operation until battery voltage exceeds **10 V**, engine speed and the surface temperature of the particulate filter are in standard conditions, there are no suspended regenerations, monitoring is inhibited by another fault and the volume of the exhaust flow is higher than the minimum permitted value established by the ECU. A pressure drop on the filter greater than the exhaust flow, based on limits established by the ECU **A-F02**, in continuous mode equal to a high level of soot which indicates the presence of a severely obstructed DPF means this fault occurs. The vehicle switches to 'emergency mode' and must be subject to maintenance to replace the Selective Catalytic Reduction on the filter (RCSsF).

**Cause:**
The ECU **A-F02** has determined that the DPF delta pressure sensor signal level **B-F34** is too high.

**Possible failure modes:**

1. Fault in the DPF delta pressure sensor signal wire **B-F34**, short circuit to high voltage source.
2. Fault in the DPF differential pressure sensor **B-F34**, internal fault.
3. Faulty ECU **A-F02**software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **5**.
2. Check the DPF delta pressure sensor signal circuit **B-F34** to check for a short circuit to ground or to another circuit.

   Disconnect the DPF delta pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the phase 5 engine wiring (S5) from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks :

| From | To | Value |
|---|---|---|
| **X-F02V pin 15** | Battery positive | There should be no continuity. |
| **X-F02V pin 15** | All other pins in connector **X-F02V_2** | There should be no continuity. |

   A. If there is continuity, there is a short circuit to battery in the DPF delta pressure sensor signal circuit **B-F34**.Locate and repair the shorted conductor.

   B. If no continuity is detected, go to step **4**.
3. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, Check that the ECU software **A-F02** is correct and update, if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 519697-0 11EEE0 - DPF pressure sensor: the differential pressure measured on the DPF exceeds the limit

## Control Module: FPT ECU

**Fault Description:**
If the exhaust gas return pressure reaches values which are too high due to a high level of soot, the system switches to an "alarm status" and the fault is activated. This can reduce engine power to protect the diesel particulate filter (DPF) from damage. The engine control unit (ECU) **A-F02** monitors operation of the exhaust until the battery voltage is above **10 V** and the engine rpm is in standard conditions. A pressure drop on the filter greater than the exhaust flow, based on limits established by the ECU **A-F02**, in continuous mode equal to a high level of soot which indicates an obstructed DPF means this fault occurs. Regeneration of the filter is not correctly completed or is not possible, we recommend managing the manual catalyst (MCM) to return the DPF to the correct condition.

**Cause:**
The ECU **A-F02** has determined that the DPF delta pressure sensor signal level **B-F34** exceeds the limit.

**Possible failure modes:**

1. Fault in the DPF delta pressure sensor signal wire **B-F34**, short circuit to high voltage source.
2. Fault in the DPF differential pressure sensor **B-F34**, internal fault.
3. Faulty ECU **A-F02**software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **5**.
2. Check the DPF delta pressure sensor signal circuit **B-F34** to check for a short circuit to ground or to another circuit.

   Disconnect the DPF delta pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the phase 5 engine wiring (S5) from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks :

| From | To | Value |
|---|---|---|
| **X-F02V pin 15** | Battery positive | There should be no continuity. |
| **X-F02V pin 15** | All other pins in connector **X-F02V_2** | There should be no continuity. |

   A. If there is continuity, there is a short circuit to battery in the DPF delta pressure sensor signal circuit **B-F34**.Locate and repair the shorted conductor.

   B. If no continuity is detected, go to step **4**.
3. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, Check that the ECU software **A-F02** is correct and update, if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 C50D00 3525-0 - Regeneration ends due to time exceeded

## Control Module: FPT ECU

**Fault Description:**
To avoid permanent regeneration of the diesel particulate filter (DPF) due to particular conditions and/or faulty sensors, the maximum duration of each regeneration level, based on the amount of soot detected, is limited with regeneration blocked and is recorded by a counter. The fault recorded is the result of the temperature being too low, therefore the system does not detect a real regeneration. If there are more than two blocked regenerations, this indicates that the system is in a critical situation and this fault is stored in the Engine Control Unit (ECU) **A-F02**. This fault could result in high fuel consumption, a dilution of the engine oil and an overload of the DPF with probable damage caused by the prolonged regeneration period. This fault is probably due to particular conditions of use of the vehicle, for example engine running at idle or low load for a prolonged period of time.

**Cause:**
The ECU **A-F02** has detected regeneration completed due to time expired.

**Possible failure modes:**

1. Fault in the exhaust temperature sensor upstream of the DOC **B-F32**, not efficient, too old, internal fault.
2. Fault in the upstream particulate filter.
3. Fault in the injectors, they do not operate after injection.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive, continue to step **9**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38** for a short circuit.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 29** | All other pins in connector **X-F02V** | There should be no continuity. |
| ***NOTE:*** *The connector **X-F02V (Plug) pin 7** is the ground return side of the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**. The value must be between **169.7 – 738.2 Ω** according to the exhaust temperature **-40 – 800 °C (-40 – 1472 °F)**.* | | |

   A. If continuity is detected, there is a short circuit, in the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**, locate and repair the conductors in a short circuit condition.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.
3. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38** for a short circuit towards a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 29** | Chassis ground | There must be no voltage. |

   A. If voltage is detected, this indicates a short circuit towards a voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F38**, locate and repair the conductors in a short circuit condition.

B. If there is no voltage, continue to step **4**.

4. Check the correct operation of the temperature sensor at the exhaust upstream of the SCR system **B-F38** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, continue to step **6**.

   B. If the sensor is not working correctly, continue to step **5**.

5. Replace the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.

6. Check the correct operation of the differential pressure sensor on the DPF **B-F34** following the procedure indicated **PRESSURE SENSOR - Test (50.71)**.

   A. If the sensor is okay, continue to step **7**.

   B. If the sensor is not working correctly, replace the sensor.

7. Check the correct operation of all the injectors.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If they operate correctly, continue to step **8**.

   B. If they are not working correctly, repair or replace as appropriate.

8. Check correct operation of catalytic converter.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If they operate correctly, return the machine to service.

   B. If they are not working correctly, repair or replace as appropriate.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 5A1510 5466-16 - Particulate filter overloaded (level 2)

## Control Module: FPT ECU

**Fault Description:**
When the regeneration of the filter is insufficient due to low exhaust temperatures for a prolonged period of time (engine running at idle or low load for a prolonged period), or in the presence of a damaged diesel oxidation catalyst (DOC) (not producing supply gas), the flow resistance of the filter can increase to values which are higher than the critical values. The engine control unit (ECU) **A-F02** monitors the soot load levels until battery voltage reaches a value exceeding **10 V** and engine reaches a standard speed. If the soot load level is high or the pressure differential in the diesel particulate filter (DPF) exceeds the limits defined by the ECU **A-F02** based on the exhaust flow, the filter is overloaded (the flow resistance is too high) and this fault occurs. Manual catalytic converter management (MCM) with possible forced thermal treatment at the inlet of the selective catalytic reduction on filter (SCR on F) must be carried out, or the filter must be cleaned.

**Cause:**
The particulate filter regeneration switch is overloaded (second level).

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration , wiring or switch.
2. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check the correct operation of the connector of the particulate filter regeneration switch and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, continue to step **3**.
3. Check the correct operation of the particulate filter regeneration switch by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch . After having carried out the regeneration reset the switch use counter.

   A. If the switch is working correctly, contact the Technical Help Desk.

   B. If the switch is not working correctly, continue to step**4**.
4. Replace the particulate filter regeneration switch.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, continue to step**5**.

5. Check the correct operation of the connector **X-F34** of the DPF differential pressure sensor **B-F34** and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, continue to step **5**.

6. Replace the DPF differential pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 5A1500 5466-0 - Particulate filter overloaded (level 3)

## Control Module: FPT ECU

**Fault Description:**
When the regeneration of the filter is insufficient due to low exhaust temperatures for a prolonged period of time (engine running at idle or low load for a prolonged period), or in the presence of a damaged diesel oxidation catalyst (DOC) (not producing supply gas), the flow resistance of the filter can increase to values which are higher than the critical values. The engine control unit (ECU) **A-F02** monitors the soot load levels until battery voltage reaches a value exceeding **10 V** and engine reaches a standard speed. If the soot load level is high or the pressure differential in the diesel particulate filter (DPF) exceeds the limits defined by the ECU **A-F02** based on the exhaust flow, the filter is overloaded (the flow resistance is too high) and this fault occurs. Manual catalytic converter management (MCM) with possible forced thermal treatment at the inlet of the selective catalytic reduction on filter (SCR on F) must be carried out, or the filter must be cleaned.

**Cause:**
The particulate filter regeneration switch is overloaded (second level).

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration , wiring or switch.
2. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Go to step **7**.
2. Check the correct operation of the connector of the particulate filter regeneration switch and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to step **3**.
3. Check the correct operation of the particulate filter regeneration switch by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch . After having carried out the regeneration reset the switch use counter.

   A. If the switch is working correctly, contact the Technical Help Desk.

   B. If the switch is not working correctly, go to step**4**.
4. Replace the particulate filter regeneration switch.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, go to step**5**.
5. Check the correct operation of the connector **X-F34** of the DPF differential pressure sensor **B-F34** and the wiring to which it is connected.

Check the correct insulation and check there are no problems with the contacts.

A. If a fault is detected, intervene and repair if necessary.

B. If no fault is detected, go to step **5**.

6. Replace the DPF differential pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 102-15 66000F - Plausibility check for high air pressure upstream of intake valve sensor

## Control Module: FPT ECU

**Fault Description:**
The plausibility of the intake manifold pressure measured under low load and low speed conditions is monitored by the engine control unit (ECU) **A-F02**. The intake manifold pressure is compared with the ambient pressure after the ECU **A-F02** initialisation and before the engine starts, until the value detected by the intake manifold temperature and pressure sensor **B-F48** is considered reliable.

**Cause:**
The ECU **A-F02** has determined that the pressure signal of the intake manifold pressure and temperature sensor **B-F48** is out of the high range.

**Possible failure modes:**

1. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
2. Fault ECU **A-F02**, software.

**Solution:**

1. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 660011 102-17 - Plausibility check for low air pressure upstream of intake valve sensor

## Control Module: FPT ECU

**Fault Description:**
The plausibility of the intake manifold pressure measured under low load and low speed conditions is monitored by the engine control unit (ECU) **A-F02**. The intake manifold pressure is compared with the ambient pressure after the ECU **A-F02** initialisation and before the engine starts, until the value detected by the intake manifold temperature and pressure sensor **B-F48** is considered reliable.

**Cause:**
The ECU **A-F02** has determined that the pressure signal of the intake manifold pressure and temperature sensor **B-F48** is out of the low range.

**Possible failure modes:**

1. Fault in the wire of the pressure signal of the intake manifold pressure and temperature sensor **B-F48**, poor connection.
2. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken wires. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions.

   A. If damage is found Repair the damage found during the inspection and then check that the error has been corrected.

   B. If no damage is present, continue with step **2**.
2. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 102-3 660003 - Engine Intake Air Pressure Sensor voltage is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the intake manifold temperature and pressure sensor **B-F48** to check for a short circuit to a high voltage source or an open circuit. If the ECU **A-F02** determines the presence of a short circuit to a high voltage source or an interruption in the pressure signal circuit of the intake manifold temperature and pressure sensor **B-F48**, this fault occurs. If this fault occurs, the pressure is set to the last valid value detected following the preliminary fault report and switches to a default value once the fault has been validated.

**Cause:**
The ECU **A-F02** has sensed a voltage greater than expected in the pressure signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**.

**Possible failure modes:**

1. Fault in the pressure signal wire of the intake manifold temperature and pressure sensor **B-F48**, short circuit to a high voltage source or open circuit.
2. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to step **6**.
2. Check the pressure signal circuit of the intake manifold pressure and temperature sensor **B-F48** to check for an interruption.

   Disconnect the engine wiring (EN) from the intake manifold pressure and temperature sensor **B-F48** connector **X-F48**.

   Disconnect the engine harness (EN) from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E pin 96** | **X-F48 (Plug) pin 4** | There should be continuity. |
| **X-F02E pin 38** | **X-F48 (Plug) pin 3** | There should be continuity. |
| **X-F02E pin 95** | **X-F48 (Plug) pin 1** | There should be continuity. |

   A. If continuity is detected, leave connectors **X-F48** and **X-F02E** disconnected and go to **3**.

   B. If there is no continuity, there is an open circuit,Locate and repair the broken conductor.
3. Check the pressure signal circuit of the intake manifold pressure and temperature sensor **B-F48** to check for a short circuit to another circuit.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E pin 96** | All other pins in connector **X-F02E_6** | There should be no continuity. |

A. If there is continuity, there is a short circuit to another circuit in the pressure signal circuit of the intake manifold temperature and pressure sensor **B-F48**. Locate and repair the shorted conductor.

B. If no continuity is detected, leave the connectors disconnected and go to **4**.

4. Check the pressure signal circuit of the intake manifold pressure and temperature sensor **B-F48** to check for a short circuit to voltage.

   With the ignition switch **S-F200** set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E pin 96** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit to a voltage source in the pressure signal circuit of the intake manifold temperature and pressure sensor **B-F48**. Locate and repair the shorted conductors.

   B. In the absence of voltage, go to step **5**.

5. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-9300** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 660004 102-4 - Engine intake air pressure sensor voltage is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the pressure signal circuit of the intake manifold temperature and pressure sensor **B-F48**. If the ECU **A-F02** determines that the voltage in the pressure sensor circuit of the intake manifold temperature and pressure signal **B-F48** is lower than the expected value, this fault occurs. If this fault occurs, the pressure is set to the last valid value detected following the preliminary reporting of the fault and switches to a default value once the fault has been validated.

**Cause:**
The ECU **A-F02** has sensed a voltage lower than expected in the pressure signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**.

**Possible failure modes:**

1. Fault in the wire of the pressure signal of the intake manifold pressure and temperature sensor **B-F48**, short circuit to ground.
2. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **4**.
2. Check the pressure signal circuit of the intake manifold pressure and temperature sensor **B-F48** to check for a short circuit to ground condition.

   Disconnect the engine wiring (EN) from the intake manifold pressure and temperature sensor **B-F48** connector **X-F48**.

   Disconnect the engine wiring (EN) from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to carry out the following continuity checks:

| From | A | Value |
|---|---|---|
| **X-F02E pin 38** | Frame ground | There should be no continuity. |
| **X-F02E pin 96** | Frame ground | There should be no continuity. |

   A. If there is continuity during one of the checks, there is a short circuit to ground or towards another circuit in the pressure signal circuit of the intake manifold temperature and pressure sensor **B-F48**.Locate and repair the damaged or shorted conductors.

   B. If there is no continuity in both checks, go to **3**.
3. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 519694-7 0EEEE7 - DPF differential pressure sensor: error on pipe sensor

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the diesel particulate filter (DPF) delta pressure sensor **B-F34** and evaluates the filter differential pressure and the change in filter volume flow over time. By monitoring the flexible hoses it is possible to detect drops, obstructions, or blockages in the hose connections of the particulate filter pressure sensor system. If the filter differential pressure signal is lower than the minimum value, this fault occurs. With atmospheric pressure constantly present on the pressure connection upstream of the particulate filter, this fault indicates the presence of a hose connection upstream of the particulate filter disconnected or completely blocked.

**Cause:**
Filter differential pressure sensor **B-F34** error on sensor pipes.

**Possible failure modes:**

1. Fault in the DPF delta pressure sensor **B-F34**, fault in the pipes.
2. Fault in the DPF differential pressure sensor **B-F34**, internal fault.
3. Faulty ECU **A-F02**software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check that the pipes for the DPF delta pressure sensor **B-F34** are correctly fitted and are not faulty.

   A. If a fault is detected, locate it and repair.

   B. If there are no faults on the pipes, go to step **4**.
3. Check that the DPF delta pressure sensor is correctly installed **B-F34**.

   A. If the DPF delta pressure sensor **B-F34** is correctly fitted, go to step **6**.

   B. If there is an error in the assembly, correct the error and install the sensor correctly.
4. Restore the offset drift compensation for the differential pressure sensor **B-F34** using the dedicated UDS routine control service (ID $0253).

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, go to step **5**.
5. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, Check that the ECU software **A-F02** is correct and update, if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 0FEEE7 519695-7 - DPF differential pressure sensor: plausibility error in the pipe

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the operation of the diesel particulate filter (DPF) delta pressure sensor **B-F34** and evaluates the filter differential pressure and the change in filter volume flow over time. By monitoring the flexible hoses, it is possible to detect drops, obstructions, or blockages in the hose connections of the particulate filter pressure sensor system. This error is generated when implausible behaviour of the volume flow signal and the pressure of the differential is detected. This means that the change in the differential pressure is lower than the minimum positive value or higher than the minimum negative value. If this condition is present at low temperatures, this fault occurs. With atmospheric pressure constantly present on the pressure connection upstream of the particulate filter, this fault indicates the presence of a hose connection upstream of the particulate filter disconnected or completely blocked.

**Cause:**
Differential pressure sensor of the filter **B-F34** plausibility error in the pipe.

**Possible failure modes:**

1. Faulty delta pressure sensor of the DPF **B-F34**, pipe fault.
2. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check that the delta pressure sensor pipes of the DPF **B-F34** are correctly installed and are not faulty.

   A. If a fault is detected, locate it and repair.

   B. If there are no faults on the pipes, go to step **4**.
3. Check that the delta pressure sensor of the DPF **B-F34** is correctly installed.

   A. If the delta pressure sensor of the DPF **B-F34** is correctly installed, go to step **5**.

   B. If there is an error in the assembly, correct the error and install the sensor correctly.
4. Check the integrity of the DPF delta pressure sensor control circuit **B-F34**. Check for an open circuit.

   Disconnect the connector **X-F34** at the DPF delta pressure sensor **B-F34**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F34 (Plug) pin 1** | **X-F02V (Plug) pin 42** | There should be continuity |
| **X-F34 (Plug) pin 2** | **X-F02V (Plug) pin 15** | There should be continuity |
| **X-F34 (Plug) pin 3** | **X-F02V (Plug) pin 16** | There should be continuity |

   A. If there is no continuity, repair or replace as required.

   B. If continuity is detected, go to step **6**

5. Reset the offset drift compensation for the differential pressure sensor **B-F34** using the dedicated UDS routine control service (ID $0253).

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, go to step **5**.

6. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3251-3 B30C03 - DPF differential pressure sensor: pressure difference too great

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the diesel particulate filter (DPF) delta pressure sensor **B-F34**. The DPF delta pressure sensor **B-F34** is an advanced sensor that uses SENT (Single Edge Nibble Transmission) technology. SENT technology is intended for use in applications where it high-resolution sensor data has to be transmitted from a sensor to an ECU unit. The DPF delta pressure sensor **B-F34** supplies information to the ECU **A-F02** using 2 fast channels and a slow channel. Fast channel 1 contains the value of the differential pressure, fast channel 2 contains known values for the validation of sensor information, while the slow channel contains warning messages and the configuration and manufacturer codes. The DPF delta pressure sensor **B-F34** contains an integrated circuit for specific applications (ASIC) and a digital signal processor (DSP) based on a microprocessor and monitors the presence of internal faults. If the signal circuit of the DPF delta pressure sensor **B-F34** is above the expected value, the DPF differential pressure is blocked to the last valid value during the preliminary fault signalisation or switches to default value if the fault is validated, and this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the signal level of the DPF delta pressure sensor **B-F34** is too high.

**Possible failure modes:**

1. Fault in the signal wire of the DPF delta pressure sensor **B-F34**, short circuit to a high voltage source.
2. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check the signal circuit of the delta pressure sensor of the DPF **B-F34** for a short circuit to another circuit.

   Disconnect the DPF delta pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the phase 5 engine wiring (S5) from the ECU **A-F02** at the connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V pin 15** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit to another circuit of the delta pressure sensor signal of the DPF **B-F34** Locate and repair the shorted connectors.

   B. If no continuity is detected, leave the connectors disconnected and go to **4**.
3. Check the signal circuit of the delta pressure sensor of the DPF **B-F34** for a short circuit to a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 15** | Chassis ground | There should be no voltage. |

A. If there is voltage, there is a short circuit to a voltage source in the signal circuit of the delta pressure sensor of the DPF **B-F34** Locate and repair the damaged connectors.

B. If there is no voltage, go to step **6**.

4. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 B30C04 3251-4 - DPF differential pressure sensor: pressure difference too low

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the diesel particulate filter (DPF) delta pressure sensor **B-F34**. The DPF delta pressure sensor **B-F34** is an advanced sensor that uses SENT (Single Edge Nibble Transmission) technology. SENT technology is intended for use in applications where it high-resolution sensor data has to be transmitted from a sensor to an ECU unit. The DPF delta pressure sensor **B-F34** supplies information to the ECU **A-F02** using 2 fast channels and a slow channel. Fast channel 1 contains the value of the differential pressure, fast channel 2 contains known values for the validation of sensor information, while the slow channel contains warning messages and the configuration and manufacturer codes. The DPF delta pressure sensor **B-F34** contains an integrated circuit for specific applications (ASIC) and a digital signal processor (DSP) based on a microprocessor and monitors the presence of internal faults. If the signal circuit of the DPF delta pressure sensor **B-F34** is below the expected value, the DPF differential pressure is blocked to the last valid value during the preliminary fault signalisation or switches to default value if the fault is validated, and this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the signal level of the DPF delta pressure sensor **B-F34** is too low.

**Possible failure modes:**

1. Fault in the signal wire of the DPF delta pressure sensor **B-F34**, short circuit to a low voltage source (ground).
2. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **5**.

2. Check the signal circuit of the DPF delta pressure sensor **B-F34** to check for a short circuit to ground or towards another circuit.

   Disconnect the DPF delta pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the phase 5 engine wiring (S5) from the ECU **A-F02** at the connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V pin 15** | Frame ground | There should be no continuity. |
| **X-F02V pin 15** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit to ground or towards another circuit in the signal circuit of the DPF delta pressure sensor **B-F34**.Locate and repair the conductor connected to ground or the shorted conductors.

   B. If no continuity is detected, go to step **4**.

3. Replace the DPF delta pressure sensor **B-F34**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 C3150F 5571-15 - Fuel pressure relief valve reached maximum allowed opening count

## Control Module: FPT ECU

**Fault Description:**
A mechanical pressure relief valve (PRV), integrated in the fuel supply rail, opens if excessive pressure is present in the rail. The engine control unit (ECU) **A-F02** detects and counts the sudden pressure drops in the rail due to the opening of the PRV valve. If more openings than the maximum limit are detected, this fault occurs.

**Cause:**
The PRV opening counter inside the ECU **A-F02**, has exceeded the maximum limit.

**Possible failure modes:**

1. Faulty PRV, check tightness and opening pressure.
2. Faulty fuel metering unit **Y-F07**, wiring.
3. Faulty fuel metering unit **Y-F07**, internal failure.

**Solution:**

1. Check the status of the following related faults:

   **44651F 17509-31 4465-1F 1240-31 1239-0 – Fuel pump pressure has exceeded desired pressure limits**

   **6245-31 18651F 520502-0 1865-1F 1442-0 – Fuel Rail Pressure has exceeded maximum limit**

   **5380-5 – Fuel measuring unit: open circuit**

   **1442-2 – Fuel measuring unit: contact lost between the measuring unit and the control unit**

   **519744-18 22651F 2265-1F 8805-31 520500-18 – Fuel rail pressure has exceeded maximum positive deviation limits**

   **520500-16 519744-15 5477-31 1565-1F 15651F – Fuel Rail Pressure has exceeded maximum negative deviation limits**

   A. If either of the faults are active, diagnose them first and then return to this fault.

   B. If neither of the listed faults is active, go to **2**.
2. Replace the PRV.

   Use the diagnostic tool to verify the status of the **17451F 520400-16 5571-16 5957-31 1745-1F – Pressure relief valve reached maximum allowed open time**.

   A. If the fault has been resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 5571-14 C3150E - Fuel pressure relief valve is forced to open, perform pressure increase

## Control Module: FPT ECU

**Fault Description:**
To determine the wear of the mechanical components or to make the system pass into emergency mode, the electronic control unit (ECU) **A-F02**can force the fuel pressure relief valve open. This action consists of two phases, waiting for the pressure in the rail to increase and then performing the pressure peak. If this operation is controlled by the ECU **A-F02**, this fault occurs. This fault, when it occurs, can generate other related faults due to the increase in fuel pressure. In this case, diagnose these codes as required.

# 295467 5571-10 C3150A - Fuel pressure relief valve is forced to open, perform pressure spike

## Control Module: FPT ECU

**Fault Description:**
To determine the wear of the mechanical components or to make the system pass into emergency mode, the electronic control unit (ECU) **A-F02**can force the fuel pressure relief valve open. This action consists of two phases, waiting for the pressure in the rail to increase and then performing the pressure peak. If this operation is controlled by the ECU **A-F02**, this fault occurs. This fault, when it occurs, can generate other related faults due to the increase in fuel pressure. In this case, diagnose these codes as required.

# 295467 5571-11 C3150B - Fuel pressure relief valve is open

## Control Module: FPT ECU

**Fault Description:**
A mechanical pressure relief valve (PRV), integrated in the fuel supply rail, opens if excessive pressure is present in the rail. The Engine Control Unit (ECU) **A-F02** detects and counts the radical pressure drops in the rail. If opening of the valve is detected, this fault occurs.

**Cause:**
The ECU **A-F02** has detected that the PRV is open.

**Possible failure modes:**

1. The ECU **A-F02** has commanded the PRV open by a pressure shock.
2. Faulty PRV, mechanical fault
3. Faulty mechanical component of the injection system, leak
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **5**.
2. Check the operating condition of the mechanical system of the engine injection system.

   Check that there are no leaks in the system or any other conditions which could cause fuel pressure surges.

   A. If a mechanical condition is present which could cause a pressure surge or fuel leak, repair or replace the component as required.

   B. If there is no mechanical condition present which could cause a pressure surge or fuel leak, check the ECU **A-F02** for the appropriate software and update if necessary.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 5571-16 C31510 - Pressure relief valve reached maximum allowed open time

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The pressure relief valve (PRV), integrated in the fuel line, opens if excessive pressure is present in the rail. The engine control unit (ECU) **A-F02** detects, counts and records the number and duration of PRV openings. If the ECU **A-F02** determines that the PRV has remained open for too long, this fault occurs.

**Cause:**
The ECU **A-F02** has recorded a PRV opening for too long.

**Possible failure modes:**

1. Faulty fuel injection system, causing the PRV to open for an extended period of time.
2. Faulty low pressure fuel lines, clogged fuel filter, faulty charge gear pump, faulty lift pump (if equipped).
3. Faulty fuel metering unit **Y-F07**, internal failure or wiring.
4. Faulty PRV, mechanical failure.
5. Fault in the rail pressure sensor **B-F09**, implausible value.
6. Faulty ECU **A-F02**, software.

**Solution:**

1. Use the diagnostic tool to check if other faults relating to the fuel system, rail pressure or pressure relief valve are active.

   A. If other faults relating to the fuel system, rail pressure or pressure relief valve are active, diagnose them first and then return to this fault.

   B. If other faults relating to the fuel system, rail pressure or pressure relief valve are not active, go to **2**.
2. Check that there are no leaks, obstructions or damage that could allow air to enter the low pressure side of the fuel system. Visually check and inspect the low pressure side of the supply system to check that there are no leaks, obstructions or damage due to air entry. Inspect the gear pump to verify that the pressure is correct.

   A. If leakage, clogging, air entry, damage or low gear pump pressure is found, repair of replace fittings, filters, lines, etc., as required.

   B. If no leakage, clogging, air entry, damage or low gear pump pressure is found, continue with step **3**.
3. Replace the fuel metering unit **Y-F07**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, go to step **4**.
4. Replace the PRV.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, go to step **5**.

5. Replace the rail pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If fault has not been resolved, Check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 519744-18 40EEF2 - Fuel rail pressure has exceeded maximum positive deviation limits

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the fuel pressure control. Fuel pressure is controlled by the fuel metering unit (FMU) . If the ECU **A-F02** determines that the rail pressure is lower than the expected value for the engine speed based on the threshold value, this indicates that fuel pressure in the rail has exceeded the maximum positive deviation limits and this fault occurs.

**Cause:**
Leaks in the high pressure valve: Injection nozzle blocked in the open position, low efficiency of the high pressure valve, internal leaks in the injectors, leaks in the pressure control valve. Low pressure in the high pressure valve due to clogged filter, leaks in the low pressure pipe, faulty pre-pressure pump, faulty gear pump.

**Possible failure modes:**

1. Fault in the low pressure system, clogging
2. Fault in the fuel filter controlled by the relay **K-F230**.
3. Fault in the pipes
4. Fault in the high pressure valve
5. Fault in the injector seal
6. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check that the low pressure system (and the fuel filter controlled by the relay **K-F230**) are not clogged

   A. If the system is clogged, Bleed the system

   B. If the system is not clogged, Continue to step **3**.
3. Check that the pipes between the pre-supply and the fuel metering unit **Y-F07** do not show any sign of malfunctions

   A. If any malfunctions are present, repair or replace as required.

   B. If no malfunctions are present, Continue to step **3**.
4. Check the supply (this may be low due to clogging of the pipes ate the tank outlet) of the pre-supply pump

   A. If the supply is too low, repair or replace as required.

   B. If the supply is not too low, Continue to step **4**.
5. Check the high pressure system to check for leaks

   A. If the system has leaks, repair or replace as required.

   B. If the system does not have any leaks, Continue to step **5**.
6. Check the correct operation of the high pressure pump

A. If the pump is not working correctly, repair or replace the high pressure pump.

B. If the pump is working correctly, Continue to step **6**.

7. Check none of the injectors are tightened more than normal

   A. If one or more of the injectors are too tight, repair or replace one or more injectors.

   B. If one or more of the injectors are not too tight, send a request to the Technical Help Desk

8. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 1240-31 D8041F - Fuel pump pressure has exceeded desired pressure limits

## Control Module: FPT ECU

**Fault Description:**
The fuel metering unit (FMU) **Y-F07** controls the required fuel flow on the common rail. The unit is regulated via feedback control from the Engine Control Unit (ECU) **A-F02**. If the ECU **A-F02** determines that the required fuel pressure cannot be obtained, this indicates the probable presence of a leak and this fault occurs.

**Cause:**
Fuel pressure is unable to reach the desired pressure.

**Possible failure modes:**

1. Operating in higher than normal ambient pressure conditions.
2. Faulty fuel injectors, excessive return leakage or stuck open.
3. Fault in the fuel filter, clogged.
4. Faulty low pressure fuel system, leakage or blockage.
5. Faulty charge gear pump, low efficiency.
6. Rail pressure sensor (RPS) **B-F09**, internal fault or fault in the wiring.
7. Fault in the FMU **Y-F07**, internal fault or in the wiring.
8. Faulty high pressure pump, feeding efficiency low.
9. Faulty ECU **A-F02**, software.

**Solution:**

1. Use the diagnostic instrument to check for the following related faults that may have caused this fault to occur. If any of the listed faults are active, diagnose them first and then return to the current fault.

   **5447-3 – Fuel measuring unit: short circuit to battery on low level**

   **5380-4 – Fuel measuring unit: short circuit to ground on high level**

   **5380-5 – Fuel measuring unit: open circuit**

   **1442-2 – Fuel measuring unit: contact lost between the measuring unit and the control unit**

   **14251F 5157-31 1425-1F 157-11 157-3 – Fuel rail pressure sensor voltage is higher than expected**

   **1240-14 3C65-1F 157-2 15461-31 3C651F – Setpoint of metering unit in idle mode not plausible**

   **1240-11 3B651F 157-16 15205-31 3B65-1F – setpoint of metering unit in overrun mode not plausible**

   **520500-16 519744-15 5477-31 1565-1F 15651F – Fuel Rail Pressure has exceeded maximum negative deviation limits**

   **519744-18 22651F 2265-1F 8805-31 520500-18 – Fuel rail pressure has exceeded maximum positive deviation limits**

# 295467 40EEEF 519744-15 - Fuel Rail Pressure has exceeded maximum negative deviation limits

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the fuel pressure control. Fuel pressure is controlled by the fuel metering unit **Y-F07**. If the ECU **A-F02** determines that the actual fuel pressure has exceeded the required pressure with the fuel metering unit fully closed compared to a curve which is based on the engine speed, this fault occurs.

**Cause:**
Fuel metering unit **Y-F07** is stuck in the open position, throttle solenoid valve clogged, fuel metering unit without power due to electrical problem. High pressure after throttle solenoid valve (backflow pump pressure too high)

**Possible failure modes:**

1. Faulty fuel metering unit **Y-F07**, internal failure.
2. Faulty fuel metering unit **Y-F07**, wiring.
3. Fault in the throttle valve, internal fault.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Determine the position of the open circuit condition in the fuel metering unit **Y-F07**.

   Disconnect the connector **X-F3YY_1** of the throttle valve wiring.

   Disconnect the connector of the wiring **X-F07** of the fuel metering unit **Y-F07**.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F07 (Plug) pin 1** | **X-F3YY_1 (Plug) pin 1** | There should be continuity |
| **X-F07 (Plug) pin 2** | **X-F3YY_1 (Plug) pin 2** | There should be continuity |

   A. If continuity is detected, leave connectors **X-F07** and **X-F3YY_1** disconnected and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the position of the open circuit condition of the throttle solenoid valve.

   Disconnect the connectors **X-F3YY_1** and **X-F3YY** of the throttle valve solenoid valve wiring.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F3YY_1 (Plug) pin 1** | **X-F3YY (Plug) pin 1** | There should be continuity |
| **X-F3YY_1 (Plug) pin 2** | **X-F3YY (Plug) pin 2** | There should be continuity |

   A. If continuity is detected, leave the connector **X-F3YY** disconnected and go to **4**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.

4. Determine the position of the open circuit condition of the throttle solenoid valve.

   Disconnect the connectors **X-F3YY_1** and **X-F3YY** of the throttle valve solenoid valve wiring.

   Use a multimeter to check for continuity on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F3YY (Plug) pin 1** | **X-F02E (Plug) pin 7** | There should be continuity |
| **X-F3YY (Plug) pin 2** | **X-F02E (Plug) pin 6** | There should be continuity |

   A. If continuity is detected, continue to step **5**.

   B. If there is no continuity, there is an open circuit, Locate and repair the broken conductor.

5. Check the low pressure system to check for leaks.

   A. If the system has leaks, repair or replace as required.

   B. If the system does not have any leaks, Continue to step **6**.

6. Check operation of the throttle solenoid valve.

   A. If it is not working correctly, repair or replace as required.

   B. If it is working correctly, send a request to the Technical Help Desk.

7. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 41EEF1 519745-17 - Fuel Rail Pressure has exceeded minimum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the fuel pressure control. Fuel pressure is controlled by the fuel metering unit (FMU) . If the ECU **A-F02** determines that the rail pressure is lower than the expected value for the engine speed based on the minimum threshold value, this indicates that fuel pressure in the rail has exceeded the maximum positive deviation limits and this fault occurs.

**Cause:**
Leaks in the high pressure valve: Injection nozzle blocked in the open position, low efficiency of the high pressure valve, internal leaks in the injectors, leaks in the pressure control valve. Low pressure in the high pressure valve due to clogged filter, leaks in the low pressure pipe, faulty pre-pressure pump, faulty gear pump.

**Possible failure modes:**

1. Fault in the low pressure system, clogging
2. Fault in the fuel filter controlled by the relay **K-F230**.
3. Fault in the pipes
4. Fault in the high pressure valve
5. Fault in the injector seal
6. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check that the low pressure system (and the fuel filter controlled by the relay **K-F230**) are not clogged

   A. If the system is clogged, Bleed the system

   B. If the system is not clogged, Continue to step **3**.
3. Check that the pipes between the pre-supply and the fuel metering unit **Y-F07** do not show any sign of malfunctions

   A. If any malfunctions are present, repair or replace as required.

   B. If no malfunctions are present, Continue to step **3**.
4. Check the supply (this may be low due to clogging of the pipes ate the tank outlet) of the pre-supply pump

   A. If the supply is too low, repair or replace as required.

   B. If the supply is not too low, Continue to step **4**.
5. Check the high pressure system to check for leaks

   A. If the system has leaks, repair or replace as required.

   B. If the system does not have any leaks, Continue to step **5**.
6. Check the correct operation of the high pressure pump

A. If the pump is not working correctly, repair or replace the high pressure pump.

B. If the pump is working correctly, Continue to step **6**.

7. Check none of the injectors are tightened more than normal

   A. If one or more of the injectors are too tight, repair or replace one or more injectors.

   B. If one or more of the injectors are not too tight, send a request to the Technical Help Desk

8. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 A20500 1442-0 - Fuel Rail Pressure has exceeded maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the fuel pressure control. Fuel pressure is controlled by the fuel metering unit (FMU) . If the ECU **A-F02** determines that the rail pressure is lower than the expected value for the engine speed based on the maximum threshold value, this indicates that fuel pressure in the rail has exceeded the maximum positive deviation limits and this fault occurs.

**Cause:**
Leaks in the high pressure valve: Injection nozzle blocked in the open position, low efficiency of the high pressure valve, internal leaks in the injectors, leaks in the pressure control valve. Low pressure in the high pressure valve due to clogged filter, leaks in the low pressure pipe, faulty pre-pressure pump, faulty gear pump.

**Possible failure modes:**

1. Fault in the low pressure system, clogging
2. Fault in the fuel filter controlled by the relay **K-F230**.
3. Fault in the pipes
4. Fault in the high pressure valve
5. Fault in the injector seal
6. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check that the low pressure system (and the fuel filter controlled by the relay **K-F230**) are not clogged

   A. If the system is clogged, Bleed the system

   B. If the system is not clogged, Continue to step **3**.
3. Check that the pipes between the pre-supply and the fuel metering unit **Y-F07** do not show any sign of malfunctions

   A. If any malfunctions are present, repair or replace as required.

   B. If no malfunctions are present, Continue to step **3**.
4. Check the supply (this may be low due to clogging of the pipes ate the tank outlet) of the pre-supply pump

   A. If the supply is too low, repair or replace as required.

   B. If the supply is not too low, Continue to step **4**.
5. Check the high pressure system to check for leaks

   A. If the system has leaks, repair or replace as required.

   B. If the system does not have any leaks, Continue to step **5**.
6. Check the correct operation of the high pressure pump

A. If the pump is not working correctly, repair or replace the high pressure pump.

B. If the pump is working correctly, Continue to step **6**.

7. Check none of the injectors are tightened more than normal

   A. If one or more of the injectors are too tight, repair or replace one or more injectors.

   B. If one or more of the injectors are not too tight, send a request to the Technical Help Desk

8. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 D8040B 1240-11 - setpoint of metering unit in overrun mode not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the fuel delivery through the fuel metering unit (FMU) **Y-F07**. The FMU **Y-F07** monitors the presence of any high pressure leakage in overspeed conditions. If the high pressure fuel delivery exceeds the maximum threshold during overspeed and it is not possible to reach the desired fuel pressure, it is assumed that there are leakages from the system and this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the desired fuel rail pressure is lower than expected in overspeed.

**Possible failure modes:**

1. Faulty fuel injectors, internal leakage or stuck open.
2. Faulty pressure relief valve leaking.
3. Internal fault of faulty wiring of the FMU **Y-F07**.
4. Faulty high pressure pump.
5. Fault in the fuel filter, clogged.
6. Faulty low pressure fuel pipes, leaking (air entrance)
7. Fault in the low-pressure gear pump.
8. Faulty electric intake pump (if applicable)
9. Faulty ECU **A-F02**, software.

# 295467 D8040E 1240-14 - Setpoint of metering unit in idle mode not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the fuel delivery through the fuel metering unit (FMU) **Y-F07**. If the ECU **A-F02** determines that it is impossible to reach the correct fuel pressure at engine idle speed, it is assumed that the system is leaking and this fault occurs.

**Cause:**
The Engine Control Unit (ECU) **A-F02** has determined that the controlled fuel rail pressure is less than the expected value with engine speed at idle.

**Possible failure modes:**

1. Faulty fuel injectors, internal leakage or stuck open.
2. Faulty pressure relief valve leaking.
3. Faulty FMU **Y-F07**.
4. Faulty high pressure pump.
5. Fault in the fuel filter, clogged.
6. Faulty low pressure fuel lines, leaking (air entrance).
7. Fault in the low-pressure gear pump.
8. Faulty electric lift pump (if applicable).
9. Faulty ECU **A-F02**, software.

# 295467 3CEFE1 519996-1 - Fuel pressure check: pressure on the rail insufficient, fuel injection inhibited

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors fuel injection. This occurs when the minimum value of the rail pressure sensor **B-F09** is reached. If the rail pressure sensor is below the threshold value, injection is inhibited and this fault occurs.

**Cause:**
Rail pressure sensor **B-F09** too low to allow the engine to start

**Possible failure modes:**

1. Fault in the rail pressure sensor **B-F09**.
2. Tank empty.
3. Fuel filter obstructed.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **7**.
2. Check that the issue is not due to low pressure in the rail.

   A. If a fault is presentrepair or replace as required.

   B. If the tank is not empty, Continue to step **2**.
3. Check that the fuel tank is not empty.

   A. If the tank is empty, fill it to more than **130.00 bar**.

   B. If the tank is not empty, Continue to step **3**.
4. Check that the fuel filter is not blocked.

   A. If the fuel filter is blocked, repair or replace as required.

   B. If the fuel filter is not blocked, Continue to step **3**.
5. Check that the pump is not broken and that there are no leaks.

   A. If there is a fault in the pump repair or replace as required.

   B. If there is no fault in the pump Continue to step **4**.
6. Check the high pressure system to check for leaks

   A. If the system has leaks, repair or replace as required.

   B. If the system does not have any leaks, send a request to the Technical Help Desk
7. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

Operate the machine while monitoring the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 18-14 12000E - Fuel pressure check: maximum rail pressure in limp home mode

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the pressure of the fuel supply rail in limp home mode with the Pressure Control Valve (PCV).

**Cause:**
The Pressure Control Valve (PCV) is blocked in the closed position, the backflow system from the PCV is clogged, overcurrent on the PCV due to wiring problems, fuel metering unit **Y-F07** blocked in the full feeding position, no power to the fuel metering unit

**Possible failure modes:**

1. Faulty fuel metering unit **Y-F07**, internal failure.
2. Faulty fuel metering unit **Y-F07**, wiring.
3. Faulty Pressure control valve (PCV), internal failure.
4. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. Go to step **7**.
2. Determine the position of the open circuit condition in the fuel metering unit **Y-F07**.

   Disconnect the connector **X-F3YY_1** of the throttle valve wiring.

   Disconnect the connector of the wiring **X-F07** of the fuel metering unit **Y-F07**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F07 (Plug) pin 1** | **X-F3YY_1 (Plug) pin 1** | There should be continuity |
| **X-F07 (Plug) pin 2** | **X-F3YY_1 (Plug) pin 2** | There should be continuity |

   A. If continuity is detected, leave both connectors disconnected **X-F07** and **X-F3YY_1** and go to step **3**.

   B. If there is no continuity, there is an open circuit.Locate and repair the broken conductor.
3. Determine the position of the short circuit to battery condition in the fuel metering unit **Y-F07**.

   Disconnect the connector of the wiring **X-F07** of the fuel metering unit **Y-F07**.

   Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F07 (Plug) pin 2** | Battery positive | There should be no continuity |

   A. If no continuity is detected, leave the connector **X-F07** disconnected and go to step **3**.

   B. If there is no continuity, this indicates a short circuit.Locate and repair the broken conductor.
4. Determine the position of the short circuit to ground condition in the fuel metering unit **Y-F07**.

Disconnect the connector of the wiring **X-F07** of the fuel metering unit **Y-F07**.

Use a multimeter to check the continuity on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F07 (Plug) pin 1** | Chassis ground | There should be no continuity |

A. If no continuity is detected, continue to step **4**.

B. If there is no continuity, this indicates a short circuit.Locate and repair the broken conductor.

5. Check for clogging in the return pipe from the Pressure Control Valve (PCV) to the tank.

   A. If there are faults in the system, repair or replace as required.

   B. If there are no faults in the system, Go to step **5**.

6. Check the correct operation of the Pressure Control Valve (PCV).

   A. If faults are detected, repair or replace as required.

   B. If no faults are detected, send a request to the Technical Help Desk.

7. Visually inspect the relevant wiring harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Check that the connectors are fully inserted.

   Bend the relevant wiring to identify short circuits or intermittent interruptions in the wires.

   Operate the machine while monitoring the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is detected and normal values are shown on the display, delete the fault code.

# 295467 157-2 9D0002 - Rail pressure raw value is intermittent

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the fuel pressure sensor in the **B-F09** to check for any intermittent operation connections. If the ECU **A-F02** detects more than one pressure jumps, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an intermittent connection in the circuit of the rail fuel pressure sensor **B-F09**.

**Possible failure modes:**

1. Faulty rail pressure sensor **B-F09**, internal fault.
2. Faulty rail fuel pressure sensor **B-F09**, wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active,continue to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **7**.
2. Check the circuit of the rail fuel pressure sensor **B-F09** for an intermittent open circuit.

   Disconnect the wiring from the rail fuel pressure sensor **B-F09** at connector **X-F09**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | **X-F02E pin 63** | There should be continuity. |
| **X-F09 (Plug) pin 2** | **X-F02E pin 62** | There should be continuity. |
| **X-F09 (Plug) pin 3** | **X-F02E pin 42** | There should be continuity. |

   A. If continuity is detected, Locate and repair the damaged conductor.

   B. If there is no continuity, leave the connectors disconnected and go to **3**.
3. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to ground.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 2** | Chassis ground | There should be no continuity. |
| **X-F09 (Plug) pin 3** | Chassis ground | There should be no continuity. |

   A. If there is no continuity, continue to step **4**.

   B. If continuity is detected, Locate and repair the shorted conductor.
4. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to battery.

Set the ignition switch to OFF.

Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | Battery positive | There should be no continuity. |
| **X-F09 (Plug) pin 2** | Battery positive | There should be no continuity. |

A. If there is no continuity, continue to step **6**.

B. If continuity is detected, Locate and repair the shorted conductor.

5. Replace the rail fuel pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 157-20 9D0014 - Rail pressure raw value is above maximum offset

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the offset deviation of the engine mount after a specified waiting time for the fuel pressure sensor in the rail **B-F09**. This allows the rail pressure to be lowered to ambient pressure.

**Cause:**
Inaccurate rail fuel pressure signal **B-F09**.

**Possible failure modes:**

1. Faulty rail pressure sensor **B-F09**, internal fault.
2. Faulty rail fuel pressure sensor **B-F09**, wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active,continue to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **7**.
2. Check the circuit of the rail fuel pressure sensor **B-F09** for an intermittent open circuit.

   Disconnect the wiring from the rail fuel pressure sensor **B-F09** at connector **X-F09**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | **X-F02E pin 63** | There should be continuity. |
| **X-F09 (Plug) pin 2** | **X-F02E pin 62** | There should be continuity. |
| **X-F09 (Plug) pin 3** | **X-F02E pin 42** | There should be continuity. |

   A. If continuity is detected, Locate and repair the damaged conductor.

   B. If there is no continuity, leave the connectors disconnected and go to **3**.
3. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to ground.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 2** | Chassis ground | There should be no continuity. |
| **X-F09 (Plug) pin 3** | Chassis ground | There should be no continuity. |

   A. If there is no continuity, continue to step **4**.

   B. If continuity is detected, Locate and repair the shorted conductor.

4. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to battery.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | Battery positive | There should be no continuity. |
| **X-F09 (Plug) pin 2** | Battery positive | There should be no continuity. |

   A. If there is no continuity, continue to step **6**.

   B. If continuity is detected, Locate and repair the shorted conductor.

5. Replace the rail fuel pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 157-21 9D0015 - Rail pressure raw value is below minimum offset

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the offset deviation of the engine mount after a specified waiting time for the fuel pressure sensor in the rail **B-F09**. This allows the rail pressure to be lowered to ambient pressure.

**Cause:**
Inaccurate rail fuel pressure signal **B-F09**.

**Possible failure modes:**

1. Faulty rail pressure sensor **B-F09**, internal fault.
2. Faulty rail fuel pressure sensor **B-F09**, wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active,continue to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **7**.
2. Check the circuit of the rail fuel pressure sensor **B-F09** for an intermittent open circuit.

   Disconnect the wiring from the rail fuel pressure sensor **B-F09** at connector **X-F09**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | **X-F02E pin 63** | There should be continuity. |
| **X-F09 (Plug) pin 2** | **X-F02E pin 62** | There should be continuity. |
| **X-F09 (Plug) pin 3** | **X-F02E pin 42** | There should be continuity. |

   A. If continuity is detected, Locate and repair the damaged conductor.

   B. If there is no continuity, leave the connectors disconnected and go to **3**.
3. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to ground.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 2** | Chassis ground | There should be no continuity. |
| **X-F09 (Plug) pin 3** | Chassis ground | There should be no continuity. |

   A. If there is no continuity, continue to step **4**.

   B. If continuity is detected, Locate and repair the shorted conductor.

4. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to battery.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | Battery positive | There should be no continuity. |
| **X-F09 (Plug) pin 2** | Battery positive | There should be no continuity. |

   A. If there is no continuity, continue to step **6**.

   B. If continuity is detected, Locate and repair the shorted conductor.

5. Replace the rail fuel pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 157-11 9D000B - Fuel rail pressure sensor voltage is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the rail pressure sensor **B-F09**.

**Cause:**
Short circuit to battery in the rail pressure sensor **B-F09**, faulty

**Possible failure modes:**

1. Faulty rail pressure sensor **B-F09**, internal fault.
2. Faulty rail fuel pressure sensor **B-F09**, wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active,continue to step **4**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **7**.
2. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to battery.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 1** | Battery positive | There should be no continuity. |
| **X-F09 (Plug) pin 2** | Battery positive | There should be no continuity. |

   A. If there is no continuity, continue to step **6**.

   B. If continuity is detected, Locate and repair the shorted conductor.
3. Replace the rail fuel pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 157-4 9D0004 - Fuel rail pressure sensor voltage is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the rail pressure sensor **B-F09**.

**Cause:**
Short circuit to ground in the rail pressure sensor **B-F09**, faulty

**Possible failure modes:**

1. Faulty rail pressure sensor **B-F09**, internal fault.
2. Faulty rail fuel pressure sensor **B-F09**, wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active,continue to step **4**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **7**.
2. Check the wiring of the rail fuel pressure sensor **B-F09** for a short circuit to ground.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 2** | Chassis ground | There should be no continuity. |
| **X-F09 (Plug) pin 3** | Chassis ground | There should be no continuity. |

   A. If there is no continuity, continue to step **6**.

   B. If continuity is detected, Locate and repair the shorted conductor.
3. Replace the rail fuel pressure sensor **B-F09**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 98000D 152-13 - An external device has activated an ECU reset during normal driving

## Control Module: FPT ECU

**Fault Description:**
The KeepAlive process of the engine control unit (ECU) **A-F02** queries the external devices searching for problems (e.g. memory errors, incorrect initialization status, unexpected reboots of the external device). If a control device reports an error, KeepAlive starts a reset of the ECU **A-F02**. The drivers of the external device can report errors during the initialization (INI) or during the operational phases of the ECU of the normal operating time (DRV). When the control device reports an error and KeepAlive starts a reset of the ECU **A-F02**, this fault occurs and a replacement of the ECU **A-F02** is requested.

# 295467 152-11 98000B - An external device has activated an ECU reset during normal Control unit initialisation

## Control Module: FPT ECU

**Fault Description:**
The KeepAlive process of the engine control unit (ECU) **A-F02** queries the external devices searching for problems (e.g. memory errors, incorrect initialization status, unexpected reboots of the external device). If a control device reports an error, KeepAlive starts a reset of the ECU **A-F02**. The drivers of the external device can report errors during the initialization (INI) or during the operational phases of the ECU **A-F02** of the normal operating time (DRV). When the control device reports an error and KeepAlive starts a reset of the ECU **A-F02**, this fault occurs and a replacement of the ECU **A-F02** is requested.

# 295467 628-13 74020D - ECU internal: reading access to the memory not successful

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the internal processes searching for error reports while trying to read or write on non-volatile memory. When it is no longer possible to read correctly a memory block, this fault occurs and the ECU **A-F02** needs to be replaced.

# 295467 628-12 74020C - ECU internal: writing access to the memory not successful

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the internal processes searching for error reports when trying to read or write on non-volatile memory. When it is no longer possible to write a memory block, this fault occurs and the ECU **A-F02** needs to be replaced.

# 295467 CD051F 1485-31 - Main relay blocked

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** controls the main relay and determines the effective status and carries out main relay diagnostics. If the ECU detects that the main relay is locked, this fault occurs.

**Cause:**
The ECU **A-F02** has detected that the main relay is locked.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue with the normal operation.

2. Visually check the relative connector to check that there are no damaged, bent, or displaced pins, or corroded terminals.

   A. If there are damages, repair the damage found during the inspectionthen verify that the fault has been resolved.

   B. If no damage is present check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 518166-14 16E8EE - Control unit internal error: error of stack memory threshold exceeded

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** contains several electronic components designed to support the performance of the main processors. One of the support functions involves grouping the data to be processed. If this functional group reports an overload of the stack memory threshold, this fault occurs. As this fault is caused by an internal fault, the ECU **A-F02** must be replaced.

# 295467 518201-11 39E8EB - Control unit internal error: erratic shutdown detected

## Control Module: FPT ECU

**Fault Description:**
The system of the engine control unit (ECU) **A-F02** supplies the execution command as the calculation of the "ECU deactivation time". The "incorrect activation counter" is a function of a control counter whose task is to check if the ECU **A-F02** has always been operating from when the ECU **A-F02** has been activated to when it has been deactivated. If the ECU **A-F02** has been incorrectly switched off before completing the shut down procedure (due to power failure, power supply reset, or software reset with the key switch signal set to OFF), the counter is not reset. This causes the subsequent initialization (switching on activation) after reading the counter in order to detect the missed reset and the signalisation of this error.

**Cause:**
The ECU **A-F02** has been switched off while the engine is running.

**Solution:**

1. Check for related faults.

   Use the diagnostic instrument to determine the presence of faults in the battery power supply.

   A. If there are no other faults present, resolve the corresponding fault. Then determine if the fault **518201-11 – Control unit internal error: erratic shutdown detected** has been resolved.

   B. If no faults are detected and this fault is still present, continue with step **2**.
2. End the operations underway and restart the machine.

   Check the ECU **A-F02** for the appropriate software and re-flash if necessary.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 3509-12 B50D0C - ECU internal: Error sensor supplies 1

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5. 0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage of sensor 1 is not within the set range, this fault occurs.

**Cause:**
The ECU sensor supply 1 reference voltage is out of range.

**Possible failure modes:**

1. Faulty differential pressure sensor of the DPF **B-F34**, internal failure.
2. Fault in the intake air temperature sensor **B-F65**.
3. Faulty SCR pump module , internal fault or faulty wiring.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **10**.

2. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the DPF differential pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F34 pin 1** | Chassis ground | There should be no continuity. |
| **X-F34 pin 2** | Chassis ground | There should be no continuity. |

   A. If there is continuity, a short circuit to ground is present condition in the wiring.Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **3**.

3. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F34 pin 1** | Chassis ground | There should be no voltage. |
| **X-F34 pin 3** | Chassis ground | There should be no voltage. |

A. If voltage is detected, this indicates a fault in the wiring.Locate and repair the shorted conductor.

B. If there is no voltage, go to step **4**.

4. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 1** | Chassis ground | There should be no continuity. |

   A. If there is continuity, a short circuit to ground is present. Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **5**.

5. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 2** | Chassis ground | There should be no voltage. |

   A. If voltage is detected, this indicates a fault in the wiring.Locate and repair the shorted conductor.

   B. If there is no voltage, go to **6**.

6. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the SCR pump module.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to check the continuity.

   A. If there is continuity, a short circuit to ground is present condition in the wiring.Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **7**.

7. Check the power supply circuit 1 for a short circuit towards a voltage source in the SCR module.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage.

   A. If voltage is detected, this indicates a fault in the wiring. Locate and repair the shorted conductor.

   B. In the absence of voltage, go to **8**.

8. Check the correct operation of the SCR pump module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, go to **9**.

9. Replace pump module.

Use the operator display or the diagnostic tool to check that the fault has been resolved.

A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3509-6 B50D06 - ECU internal: overtemperature in the power supply of sensor 1

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock 'inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5. 0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the ECU **A-F02** detects an overtemperature in the ECU sensor supply reference voltage 1 circuit, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an overtemperature in the supply reference voltage circuit 1 of the ECU sensor.

**Possible failure modes:**

1. Internal fault or faulty wiring of the DPF differential pressure sensor **B-F34**.
2. Internal fault or fault in the wiring of the intake air temperature sensor **B-F65**
3. Faulty SCR pump module , internal fault or faulty wiring.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **10**.
2. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the DPF differential pressure sensor **B-F34** at connector **X-F34**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F34 pin 1** | Chassis ground | There should be no continuity. |
| **X-F34 pin 2** | Chassis ground | There should be no continuity. |

   A. If there is continuity, a short circuit to ground is present condition in the wiring.Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **3**.
3. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F34 pin 1** | Chassis ground | There should be no voltage. |
| **X-F34 pin 3** | Chassis ground | There should be no voltage. |

A. If voltage is detected, this indicates a fault in the wiring.Locate and repair the shorted conductor.

B. If there is no voltage, go to step **4**.

4. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 1** | Chassis ground | There should be no continuity. |

   A. If there is continuity, a short circuit to ground is present. Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **5**.

5. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 2** | Chassis ground | There should be no voltage. |

   A. If voltage is detected, this indicates a fault in the wiring.Locate and repair the shorted conductor.

   B. If there is no voltage, go to **6**.

6. Check the supply circuit 1 for a short circuit to ground.

   Disconnect the wiring from the SCR pump module.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to check the continuity.

   A. If there is continuity, a short circuit to ground is present condition in the wiring.Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **7**.

7. Check the power supply circuit 1 for a short circuit towards a voltage source in the SCR module.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage.

   A. If voltage is detected, this indicates a fault in the wiring. Locate and repair the shorted conductor.

   B. In the absence of voltage, go to **8**.

8. Check the correct operation of the SCR pump module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

B. The module is not working correctly, go to **9**.

9. Replace pump module.

   Use the operator display or the diagnostic tool to check that the fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 B50D03 3509-3 - ECU internal: voltage too high in the power supply of sensor 1

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the ECU hardware and cannot be calibrated. If the power supply reference voltage 1 of the sensor exceeds the set threshold, this fault occurs.

**Cause:**
The ECU sensor 1 supply reference voltage exceeds the set range.

**Possible failure modes:**

1. Internal fault or faulty wiring of the DPF differential pressure sensor **B-F34**.
2. Internal fault or fault in the wiring of the intake air temperature sensor **B-F65**.
3. Faulty SCR pump module , internal fault or faulty wiring.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **12**.
2. Disconnect the wiring from the DPF differential pressure sensor **B-F34** at connector **X-F34**.

   Use the diagnostic tool to monitor the status of the **3509-3 – ECU internal: voltage too high in the power supply of sensor 1**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **3**.
3. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F34 (Plug) pin 1** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If the voltage reading is not correct, go to **4**

   B. If the voltage reading is correct, go to **5**
4. Check the power supply circuit 1 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 42** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage is high, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring.Locate and repair the shorted conductor.

5. Disconnect the wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

Use the diagnostic tool to monitor the status of the **3509-3 – ECU internal: voltage too high in the power supply of sensor 1**.

A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **6**.

6. Check the power supply circuit 1 for a short circuit towards a voltage source.

Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 1** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage reading is not correct, go to **7**.

B. If the voltage reading is correct, go to **8**.

7. Check the power supply circuit 1 for a short circuit towards a voltage source.

Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 76** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage is high, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring Locate and repair the shorted conductor.

8. Disconnect the wiring from the SCR pump module.

Use the diagnostic tool to monitor the status of the **3509-3 – ECU internal: voltage too high in the power supply of sensor 1**.

A. If this fault is eliminated after disconnecting a connector, the module has an internal fault. Replace the SCR pump module .

B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **9**.

9. Check the power supply circuit 1 for a short circuit towards a voltage source between the SCR pump and the vehicle side control unit.

Set the ignition switch to ON.

Use a multimeter to check the voltage.

A. If the voltage is high, go to **8**.

B. If the voltage reading is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

10. Check the correct operation of the SCR pump module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

    A. The module is working correctly, contact the Technical Help Desk.

    B. The module is not working correctly, go to **9**.

11. Replace pump module.

    Use the operator display or the diagnostic tool to check that the fault has been resolved.

    A. If the fault has been resolved, return the machine to service.

    B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

12. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3509-5 B50D05 - ECU internal: short circuit in the power supply of sensor 1

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage 1 is below the set range, this fault occurs.

**Cause:**
The ECU sensor supply reference voltage 1 is below the set range.

**Possible failure modes:**

1. Internal fault or faulty wiring of the DPF differential pressure sensor **B-F34**.
2. Internal fault or fault in the wiring of the intake air temperature sensor **B-F65**.
3. Faulty SCR pump module **M-F42**, internal fault or faulty wiring.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **12**.
2. Disconnect the wiring from the DPF differential pressure sensor **B-F34** at connector **X-F34**.

   Use the diagnostic tool to monitor the status of the **3509-5 – ECU internal: short circuit in the power supply of sensor 1**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **3**.
3. Check the supply circuit 1 for an interruption.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F34 (Plug) pin 1** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If there is no voltage or if the voltage is too low, go to **4**

   B. If the voltage reading is correct, go to **5**
4. Check the supply circuit 1 for an interruption.

   Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 42** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If there is no voltage or if the voltage is too low, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring.Locate and repair the shorted conductor.

5. Disconnect the wiring from the intake air temperature sensor **B-F65** at connector **X-F65**.

Use the diagnostic tool to monitor the status of the **3509-5 – ECU internal: short circuit in the power supply of sensor 1**.

A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **6**.

6. Check the supply circuit 1 for an interruption.

Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F65 pin 1** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If there is no voltage or if the voltage is too low, go to **7**.

B. If the voltage reading is correct, go to **8**.

7. Check the supply circuit 1 for an interruption.

Set the ignition switch to ON.

Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 76** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If there is no voltage or if the voltage is too low, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring.Locate and repair the shorted conductor.

8. Disconnect the wiring from the SCR pump module.

Use the diagnostic tool to monitor the status of the **3509-5 – ECU internal: short circuit in the power supply of sensor 1**.

A. If this fault is eliminated after disconnecting a connector, the module has an internal fault. Replace the SCR pump module **M-F42**.

B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **9**.

9. Check the power supply circuit 1 for an interruption between the pump module and the vehicle side control unit.

Set the ignition switch to ON.

Use a multimeter to check the voltage.

A. If there is no voltage or if the voltage is too low, go to **6**.

B. If the voltage reading is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

10. Check the correct operation of the SCR pump module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

    A. The module is working correctly, contact the Technical Help Desk.

    B. The module is not working correctly, go to **9**.

11. Replace pump module.

    Use the operator display or the diagnostic tool to check that the fault has been resolved.

    A. If the fault has been resolved, return the machine to service.

    B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

12. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 B60D0C 3510-12 - ECU internal: voltage too low in the power supply of sensor 1

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** power supplies to the sensors. These voltages are monitored by the hardware of the ECU to make sure that they are between a defined range. This range is defined by the hardware of the ECU and cannot be calibrated. If the sensor 2 power supply reference voltage is not within the expected range, this fault occurs.

**Cause:**
The ECU sensor supply 2 reference voltage is out of range.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue with the normal operation.

2. Visually check the relative connector to check that there are no damaged, bent, or displaced pins, or corroded terminals.

   A. If there are damages, repair the damage found during the inspectionthen verify that the fault has been resolved.

   B. If no damage is present check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 B60D06 3510-6 - ECU internal: overtemperature in the power supply of sensor 2

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the ECU hardware and cannot be calibrated. If the ECU **A-F02** detects an overtemperature in the power supply reference voltage circuit 2 of the ECU sensor, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an overtemperature in the power supply reference voltage circuit 2 of the ECU sensor.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue with the normal operation.

2. Visually check the relative connector to check that there are no damaged, bent, or displaced pins, or corroded terminals.

   A. If there are damages, repair the damage found during the inspectionthen verify that the fault has been resolved.

   B. If no damage is present check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 B60D03 3510-3 - ECU internal: voltage too high in the power supply of sensor 2

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is set by the ECU hardware and cannot be calibrated. If the sensor power supply reference voltage 2 is above the expected threshold, this fault occurs.

**Cause:**
The ECU **A-F02** sensor supply 2 reference voltage is above the expected range.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue with the normal operation.
2. Visually check the relative connector to check that there are no damaged, bent, or displaced pins, or corroded terminals.

   A. If there are damages, repair the damage found during the inspectionthen verify that the fault has been resolved.

   B. If no damage is present check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 3510-5 B60D05 - ECU internal: voltage too low in the power supply of sensor 2

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the ECU hardware and cannot be calibrated. If the power supply reference voltage 2 of the sensor is below the set threshold, this fault occurs.

**Cause:**
The ECU sensor 2 supply reference voltage is below the set range.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue with the normal operation.

2. Visually check the relative connector to check that there are no damaged, bent, or displaced pins, or corroded terminals.

   A. If there are damages, repair the damage found during the inspectionthen verify that the fault has been resolved.

   B. If no damage is present check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 3511-12 B70D0C - ECU internal: Error sensor supplies 3

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage of sensor 3 is not within the set range, this fault occurs.

**Cause:**
The ECU sensor supply 3 reference voltage is out of range.

**Possible failure modes:**

1. Fault inside the oil pressure and temperature sensor .
2. Fault inside the intake manifold temperature and pressure sensor **B-F48**.
3. Internal fault or faulty wiring of the rail pressure sensor **B-F09**.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.go to **8**.
2. Disconnect the wiring from the oil temperature and pressure sensor.

   Use the diagnostic instrument to monitor the status of the **3511-12 E42D1F E42D-1F 3511-2 58413-31 – ECU internal: Error sensor supplies 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **3**.
3. Check the power supply 3 circuit for a short circuit.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage.

   A. If the voltage reading is not correct, go to **4**

   B. If the voltage reading is correct, Go to **6**
4. Disconnect the wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Use the diagnostic instrument to monitor the status of the **3511-12 E42D1F E42D-1F 3511-2 58413-31 – ECU internal: Error sensor supplies 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **6**.
5. Check the power supply 3 circuit for a short circuit.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F48 (Plug) pin 3** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage reading is not correct, go to **7**

B. If the voltage reading is correct, go to **8**

6. Check the power supply 3 circuit for a short circuit.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 38** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage reading is not correct, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring.Locate and repair the shorted conductor.

7. Disconnect the wiring from the rail pressure sensor **B-F09**, connector **X-F09**.

Use the diagnostic instrument to monitor the status of the **3511-12 E42D1F E42D-1F 3511-2 58413-31 – ECU internal: Error sensor supplies 3**.

A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **9**.

8. Check the power supply 3 circuit for a short circuit.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 3** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage reading is not correct, go to **9**

B. If the voltage reading is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Check the power supply 3 circuit for a short circuit.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 42** | Chassis ground | There should be between **4.5 – 5.5 V**. |

A. If the voltage reading is not correct, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage reading is correct, this indicates faulty wiring.Locate and repair the shorted conductor.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 3511-6 B70D06 - ECU internal: overtemperature in the power supply of sensor 3

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the ECU **A-F02** detects an overtemperature in the ECU sensor supply reference voltage 3 circuit, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an overtemperature in the supply reference voltage circuit 3 of the ECU sensor.

**Possible failure modes:**

1. Fault inside the oil pressure and temperature sensor .
2. Fault inside the intake manifold temperature and pressure sensor **B-F48**.
3. Internal fault or faulty wiring of the rail pressure sensor **B-F09**.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.go to **8**.
2. Check the power supply circuit 3 of the oil pressure and temperature sensor to check for a short circuit to ground.

   Disconnect the wiring from the oil temperature and pressure sensor.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02E**.

   Set the ignition switch to OFF.

   Use a multimeter to check the continuity.

   A. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and go to **3**
3. Check the power supply circuit 3 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage.

   A. If voltage is detected, this indicates a fault in the wiring between the oil temperature and pressure sensor connector and the engine control unit.Locate and repair the shorted conductor.

   B. If there is no voltage, go to **4**
4. Check the supply circuit 3 for a short circuit to ground.

   Disconnect the wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02E**.

Set the ignition switch to OFF.

Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F48 pin 03** | Chassis ground | There should be no continuity. |
| **X-F48 pin 04** | Chassis ground | There should be no continuity. |

A. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.

B. If there is no continuity, leave the connector disconnected and go to **5**.

5. Check the power supply circuit 3 for a short circuit towards a voltage source.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F48 (Plug) pin 3** | Chassis ground | There should be no voltage. |
| **X-F48 pin 04** | Chassis ground | There should be no voltage. |

A. If voltage is detected, this indicates a fault in the wiring.Locate and repair the shorted conductor.

B. If there is no voltage, Go to **6**

6. Check the supply circuit 3 for a short circuit to ground.

Disconnect the wiring from the rail pressure sensor **B-F09**, connector **X-F09**.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02E_6**.

Set the ignition switch to OFF.

Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F09 pin 03** | Chassis ground | There should be no continuity. |
| **X-F09 pin 02** | Chassis ground | There should be no continuity. |

A. If there is continuity, a short circuit to ground is present.Locate and repair the shorted conductor.

B. If there is no continuity, leave the connector disconnected and go to **7**

7. Check the power supply circuit 3 for a short circuit towards a voltage source.

Set the ignition switch to ON.

Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F09 pin 03** | Chassis ground | There should be no voltage. |
| **X-F09 pin 02** | Chassis ground | There should be no voltage. |

A. If voltage is detected, this indicates a fault in the wiring. Locate and repair the shorted conductor.

B. If there is no voltage and each component and the respective wiring operate correctly, there in an internal fault in the ECU.Check the ECU **A-F02** for the appropriate software and update if necessary.

8. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 3511-3 B70D03 - ECU internal: voltage too high in the power supply of sensor 3

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage 3 of the sensor is above the set range, this fault occurs.

**Cause:**
The ECU sensor supply reference voltage 3 is above the set range.

**Possible failure modes:**

1. Fault inside the oil pressure and temperature sensor .
2. Fault inside the intake manifold temperature and pressure sensor **B-F48**.
3. Internal fault or faulty wiring of the rail pressure sensor **B-F09**.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **8**.
2. Disconnect the wiring from the oil temperature and pressure sensor.

   Use the diagnostic instrument to monitor the status of the **3511-3 – ECU internal: voltage too high in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **3**.
3. Check the power supply circuit 3 for a short circuit towards a voltage source between the oil pressure and temperature sensor and the engine side control unit.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage

   A. If the voltage is high, go to **4**

   B. If the voltage reading is correct, Go to **6**
4. Disconnect the wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Use the diagnostic instrument to monitor the status of the **3511-3 – ECU internal: voltage too high in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **6**.

5. Check the power supply circuit 3 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F48 (Plug) pin 3** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If the voltage is high, go to **7**

   B. If the voltage reading is correct, go to **8**

6. Check the power supply circuit 3 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 38** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If the voltage is high, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the voltage value is correct, this indicates faulty wiring between the pressure and temperature sensor of the intake manifold **B-F48** and the engine side control unit.Locate and repair the shorted conductor.

7. Disconnect the wiring from the rail pressure sensor **B-F09**, connector **X-F09**.

   Use the diagnostic instrument to monitor the status of the **3511-3 – ECU internal: voltage too high in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **9**.

8. Check the power supply circuit 3 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 3** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If the voltage is high, go to **9**

   B. If the voltage reading is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Check the power supply circuit 3 for a short circuit towards a voltage source.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 42** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If the voltage is high, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the voltage value is correct, this indicates faulty wiring between the rail pressure sensor **B-F09** and the engine side control unit.Locate and repair the shorted conductor.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 3511-5 B70D05 - ECU internal: voltage too low in the power supply of sensor 3

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-9300** supplies six separate **5.0 V** voltage supplies to the sensors. These voltages are monitored by the ECU hardware to make sure that they are within a set range. This range is defined by the hardware of the ECU and cannot be calibrated. If the power supply reference voltage 3 is below the set range, this fault occurs.

**Cause:**
The ECU sensor 3 supply reference voltage is below the set range.

**Possible failure modes:**

1. Internal fault or faulty wiring of the oil temperature and pressure sensor .
2. Internal fault or faulty wiring of the intake manifold temperature and pressure sensor **B-F48**.
3. Internal fault or faulty wiring of the rail pressure sensor **B-F09**.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.go to **8**.
2. Disconnect the wiring from the oil temperature and pressure sensor.

   Use the diagnostic instrument to monitor the status of the **3511-5 – ECU internal: voltage too low in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **3**.
3. Check the power supply circuit 3 for an interruption between the oil pressure and temperature sensor and the engine side control unit.

   Set the ignition switch to ON.

   Use a multimeter to check the voltage.

   A. If there is no voltage or if the voltage is too low, go to **4**

   B. If the voltage reading is correct, Go to **6**
4. Disconnect the wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Use the diagnostic instrument to monitor the status of the **3511-5 – ECU internal: voltage too low in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **6**.

5. Check the supply circuit 3 for an interruption.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F48 pin 03** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If there is no voltage or if the voltage is too low, go to **7**

   B. If the voltage reading is correct, go to **8**

6. Check the supply circuit 3 for an interruption.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 38** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If there is no voltage or if the voltage is too low, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the voltage value is correct, this indicates faulty wiring between the pressure and temperature sensor of the intake manifold **B-F48** and the engine side control unit.Locate and repair the shorted conductor.

7. Disconnect the wiring from the rail pressure sensor **B-F09**, connector **X-F09**.

   Use the diagnostic instrument to monitor the status of the **3511-5 – ECU internal: voltage too low in the power supply of sensor 3**.

   A. If this fault is eliminated after disconnecting a connector, the sensor has an internal fault.Replace sensor.

   B. If the fault is not eliminated after the connectors have been disconnected, leave the connector disconnected and go to **9**.

8. Check the supply circuit 3 for an interruption.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F09 (Plug) pin 3** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If there is no voltage or if the voltage is too low, go to **9**

   B. If the voltage reading is correct, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Check the supply circuit 3 for an interruption.

   Set the ignition switch to ON.

   Use a multimeter to perform the following voltage check :

| From | To | Value |
|---|---|---|
| **X-F02E pin 42** | Chassis ground | There should be between **4.5 – 5.5 V**. |

   A. If there is no voltage or if the voltage is too low, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the voltage value is correct, this indicates faulty wiring between the rail pressure sensor and the engine side control unit.Locate and repair the shorted conductor.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 519648-15 E0EDEF - SCR inducement: error warning triggered by customer(errors that affect NOx efficiency)

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is for informational purposes only and requires no action other than the resolution of the active fault causing this fault to occur. Any of the various faults that could occur in the engine causes the generation of this fault.

# 295467 5840-16 D01610 - SCR inducement: level 1 (torque reduction), triggered by fault relating to interruption in DEF/AdBlue dosing

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is reported for information purposes only and no actions are required other than resolving the active error that has caused this fault. Any of the **Diesel Exhaust Fluid (DEF)/AdBlue®** fluid injection interruption faults of the selective catalytic reduction system (SCR) that remain active for too long will cause this fault.

# 295467 D01600 5840-0 - SCR inducement: level 3 (reduction mode), triggered by fault relating to interruption in DEF/AdBlue dosing

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is reported for information purposes only and no actions are required other than resolving the active error that has caused this fault. Any of the **Diesel Exhaust Fluid (DEF)/AdBlue®** fluid injection interruption faults of the selective catalytic reduction system (SCR) that remain active for a period longer than the threshold causes this fault.

# 295467 D0160F 5840-15 - SCR inducement: warning, triggered by DEF/AdBlue dosing interruption fault

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is generated for information purposes only, therefore no other corrective actions are required other than resolving the active error that has caused this fault. Any interruption in the injection **Diesel Exhaust Fluid (DEF)/ AdBlue®** in the Selective Catalytic Reduction (SCR) system has caused this fault. The active error that causes this fault must be identified and resolved within a certain operating time in order to prevent engine power reduction.

# 295467 7E1410 5246-16 - SCR inducement: level 1 (torque reduction), triggered by fault relating to tampering

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is reported for information purposes only and no actions are required other than resolving the active error that has caused this fault. Any of the **Diesel Exhaust Fluid (DEF)/AdBlue®** tampering detection faults of the Selective Catalytic Reduction system (SCR) that remain active for too long will cause this fault.

# 295467 7E1400 5246-0 - SCR inducement: level 3 (creep mode), triggered by tampering fault

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is reported for information purposes only and no actions are required other than resolving the active error that has caused this fault. Any of the **Diesel Exhaust Fluid (DEF)/AdBlue®** tampering detection faults of the selective catalytic reduction system (SCR) that remain active for too long will cause this fault.

# 295467 5246-15 7E140F - SCR inducement: warning, triggered by fault relating to tampering

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault signalisation is supplied only for information and no other actions are required other than resolving the active error that has caused this fault. Any of the tampering detection faults **Diesel Exhaust Fluid (DEF)/AdBlue®** of the selective catalytic reduction (SCR) system has caused this fault. The active error that causes this fault must be identified and resolved in order to prevent engine power reduction.

# 295467 6819-31 A31A1F - SCR inducement: warning, Repeated offence activated

## Control Module: FPT ECU

**Fault Description:**
Part of the Selective Catalytic Reduction (SCR) system, inducement refers to the detection of abnormal functions in the system. Within this detection, if the engine control unit (ECU) determines that the DEF/AdBlue® consumption is too low, this fault occurs. Even though no corrective actions are required as a response to this particular fault, other active faults or conditions have caused this fault.

# 295467 519646-31 DEEDFF - SCR inducement: serious block of induction reached

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to run the Engine Restart Counter Reset/Unlock inducement configuration in order to restore functionality. Carry out the SCR Fault Repair Verification Test using the diagnostic tool before returning the machine to service. If the lock due to inducement persists, use the Easy Engine software supplied with the diagnostic tool to clear all faults.*

**Fault Description:**
This fault path is generated for information purposes only. One or more inducement locks have been detected as active by the engine control unit (ECU) **A-F02** which has caused locking of the inducement system. The fault that has caused the inducement must be located, resolved, and restored before deleting this error. Use the diagnostic instrument to unlock the inducement.

# 295467 519644-31 DCEDFF - Diagnosis validation is active

## Control Module: FPT ECU

**Fault Description:**
This fault is reported for information purposes only and no actions are required. If this fault is active, it means that the validation mode is active. The validation mode implies deactivation of the inducement strategy for three full-power restarts. During this validation mode, the vehicle will be at full power to allow the detection of any components which have been replaced or the elimination of a previously active fault.

# 295467 A4EEFF 519844-31 - Torque limitation: due to turbocharger protection

## Control Module: FPT ECU

**Fault Description:**
This fault path is generated only for information. This fault requires no actions except for checking the presence of other faults relating to the turbocharger in the relevant memory. If a fault is present, follow the relevant troubleshooting procedure. This fault confirms that a temporary torque limitation has occurred.

# 295467 519845-31 A5EEFF - Torque limitation due to engine protection

## Control Module: FPT ECU

**Fault Description:**
The engine is protected against too high temperature in the air intake gas, against too high temperature of the coolant, against too high temperature of the oil, and against too high temperature of the fuel, by means of a torque reduction. If one of the temperature values exceeds the limit set by the dedicated parameters programmed in the engine control unit (ECU) **A-F02**. If the power reduction exceeds the set value, a fault is saved as a confirmation that a performance limitation has been activated. This is not caused by a faulty component or system, but by extreme operating conditions. This fault is a confirmation of the temporary power limitation. This fault requires no corrective actions except for checking the presence of other faults relating to the engine speed / engine protection that could be present in the relevant memory. If only this fault has been generated, no corrective actions are required. If the power reduction has been caused by an effective fault, also the fault that activated the torque limitation must be present in the fault memory. Follow the troubleshooting procedure for the actual fault.

# 295467 A6EEFF 519846-31 - Torque limitation: injection system active

## Control Module: FPT ECU

**Fault Description:**
This fault has been generated following performance limitation to protect the high-pressure fuel pump from high temperatures. This fault is stored when a power reduction occurs. It is not caused by a component or system fault. This fault code is generated for information purposes only and does not require any further action. If there are other fault codes present which could affect high-pressure fuel pump temperatures, these faults may indicate an actual fault. Follow the troubleshooting procedure for the other fault.

# 295467 A7EEFF 519847-31 - Pressure limitation in the rail and speed caused by temperature too high in the rail

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This function identifies components that limit the ordinary torque request or cause an abnormal restriction of the speed controller. Activating this torque limitation results in an ordinary restriction of the torque request which is much greater than the calibrated percentage at a given position. In addition to this, there are associated component failures that are caused by this limitation. Strong torque limitation is caused by the temperature of the fuel in the rail.

**Cause:**
INFO: active torque limitation due to high fuel temperature

**Solution:**

1. This fault is provided for information purposes only, so no action is required other than to resolve the active fault that caused this failure. If the power reduction occurs due to an actual fault, the torque limitation fault should be in the fault memory. Follow the relevant troubleshooting.

# 295467 700406 1136-6 - Short circuit to battery in the ECU temperature sensor (ECU internal error)

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature sensor of the ECU **A-F02** inside the ECU **A-F02** to check for a short circuit to battery. If the ECU **A-F02** detects a short circuit to battery in the temperature sensor circuit, this fault occurs.

**Possible failure modes:**

1. ECU **A-F02** faulty, internal fault.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and update if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 1136-17 700411 - Short circuit to ground in the ECU temperature sensor (ECU internal error)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature sensor of the ECU **A-F02** inside the ECU **A-F02**, to check for a short circuit to ground. If the ECU **A-F02** detects a short circuit to ground in the temperature sensor circuit, this fault occurs.

**Possible failure modes:**

1. ECU **A-F02** faulty, internal fault.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and update if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 1136-2 700402 - ECU temperature sensor reading not plausible

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature sensor of the ECU **A-F02** inside the ECU **A-F02**, to check for the presence of a temperature signal. If the ECU **A-F02** detects a non-plausible temperature signal in the temperature sensor circuit, this fault occurs.

**Possible failure modes:**

1. ECU **A-F02** faulty, internal fault.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and update if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 690003 105-3 - Engine intake air temperature sensor voltage is higher than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature and pressure sensor of the intake manifold **B-F48** checking for a short circuit towards a high voltage source or an open circuit. If the ECU **A-F02** senses the presence of a short circuit towards a high voltage source or an open circuit in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**, this fault occurs, If this fault occurs, the ambient temperature value is set by the ECU **A-F02** at the last valid value detected or at a default replacement value, once the fault is validated.

**Cause:**
The ECU **A-F02** has sensed a voltage greater than the threshold in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature and pressure sensor of the intake manifold **B-F48**, short circuit towards a high voltage source or open circuit.
2. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Check the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48** for an interruption.

   Disconnect the engine wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E pin 38** | **X-F48 pin 03** | There should be continuity. |
| **X-F02E pin 95** | **X-F48 pin 01** | There should be continuity. |
| **X-F02E pin 96** | **X-F48 pin 04** | There should be continuity. |

   A. If there is continuity, leave connectors **X-F48** and **X-F02E** disconnected and go to **3**.

   B. If there is no continuity, this indicates an open circuit in the engine wiring between the connector **X-F02E** and the connector **X-F48**, locate and repair the broken conductor.
3. Check the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48** for a short circuit towards another circuit.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E pin 96** | All other pins in connector **X-F02E_6** | There should be no continuity. |
| **X-F02E pin 95** | All other pins in connector **X-F02E_6** | There should be no continuity. |

A. If there is continuity, there is a short circuit towards another circuit in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**. Locate and repair the shorted conductor.

B. If there is no continuity, leave the connectors disconnected and go to **4**.

4. Check the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48** for a short circuit towards voltage.

   With the ignition switch **S-F200** in the OFF position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E pin 96** | Chassis ground | There should be no voltage. |
| **X-F02E pin 38** | Chassis ground | There should be no voltage. |

A. If there is voltage, there is a short circuit towards a voltage source in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**. Locate and repair the shorted conductors.

B. In the absence of voltage, go to **5**.

5. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

A. If this fault has been resolved, return the machine to service.

B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 690004 105-4 - Engine intake air temperature sensor voltage is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the circuit of the temperature signal of the temperature and pressure sensor of the intake manifold **B-F48**. If the ECU **A-F02** senses that the voltage in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48** is below the expected value, this fault occurs. If this fault occurs, the ambient temperature value is blocked by the ECU **A-F02** at the last valid value detected or at a fixed default value, once the fault is validated.

**Cause:**
The ECU **A-F02** has sensed a voltage lower than the threshold in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature and pressure sensor of the intake manifold **B-F48**, short circuit to ground.
2. Fault in the intake manifold pressure and temperature sensor **B-F48**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **4**.
2. Check the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48** for a short circuit to ground.

   Disconnect the engine wiring from the intake manifold pressure and temperature sensor **B-F48** at connector **X-F48**.

   Disconnect the engine wiring (EN) from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch **S-007** in the OFF position, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E pin 38** | Chassis ground | There should be no continuity. |
| **X-F02E pin 38** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity during one of the two checks, there is a short circuit to ground or towards another circuit in the temperature signal circuit of the temperature and pressure sensor of the intake manifold **B-F48**, locate and repair the damaged or shorted conductor.

   B. If there is no continuity in both checks, go to step **3**.
3. Replace the intake manifold pressure and temperature sensor **B-F48**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is found and the display shows normal values, erase fault code.

# 295467 9E1203 4766-3 - High check in signal range

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature sensor at the exhaust downstream of the Diesel Oxidation Catalyst (DOC) **B-F33** to check the presence of a short circuit towards a high voltage source. If the ECU **A-F02** determines the presence of a short circuit towards a high voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33**, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** on the last valid value detected or on a default replacement value once the fault has been validated.

**Cause:**
The ECU **A-F02** has detected a voltage higher than permitted in the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC system **B-F33**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature sensor at the exhaust downstream of the DOC **B-F33**, short circuit towards a high voltage source.
2. Faulty temperature sensor at the exhaust downstream of the DOC **B-F33**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **5**.

2. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33** for a short circuit towards another circuit.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 27** | All other pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Receptacle) pin 28** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33**, Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.

3. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33** for a short circuit towards a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 27** | Chassis ground | There should be no voltage. |
| **X-F02V (Receptacle) pin 28** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards a voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33**, Locate and repair the shorted conductors.

B. If there is no voltage, go to step **4**.

4. Replace the temperature sensor at the exhaust downstream of the DOC **B-F33**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 9E1204 4766-4 - Low check in signal range

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature signal circuit of the temperature sensor at the exhaust downstream of the diesel oxidation catalyst (DOC) **B-F33**. If the ECU **A-F02** determines that the voltage in the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33** is lower than the expected value, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** on the last valid value detected or on a default replacement value once the fault has been validated.

**Cause:**
The ECU **A-F02** has detected a voltage lower than expected in the temperature signal circuit of the exhaust temperature sensor downstream of the DOC **B-F33**.

**Possible failure modes:**

1. Faulty temperature signal wire in the temperature sensor at the exhaust downstream of the DOC **B-F33**, short circuit to ground.
2. Faulty temperature sensor at the exhaust downstream of the DOC **B-F33**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **4**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F113** to check for a short circuit to ground.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 27** | Chassis ground | There should be no continuity. |
| **X-F02V pin 27** | All other pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Receptacle) pin 28** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 28** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity during one of the checks, this indicates a short circuit to ground or to another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F33** Locate and repair the damaged or shorted conductor.

   B. If there is no continuity on either check, go to step **3**.
3. Replace the temperature sensor at the exhaust downstream of the DOC **B-F33**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 4765-3 9D1203 - Diagnostic fault check for SCR high in oxidation catalyst upstream temperature

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature sensor at the exhaust upstream of the diesel oxidation catalyst (DOC) **B-F32** checking for a short circuit towards a high voltage source. If the ECU **A-F02** senses the presence of a short circuit towards a high voltage source in the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32**, this fault occurs. If this fault occurs, the temperature value is blocked by the ECU **A-F02** at the last valid value detected or at a default value, once the fault is validated.

**Cause:**
The ECU **A-F02** has detected a voltage higher than expected in the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature sensor at the exhaust upstream of the DOC **B-F32**, short circuit towards a high voltage source.
2. Faulty temperature sensor at the exhaust upstream of the DOC **B-F32**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **6**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32** for a short circuit towards another circuit.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V pin 30** | All other pins in connector **X-F02V** | There should be no continuity. |
| ***NOTE:*** *The connector* ***X-F02V (Receptacle) pin 27*** *is the ground return side of the temperature signal of the temperature sensor at the exhaust upstream of the DOC* ***B-F32****. The value must be between* ***169.7 – 738.2 Ω*** *according to the temperature at the exhaust* ***-40 – 800 °C*** *(****-40 – 1472 °F****).* | | |

   A. If there is continuity, there is a short circuit towards another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F32**, Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.
3. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32** for a short circuit towards a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V pin 30** | Chassis ground | There should be no voltage. |
| **X-F02V (Receptacle) pin 27** | Chassis ground | There should be no voltage. |

A. If there is voltage, there is a short circuit towards a voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F32**, Locate and repair the shorted conductors.

B. If there is no voltage, go to step **4**.

4. Check the correct operation of the temperature sensor at the exhaust upstream of the DOC **B-F32** following the procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, go to step **6**.

   B. If the sensor is not working correctly, go to step **54**.

5. Replace the exhaust gas temperature sensor upstream of the DOC **B-F32**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 9D1204 4765-4 - Diagnostic fault check for SCR low in oxidation catalyst upstream temperature

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature signal circuit of the temperature sensor at the exhaust upstream of the diesel oxidation catalyst (DOC) **B-F32**. If the ECU **A-F02** senses that the voltage in the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32** is below the expected value, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** at the last valid value detected or at a default value once the fault is validated.

**Cause:**
The ECU **A-F02** has detected a voltage lower than expected in the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature sensor at the exhaust upstream of the DOC **B-F32**, short circuit to ground.
2. Faulty temperature sensor at the exhaust upstream of the DOC **B-F32**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **5**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the DOC **B-F32** for a short circuit to ground.

   Disconnect the Stage 5 (S5) engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 30** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 30** | All other pins in connector **X-F02V** | There should be no continuity. |
| ***NOTE:*** *The connector **X-F02V (Receptacle) pin 27** is the ground return side of the temperature signal of the temperature sensor at the exhaust upstream of the DOC **B-F32**. The value must be between **169.7 – 738.2 Ω** according to the temperature at the exhaust **-40 – 800 °C** (**-40 – 1472 °F**).* | | |

   A. If there is continuity during one of the checks, this indicates a short circuit to ground or to another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the DOC **B-F32** locate and repair the damaged or shorted conductor.

   B. If there is no continuity on either check, go to step **3**.
3. Check the correct operation of the temperature sensor at the exhaust upstream of the DOC **B-F32** following the procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, go to step **5**.

   B. If the sensor is not working correctly, go to step **4**.

4. Replace the exhaust gas temperature sensor upstream of the DOC **B-F32**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518654-9 FEE9E9 - Timeout error of CAN-receive-frame CM1BC from Body Computer

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node A of the CAN Bus is the main vehicle interface bus. The ECU **A-F02** supplies a CAN terminating resistor for node A of the CAN Bus inside the ECU **A-F02**. The ECU **A-F02** receives the CM1BC CAN message from the vehicle control unit containing information on the activation percentage of the fan, the adjustable speed limitation request switch, the second speed limitation request switch and the switches for requesting forced regeneration and disabling of the particulate filter. If the ECU **A-F02** detects a timeout error of the CM1BC message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a CM1BC message timeout.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN fault or low voltage in vehicle control unit.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN wiring harness, open or short circuit.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.go to step **7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**.

5. Check the CAN circuit of the ECU **A-F02** for a short circuit.

Disconnect the engine wiring from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to **6**.

6. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H terminal | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L terminal | There should be continuity. |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If there is continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 FDE9FF 518653-31 - CAN error from VCM control unit relating to the engine shutdown request from the auxiliary switch

## Control Module: FPT ECU

**Fault Description:**
This code does not describe a fault but a switching off due to an external request. No intervention is required. Check the source of the fault that has caused the engine to stop.

# 295467 5EE9F3 518494-19 - Timeout error of CAN-receive-frame TSC1PE (bit control error)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1PE containing the information regarding torque/speed request from the power take-off. If the ECU **A-F02** detects a timeout error for message TSC1PE, this error occurs.

**Cause:**
The ECU **A-F02** has detected a TSC1PE message timeout error.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.

4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If there is continuity, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the machine to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 5EE9FF 518494-31 - Timeout error of CAN-receive-frame TSC1PE, error condition

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1PE CAN message providing information regarding torque/speed from the PTO. If the ECU **A-F02** detects an invalid TSC1PE message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an invalid TSC1PE message.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.
4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Reading |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to**6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If no continuity is detected, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If continuity is detected, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the vehicle to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518494-11 5EE9EB - Timeout error of CAN-receive-frame TSC1PE, out of range

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1PE CAN message providing information regarding torque/speed from the PTO. If the ECU **A-F02** detects an invalid TSC1PE message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an invalid TSC1PE message.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.

4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Reading |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to**6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If no continuity is detected, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If continuity is detected, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the vehicle to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 5EE9EE 518494-14 - Timeout error of CAN-receive-frame TSC1PE, counter error (lost frame)

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1PE CAN message containing the information regarding torque/speed from the PTO. The rolling counter logic is used to identify errors caused by intermittent missing of the CAN frame. If the ECU **A-F02** detects an error in the rolling counter (missing frame) for the TSC1PE message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an error in the counter (frame missing).

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.

4. Check the ECU **A-F02** grounding.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Reading |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

   A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

   B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

   A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is correct, go to**6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

   A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

   A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. If no continuity is detected, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If continuity is detected, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the vehicle to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518494-9 5EE9E9 - Timeout error of CAN-receive-frame TSC1PE from power take-off (engine speed sensor)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1PE containing the information regarding torque/speed request from the power take-off. If the ECU **A-F02** detects a timeout error for message TSC1PE, this error occurs.

**Cause:**
The ECU **A-F02** has detected a TSC1PE message timeout error.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.

4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Reading |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to**6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If no continuity is detected, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If continuity is detected, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the vehicle to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518495-9 5FE9E9 - Timeout error of CAN-receive-frame TSC1PE from power take-off (active mode)

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN (Controller Area Network) networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU **A-F02**. The ECU **A-F02** receives the CAN message TSC1PE containing the information regarding torque/speed requested by the power take-off. If the ECU **A-F02** detects a timeout error for message TSC1PE and the fault condition occurs continuously for more than **10 ms**, this error occurs.

**Cause:**
The ECU **A-F02** has detected a timeout error of message TSC1PE for more than **10 ms**.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to step **4**.

4. Check the ECU **A-F02** grounding.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Reading |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Frame ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Frame ground | There should be continuity. |

   A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

   B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

   A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is correct, go to**6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

   A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

   A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. If no continuity is detected, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If continuity is detected, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the vehicle to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 60E9E9 518496-9 - Timeout error of CAN-receive-frame TSC1PE from power take-off (passive mode)

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1PE CAN message providing information regarding torque/speed from the PTO. If the ECU **A-F02** detects a timeout error of the TSC1PE message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a TSC1PE message timeout error.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the power take-off.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.

4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the PTO.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If there is continuity, go to **9**

9. Check the correct operation of the PTO.

A. If it is not working correctly, replace it and return the machine to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 518254-11 6EE8EB - Timeout error of CAN-receive-frame TSC1VE, out of range

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 1 of the CAN BUS is the main vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 1 of the CAN BUS inside the ECU control unit **A-F02**. The ECU **A-F02** receives the TSC1VE CAN message containing the information regarding the torque/speed request from the vehicle control unit. If the ECU **A-F02** detects an invalid TSC1VE message, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an invalid TSC1VE message.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Fault in the vehicle control unit.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **9**.

2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue with step **3**.

3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the ON position, use a multimeter to check for voltage on the wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | There should be a voltage of **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | There should be a voltage of **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.

4. Check the ECU **A-F02** grounding.

Disconnect the vehicle wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch set to OFF, use a multimeter to check for continuity on the vehicle wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine wiring harness side:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to**7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side phase:

| From | A | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. If there is no continuity, go to **9**.

8. Check the ECU CAN circuit **A-F02** for an open circuit condition.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Disconnect the wiring from the vehicle control unit.

With the ignition switch set to “ON”, use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H | There should be continuity |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L | There should be continuity |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**.Locate and repair the broken conductor.

B. If there is continuity, go to **9**

9. Check the correct operation of the vehicle control unit.

A. If it is not working correctly, replace it and return the machine to service.

B. If it is working correctly, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

10. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Flex the relevant wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 61000C 97-12 - Water in fuel sensor faulty

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the voltage output from the water sensor in the fuel **B-F217** in order to determine the presence of any water in the fuel supply. If water is detected in the fuel, warnings will be displayed to the operator about the risk of damaging the engine if continuing to use the unit. A ground signal from the water sensor in the fuel **B-F217** indicates the presence of water. This fault code is displayed to warn the operator that the ECU **A-F02** has detected water in excess in the supply system or a fault in the water in fuel sensor circuit.

**Cause:**
Faulty water in fuel sensor **B-F217**.

**Possible failure modes:**

1. Excess water in the fuel supply.
2. Faulty water in fuel sensor **B-F217**, wiring or internal (mechanical and/or electrical) fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify this fault code is still present and in an active state.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is still present and remains active, continue with step **2**.

   B. If the fault is no longer present or is in an inactive state, continue with **7**.
2. Check fuel for water contamination.

   A. If there is water contamination, continue with step **3**.

   B. If there is no water contamination, continue with **4**.
3. Check the correct operation of the water in fuel sensor **B-F217**.

   Purge fuel supply system, replace fuel filter(s) and refill with fuel that is free of water contamination.

   Start and run the engine for 5 minutes.

   Check for code to return to active status.

   A. If code returns in an active status, replace water in fuel sensor **B-F217**.

   B. If code remains inactive, return the machine to service.
4. Check for open, short, and grounded circuit conditions in the water in fuel sensor **B-F217** circuit.

   Disconnect the water in fuel sensor **B-F217** at connector **X-F217**.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | **X-F02V (Receptacle) pin 70** | There should be continuity. |
| **X-F217 (Receptacle) pin 2** | Frame ground | There should be continuity. |
| **X-F217 (Receptacle) pin 3** | **X-F02V (Receptacle) pin 75** | There should be continuity. |

   Then use the multimeter to perform the following tests on the engine wiring:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 70** | **X-F02V** all other pins | There should be no continuity |
| **X-F02V (Receptacle) pin 75** | **X-F02V** all other pins | There should be no continuity |

Use a multimeter to perform the following wiring checks:

| From | To | Value |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | Ground | There should be no continuity |
| **X-F217 (Receptacle) pin 3** | Ground | There should be no continuity |

A. If the results are not as expected for any of the wiring tests listed above, there is an open, short or grounded circuit condition in the wiring. For diagnostics and to repair the wiring refer to the wiring diagrams.

B. If the results are as expected in all of the wiring tests listed above, the wiring is okay. Leave the connectors disconnected and go to **5**.

5. Check the power supply voltage of the water in fuel sensor **B-F217**.

With the ignition switch in the ON position, use a multimeter to perform the following test on the wiring side of the water in fuel sensor:

| From | To | Reading |
|---|---|---|
| **X-F217 (Receptacle) pin 1** | Ground | There should be ignition switch voltage. |

A. If there is ignition switch voltage present, continue with step **6**.

B. If no voltage is detected in the ignition switch, there is an open circuit or a short circuit to ground between **X-F217 (Receptacle) pin 1** and **X-F02V (Receptacle) pin 70**. Locate and repair the open circuit or the short circuit in the wiring.

6. Replace the water in fuel sensor **B-F217**, then check to see if this fault has been resolved.

A. If the fault has been resolved, return the machine to service.

B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damages are found and the display shows normal values, erase fault code.

# 295467 A20505 1442-5 - Open circuit on the fuel dosing unit

## Control Module: FPT ECU

**Fault Description:**
The ECU **A-F02** monitors the voltage and the correct operation of the fuel metering unit **Y-F07**. If the fuel metering unit **Y-F07** is not operating, the fuel pressure will reach the maximum value.

**Cause:**
Wiring disconnected or faulty fuel metering unit **Y-F07**.

**Possible failure modes:**

1. Fuel metering unit **Y-F07** solenoid coil, defective.
2. Faulty fuel metering unit **Y-F07** control circuit, broken wiring.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**.

2. Check condition of fuel metering unit **Y-F07** solenoid coil.

   Disconnect the engine wiring harness from the fuel metering unit **Y-F07** at connector **X-F07**.

   Use a multimeter to measure the resistance of the fuel metering unit **Y-F07** solenoid coil:

| From | To | Value |
|---|---|---|
| **X-F07 (Receptacle) pin 1** | **X-F07 (Receptacle) pin 2** | The resistance should be **2.8 – 3.2 Ω**. |

   A. If there is between **2.8 – 3.2 Ω** leave the connector **X-F07** disconnected and go to **3**.

   B. If the result is infinite resistance, the fuel metering unit **Y-F07** solenoid coil is faulty, replace the fuel metering unit **Y-F07**.

3. Verify the condition of the fuel metering unit **Y-F07** control circuit.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

   Use a multimeter to check for continuity in the engine wiring harness:

| From | To | Value |
|---|---|---|
| **X-F07 (Receptacle) pin 1** | **X-F02E (Receptacle) pin 7** | There should be continuity. |
| **X-F07 (Receptacle) pin 2** | **X-F02E (Receptacle) pin 6** | There should be continuity |

   A. If there is continuity in both checks, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If no continuity is detected on the high side or low side control circuit, this indicates an interruption. Locate and repair the broken conductor.

4. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 A20506 1442-6 - Fuel metering unit has an over-temperature error

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the voltage and the correct operation of the fuel metering unit **Y-F07**. If the fuel metering unit **Y-F07** is not operating, the fuel pressure will reach the maximum value.

**Cause:**

- high voltage in the battery;
- high internal temperature in the ECU **A-F02**;
- open circuit or wiring problems.

**Possible failure modes:**

1. Fault in the battery, voltage too high;
2. Fuel metering unit **Y-F07** solenoid coil, defective.
3. Faulty fuel metering unit **Y-F07** control circuit, broken wiring.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **4**.
2. Check for faults in the battery.

   Check the condition of the battery charge.

   Check that the battery voltage is correct.

   A. If no problems have been detected,go to **3**.

   B. If problems have been detected,replace the battery.
3. Check condition of fuel metering unit **Y-F07** solenoid coil.

   Disconnect the engine wiring harness from the fuel metering unit **Y-F07** at connector **X-F07**.

   Use a multimeter to measure the resistance of the fuel metering unit **Y-F07** solenoid coil:

| From | To | Value |
|---|---|---|
| **X-F07 (Receptacle) pin 1** | **X-F07 (Receptacle) pin 2** | The resistance should be **2.8 – 3.2 Ω**. |

   A. If there is between **2.8 – 3.2 Ω** leave the connector **X-F07** disconnected and go to **3**.

   B. If the result is infinite resistance, the fuel metering unit **Y-F07** solenoid coil is faulty, replace the fuel metering unit **Y-F07**.
4. Verify the condition of the fuel metering unit **Y-F07** control circuit.

   Disconnect the engine wiring harness from the ECU **A-F02** at the connector **X-F02E**.

Use a multimeter to check for continuity in the engine wiring harness:

| From | To | Value |
|---|---|---|
| **X-F07 (Receptacle) pin 1** | **X-F02E (Receptacle) pin 7** | There should be continuity. |
| **X-F07 (Receptacle) pin 2** | **X-F02E (Receptacle) pin 6** | There should be continuity |

A. If there is continuity in both checks, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If no continuity is detected on the high side or low side control circuit, this indicates an interruption. Locate and repair the broken conductor.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 3064-7 F80B07 - DPF system: particulate filter damaged

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the integrity of the particulate filter. In order to determine the integrity of the particulate filter, the pressure drop measured on the empty filter (low soot) in stationary conditions is compared with the reference values determined on a new undamaged DPF. An error is detected if the maximum differential pressure value saved at stationary state is lower than a threshold that depends on the flow of the volume.

**Cause:**
The particulate filter has failed or is disassembled

**Possible failure modes:**

1. Faulty particulate filter, failed or disassembled
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Go to **6**.
2. Check for black smoke at the exhaust pipe.

   A. If there is black smoke, the particulate filter could be disassembled. Install it correctly. If the fault occurs again go to **5**.

   B. If there is no black smoke, contact the Technical Help Desk.
3. Check that the particulate filter is operating correctly.

   A. If a fault is present,replace the filter.

   B. If a fault is not present,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 3703-7 770E07 - Particulate filter blocked inhibit request switch

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the particulate filter regeneration switch. The particulate filter regeneration function allows the filter to be reset through intervention of the diagnostic tool or through the dedicated switch on the vehicle.
When the switch remains locked in the closed position for longer than expected, the fault occurs.

**Cause:**
The particulate filter regeneration switch remains blocked in the closed position.

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration , wiring or switch.
2. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or active, it may be intermittent and currently inactive. Go to step **6**.
2. Check the correct operation of the particulate filter regeneration switch and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, continue to step **5**.
3. Check the correct operation of the particulate filter regeneration switch by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch . After having carried out the regeneration reset the switch use counter.

   A. If the switch is working correctly, contact the Technical Help Desk.

   B. If the switch is not working correctly, continue to step**4**.
4. Replace the particulate filter regeneration switch.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.
5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

B. If no damage is detected and normal values are shown on the display, delete the fault code.

# 295467 4781-0 AD1200 - DPF system: particulate filter clogged

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the regeneration switch of the particulate filter . The particulate filter regeneration function allows restoring the filter by using the diagnostic instrument or the dedicated switch on the vehicle. The filter regeneration occurs when the soot load exceeds the permitted limit. When the particulate filter is overloaded with an excessive accumulation of soot, higher than permitted also after regeneration, this fault occurs.

**Cause:**
The filter regeneration has not been carried out for too much time.

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration , wiring or switch.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Go to **6**.
2. Check the correct operation of the particulate filter regeneration switch and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to **5**.
3. Check the correct operation of the particulate filter regeneration switch by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch . After having carried out the regeneration reset the switch use counter.

   A. If the switch is working correctly, contact the Technical Help Desk.

   B. If the switch is not working correctly, go to **4**.
4. Replace the particulate filter regeneration switch.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault is resolved, return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and re-flash if necessary.
5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 518201-31 39E8FF - Control unit internal error: erratic shutdown detected

## Control Module: FPT ECU

**Fault Description:**
The system of the Engine Control Unit (ECU) **A-F02** supplies the execution command as the calculation of the "ECU deactivation time". The "incorrect activation counter" is a function of a control counter whose task is to check if the ECU **A-F02** has always been operating from when the ECU **A-F02** has been activated to when it has been deactivated. If the ECU **A-F02** has been incorrectly switched off before completing the shut down procedure (due to power failure, power supply reset, or software reset with the key switch signal set to OFF), the counter is not reset. This causes the subsequent initialization (switching on activation) after reading the counter in order to detect the missed reset and the signalisation of this error.

**Cause:**

The ECU **A-F02** has been switched off while the engine is running due to:

- a loss of power supply;
- a software reset **A-F02**.

**Solution:**

1. Check that the error is not sporadic or intermittent.

   A. If the fault is not constant, it is possible that the operator might have disconnected the power supply before the afterrun has completed or immediately after the key off.Adjust the duration of the ECU afterrun accordingly **A-F02**.

   B. If the fault is always present, continue with **1**.
2. Check for related faults.

   Use the diagnostic instrument to determine the presence of faults in the battery power supply.

   A. If other faults are present in the battery supply, resolve the corresponding fault. Then determine if the fault has been resolved.

   B. If other faults are not detected on the battery supply, continue with step **2**.
3. End the operations underway and restart the machine.

   Check the ECU **A-F02** for the appropriate software and re-flash if necessary.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 152-14 98000E - Visibility of software resets in DSM

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the presence of possible errors in the software inside the ECU **A-F02**. If the ECU **A-F02** detects an error in the software, the software undergoes a complete reset and this fault occurs.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash if necessary.
   A. If the fault has been resolved, the machine can resume service.
   B. If the fault has not been resolved, contact the Technical Help Desk.

# 295467 98001F 152-31 - ECU has an internal fault: software resets in DSM 1

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the presence of possible errors in the software inside the ECU **A-F02**. If the ECU **A-F02** detects an error in the software, the software undergoes a complete reset and this fault occurs.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and re-flash if necessary.
   A. If the fault has been resolved, the machine can resume service.
   B. If the fault has not been resolved, replace the ECU.

# 295467 DDEDF0 519645-16 - SCR inducement: level 1 (torque reduction), triggered by EGR valve blocked

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
Faults in the EGR and SCR systems are monitored and trigger different warnings and reactions. The Inducement starts with a warning, then a reduction in torque and if this fault has not been corrected, a slow mode is activated with a sharp reduction in the maximum speed of the vehicle. These faults are grouped into different categories.

**Cause:**
INFO: Level 1 Inducement due to EGR valve blocked

**Solution:**

1. This fault report is provided for information only, therefore no further actions are required other than resolving the active error that has caused this fault. One of the faults at the exhaust gas recirculation system valve ( EGR) or related components active for a longer time causes this problem to occur.

# 295467 DDEDE0 519645-0 - SCR inducement: level 3 (torque reduction), triggered by EGR valve blocked

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
Faults in the EGR and SCR systems are monitored and trigger different warnings and reactions. The Inducement starts with a warning, then a reduction in torque and if this fault has not been corrected, a slow mode is activated with a sharp reduction in the maximum speed of the vehicle. These faults are grouped into different categories.

**Cause:**
INFO: warning for the driver due to EGR valve blocked

**Solution:**

1. This fault report is provided for information only, therefore no further actions are required other than resolving the active error that has caused this fault. One of the faults at the exhaust gas recirculation system valve ( EGR) or related components active for a longer time causes this problem to occur.

# 295467 1128-18 680412 - Turbocharger boost pressure is lower than expected

## Control Module: FPT ECU

**Fault Description:**
The pressure sensor **B-F48** sends status and feedback information at regular intervals to the engine control unit (ECU) **A-F02** relating to the operating status of the turbocharger. If the pressure sensor **B-F48** detects that the current pressure value of the turbocharger is lower than the set threshold, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a turbocharger actuator blockage condition or turbocharger efficiency is impaired.

**Possible failure modes:**

1. Fault in the turbocharger.
2. Fault in the **B-F48**pressure sensor.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **5**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. Go to step **6**.
2. Carry out the tests to verify operation of the turbocharger pipes.

   A. If faults are identified, Replace the turbocharger.

   B. If the fault has not been resolved, go to step **3**
3. As there is no method for field testing, replace the pressure sensor **B-F48**. Check if the fault has been resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 14E8FF 518164-31 - Limitation for level 2 correction of fuel quantity on injection

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** will check in internally the quantity of fuel to be delivered to the fuel metering unit. If the ECU **A-F02** determines that the level 2 of fuel quantity is lower than level 1, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a level 2 of fuel quantity lower than level 1.

**Possible failure modes:**

1. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and update if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 15E8FF 518165-31 - Torque limitation activated for engine idle speed correction

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** will check internally the quantity of fuel to be delivered to the fuel metering unit. When the level 2 of fuel quantity is incorrect, the ECU **A-F02** will supply a minimum stable speed at the set torque, until the correct quantity of fuel of level 2 is supplied. If the ECU **A-F02** determines that the level 2 of fuel quantity is incorrect, the ECU will set the engine at idling speed and this fault occurs.

**Cause:**
The ECU **A-F02** has detected an incorrect level 2 of fuel quantity.

**Possible failure modes:**

1. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the ECU **A-F02** for the appropriate software and update if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 98F0FF 520344-31 - ECU internal failure - Safety management unit alarm group 0 Failure 1 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520344-11 98F0EB - ECU internal failure - Safety management unit alarm group 0 Failure 11 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520345-31 99F0FF - ECU internal failure - Safety management unit alarm group 0 Failure 12 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520345-11 99F0EB - ECU internal failure - Safety management unit alarm group 0 Failure 15 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 9AF0FF 520346-31 - ECU internal failure - Safety management unit alarm group 0 Failure 16 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520346-11 9AF0EB - ECU internal failure - Safety management unit alarm group 0 Failure 3 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 9BF0FF 520347-31 - ECU internal failure - Safety management unit alarm group 0 Failure 4 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 9BF0EB 520347-11 - ECU internal failure - Safety management unit alarm group 0 Failure 7 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520348-31 9CF0FF - ECU internal failure - Safety management unit alarm group 0 Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520348-11 9CF0EB - ECU internal failure - Safety management unit alarm group 1 Failure 0 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520349-31 9DF0FF - ECU internal failure - Safety management unit alarm group 1 Failure 1 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 9DF0EB 520349-11 - ECU internal failure - Safety management unit alarm group 1 Failure 11 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520350-31 9EF0FF - ECU internal failure - Safety management unit alarm group 1 Failure 12 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520350-11 9EF0EB - ECU internal failure - Safety management unit alarm group 1 Failure 15 issued

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** carries out internal extended monitoring of the alarms of the error management module (EMM), which are signalled by the hardware unit of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults of it. The SMU centralises all alarm signals relative to the safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in various groups whose status is saved in the relevant records. This fault indicates that a process internal fault is present. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 520351-31 9FF0FF - ECU internal failure - Safety management unit alarm group 1 Failure 16 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520351-11 9FF0EB - ECU internal failure - Safety management unit alarm group 1 Failure 3 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520352-31 A0F0FF - ECU internal failure - Safety management unit alarm group 1 Failure 4 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520352-11 A0F0EB - ECU internal failure - Safety management unit alarm group 1 Failure 7 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 A1F0FF 520353-31 - ECU internal failure - Safety management unit alarm group Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 A1F0EB 520353-11 - ECU internal failure - Safety management unit alarm group 2 Failure 15 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520354-31 A2F0FF - ECU internal failure - Safety management unit alarm group 2 Failure 18 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520354-11 A2F0EB - ECU internal failure - Safety management unit alarm group 2 Failure 19 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520356-31 A4F0FF - ECU internal failure - Safety management unit alarm group 2 Failure 5 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520356-11 A4F0EB - ECU internal failure - Safety management unit alarm group 2 Failure 7 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 A5F0FF 520357-31 - ECU internal failure - Safety management unit alarm group 2 Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520357-11 A5F0EB - ECU internal failure - Safety management unit alarm group 3 Failure 0 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 A6F0FF 520358-31 - ECU internal failure - Safety management unit alarm group 3 Failure 1 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520358-11 A6F0EB - ECU internal failure - Safety management unit alarm group 3 Failure 12 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520359-31 A7F0FF - ECU internal failure - Safety management unit alarm group 3 Failure 14 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520359-11 A7F0EB - ECU internal failure - Safety management unit alarm group 3 Failure 16 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520360-31 A8F0FF - ECU internal failure - Safety management unit alarm group 3 Failure 17 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520360-11 A8F0EB - ECU internal failure - Safety management unit alarm group 3 Failure 18 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 A9F0FF 520361-31 - ECU internal failure - Safety management unit alarm group 3 Failure 19 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520361-11 A9F0EB - ECU internal failure - Safety Management Unit Alarm Group 3 Failure 2 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 520362-31 AAF0FF - ECU internal failure - Safety management unit alarm group 3 Failure 20 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520362-11 AAF0EB - ECU internal failure - Safety management unit alarm group 3 Failure 26 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 ABF0FF 520363-31 - ECU internal failure - Safety management unit alarm group 3 Failure 27 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520363-11 ABF0EB - ECU internal failure - Safety management unit alarm group 3 Failure 28 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520364-31 ACF0FF - ECU internal failure - Safety management unit alarm group 3 Failure 3 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520364-11 ACF0EB - ECU internal failure - Safety management unit alarm group 3 Failure 4 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520365-31 ADF0FF - ECU internal failure - Safety management unit alarm group 3 Failure 5 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 520365-11 ADF0EB - ECU internal failure - Safety management unit alarm group 3 Failure 6 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520366-31 AEF0FF - ECU internal failure - Safety management unit alarm group 3 Failure 7 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 AEF0EB 520366-11 - ECU internal failure - Safety management unit alarm group 3 Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520367-31 AFF0FF - ECU internal failure - Safety management unit alarm group 3 Failure 9 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 AFF0EB 520367-11 - ECU internal failure - Safety management unit alarm group 4 Failure 1 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 B0F0FF 520368-31 - ECU internal failure - Safety management unit alarm group 4 Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 B0F0EB 520368-11 - ECU internal failure - Safety management unit alarm group 4 Failure 17 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520369-31 B1F0FF - ECU internal failure - Safety management unit alarm group 4 Failure 18 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 B2F0FF 520370-31 - ECU internal failure - Safety management unit alarm group 4 Failure 5 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520370-11 B2F0EB - ECU internal failure - Safety management unit alarm group 4 Failure 6 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 B3F0FF 520371-31 - ECU internal failure - Safety management unit alarm group 4 Failure 9 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520371-11 B3F0EB - ECU internal failure - Safety management unit alarm group 6 Failure 1 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 B4F0FF 520372-31 - ECU internal failure - Safety management unit alarm group 6 Failure 11 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520372-11 B4F0EB - ECU internal failure - Safety management unit alarm group 6 Failure 12 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 520373-31 B5F0FF - ECU internal failure - Safety management unit alarm group 6 Failure 15 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520373-11 B5F0EB - ECU internal failure - Safety management unit alarm group 6 Failure 16 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520374-31 B6F0FF - ECU internal failure - Safety management unit alarm group 6 Failure 3 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 B6F0EB 520374-11 - ECU internal failure - Safety management unit alarm group 6 Failure 4 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520375-31 B7F0FF - ECU internal failure - Safety management unit alarm group 6 Failure 7 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** internally performs extensive monitoring of the management module error (EMM) alarms, which are reported by the hardware of the safety management unit (SMU). The SMU is a central component of the security architecture of the hardware structure to manage the behaviour of the microcontroller in the event that it fails. The SMU centralises all alarm signals related to security mechanisms based on software and hardware. The SMU also classifies all the alarms in different groups the status of which is stored in corresponding registers. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal failure, the ECU **A-F02** must be replaced.

# 295467 520375-11 B7F0EB - ECU internal failure - Safety Management Unit Alarm Group 6 Failure 8 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

# 295467 520355-31 A3F0FF - ECU internal failure - Safety management unit alarm group 2 Failure 29 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

**Cause:**
The ECU **A-F02** has an internal problem.

**Possible failure modes:**

1. Fault in the ECU **A-F02**, hardware or software.

**Solution:**

1. Check that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step**2**,

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. go to step **6**.
2. Clear the 2/3 level error from the fault memory, the procedure is independent of level 1 errors.

   Drive the vehicle a short distance (just a few kilometres); if diagnostics is possible, check the operational point where the error occurs.

   A. If the error returns, replace the ECU **A-F02**.

   B. If the error does not return, clearing the fault memory was sufficient. The machine can be returned to service.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is detected and normal values are shown on the display, delete the fault code.

# 295467 BBF0EB 520379-11 - ECU internal failure - Safety management unit alarm group 2 Failure 30 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

**Cause:**
The ECU **A-F02** has an internal problem.

**Possible failure modes:**

1. Fault in the ECU **A-F02**, hardware or software.

**Solution:**

1. Check that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Clear the 2/3 level error from the fault memory, the procedure is independent of level 1 errors.

   Drive the vehicle a short distance (just a few kilometres); if diagnostics is possible, check the operational point where the error occurs.

   A. If the error returns, replace the ECU **A-F02**.

   B. If the error does not return, clearing the fault memory was sufficient. The machine can be returned to service.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 A3F0EB 520355-11 - ECU internal failure - Safety management unit alarm group 2 Failure 4 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

**Cause:**
The ECU **A-F02** has an internal problem.

**Possible failure modes:**

1. Fault in the ECU **A-F02**, hardware or software.

**Solution:**

1. Check that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Clear the 2/3 level error from the fault memory, the procedure is independent of level 1 errors.

   Drive the vehicle a short distance (just a few kilometres); if diagnostics is possible, check the operational point where the error occurs.

   A. If the error returns, replace the ECU **A-F02**.

   B. If the error does not return, clearing the fault memory was sufficient. The machine can be returned to service.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 520369-11 B1F0EB - ECU internal failure - Safety management unit alarm group 4 Failure 2 issued

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** carries out extended internal monitoring of the alarms of the error management module (EMM), which are signalled by the hardware of the safety management unit (SMU). The SMU is a central component of the safety architecture of the hardware structure to manage the behaviour of the micro-controller in case of faults on it. The SMU centralises all alarm signals relating to safety mechanisms based on software and hardware. Furthermore the SMU classifies all alarms in groups whose status is saved in relative records. This fault indicates that there is a fault inside the process. Since this fault is the result of an internal fault, replace the ECU **A-F02**.

**Cause:**
The ECU **A-F02** has an internal problem.

**Possible failure modes:**

1. Fault in the ECU **A-F02**, hardware or software.

**Solution:**

1. Check that the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **6**.
2. Clear the 2/3 level error from the fault memory, the procedure is independent of level 1 errors.

   Drive the vehicle a short distance (just a few kilometres); if diagnostics is possible, check the operational point where the error occurs.

   A. If the error returns, replace the ECU **A-F02**.

   B. If the error does not return, clearing the fault memory was sufficient. The machine can be returned to service.
3. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, erase fault code.

# 295467 3695-2 6F0E02 - DPF regeneration emergency switch: Value not plausible

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the particulate filter regeneration switch **SW-F243**. The particulate filter regeneration function allows the filter to be restored via intervention of the diagnostic instrument or via the dedicated switch **SW-F243** on the vehicle. When the emergency switch **SW-F243** is activated while driving and filter regeneration is not useful or required at that moment, this fault occurs.

**Cause:**
The particulate filter regeneration switch **SW-F243** is activated while driving the vehicle at high speed or it is faulty.

**Possible failure modes:**

1. Fault in the switch for particulate filter regeneration **SW-F243**, wiring or switch.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. Go to **6**.
2. Check the correct operation of the connector **X-F243** of the particulate filter regeneration switch **SW-F243** and the wiring to which they are connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to **5**.
3. Check the correct operation of the particulate filter regeneration switch **SW-F243** by performing the regeneration of the particulate filter.

   Regeneration of the filter must be carried out using the diagnostic instrument or through the switch **SW-F243**. After having carried out the regeneration reset the switch use counter.

   A. If the switch **SW-F243** is working correctly, contact the Technical Help Desk.

   B. If the switch **SW-F243** is not working correctly, go to**4**.
4. Replace the particulate filter regeneration switch **SW-F243**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault is resolved, return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 A80010 1161-1 4449-1 168-16 116101 - Battery voltage: voltage too high

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the battery voltage using internal interfaces. If the measured voltage exceeds the permitted limit, this fault occurs. This fault is activated in order to deactivate the DNOX system by means of a suitable discharge and so as to prevent damage caused by battery voltage exceeding the nominal operational voltage range of the DNOX system components.

**Cause:**
The ECU **A-F02** has detected that the BattU_uRaw (voltage) signal not processed by the sensor is too high.

**Possible failure modes:**

1. Faulty wiring of the power supply circuit.
2. Faulty battery and/or recharging system.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to **6**.

2. Check the battery voltage.

   Engine running.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Battery terminal (+) | Battery terminal (-) | The value should be approximately **12 V** |

   A. If the voltage is not approximately **12 V**, go to **4**.

   B. If the value is approximately **12 V**, go to **3**.

3. Check the power supply circuit.

   Engine running.

   Disconnect the engine wiring (EN) from the ECU control unit **A-F02** at connector **X-F02V**.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 1** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 4** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 5** | Frame ground | It must be approx. **12 V** |

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 7** | Frame ground | It must be approx. **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 8** | Frame ground | It must be approx. **12 V** |

With the engine off and the ignition switch set to OFF.

Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 6** | Frame ground | There should be continuity. |
| **X-F02V (Plug) pin 9** | Chassis ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 10** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 11** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 12** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 13** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 16** | Frame ground | There should be continuity. |

A. If a value of approximately **12 V** is not detected, or if there is no continuity, go to **4**.

B. If a value of approximately **12 V** is detected and there is continuity, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Check the charging system for proper operation.

   A. If the charging system is not functioning properly, repair the charging system as necessary.

   B. If the charging system is functioning properly, carry out an eddy current absorption test in order to measure the excessive current absorption by the battery. In case of excessive absorption, identify and repair as needed, then recommission the machine..

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 168-18 8801-2 226102 2261-2 A80012 - Battery voltage: voltage too low

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the battery voltage using internal interfaces. If the measured voltage is lower than the permitted limit, this fault occurs. This fault is activated in order to deactivate the DNOX system by means of a suitable discharge and to prevent damage caused by battery voltage being lower than the nominal operational voltage range of the DNOX system components.

**Cause:**
The ECU **A-F02** has detected that the BattU_uRaw (voltage) signal not processed by the sensor is too high.

**Possible failure modes:**

1. Faulty wiring of the power supply circuit.
2. Faulty battery and/or recharging system.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive.Go to step **6**.
2. Check the battery voltage.

   Engine running.

   Use a multimeter to carry out the following continuity voltage check:

| From | To | Value |
|---|---|---|
| Battery terminal (+) | Battery terminal (-) | The value should be approximately **12 V** |

   A. If the voltage is not approximately **12 V**, continue to step **4**.

   B. If the value is approximately **12 V**, continue to step **3**.
3. Check the power supply circuit.

   Engine running.

   Disconnect the engine wiring (EN) from the ECU control unit **A-F02** at connector **X-F02V**.

   Use a multimeter to carry out the following continuity voltage check:

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 1** | Chassis ground | The value should be approximately **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 4** | Chassis ground | The value should be approximately **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 5** | Chassis ground | The value should be approximately **12 V** |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 7** | Chassis ground | The value should be approximately **12 V** |

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 8** | Chassis ground | The value should be approximately **12 V** |

With the engine off and the ignition switch set to OFF.

Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 6** | Frame ground | There should be continuity. |
| **X-F02V (Plug) pin 9** | Chassis ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 10** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 11** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 12** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 13** | Frame ground | There should be continuity. |
| Engine wiring side (EN) of connector **X-F02V (Plug) pin 16** | Frame ground | There should be continuity. |

A. If a value of approximately **12 V** is not detected, or if there is no continuity, continue to step **4**.

B. If a value of approximately **12 V** is detected and there is continuity, check that the software of ECU **A-F02** is correct and update if necessary.

4. Check the charging system for proper operation.

   A. If the charging system is not functioning properly, repair the charging system as necessary.

   B. If the charging system is functioning properly, carry out an eddy current absorption test in order to measure the excessive current absorption by the battery. In case of excessive absorption, identify and repair as needed, then recommission the machine..

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 DB1A0F 6875-15 - SCR Monitoring: positive UREA pressure offset

## Control Module: FPT ECU

**Fault Description:**

The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** which contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The fault occurs when the ECU **A-F02** detects that:

- The pressure sensor detects a signal above the plausibility range of the pressure values (which depend on the pump module temperature);
- The pressure sensor sends a signal above the expected threshold.

**Cause:**
The ECU **A-F02** detects that the pressure sensor inside the module **M-F42A** indicates too high values.

**Possible failure modes:**

1. Fault in the wiring.
2. Fault in the pressure sensor inside the pump module **M-F42A**.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the continuity of the wiring of the pressure sensor inside the pump module **M-F42A**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Disconnect the wiring from the pressure sensor at connector **X-F42A**.

   With the ignition switch set to OFF, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F42A (Plug) pin 2** | **X-F02E (Plug) pin 10** | There should be continuity. |
| **X-F42A (Plug) pin 3** | **X-F247** pin 87 | There should be continuity. |
| **X-F42A (Plug) pin 4** | **X-F02V (Plug) pin 2** | There should be continuity. |
| **X-F42A (Plug) pin 4** | **X-F02V (Plug) pin 4** | There should be continuity. |
| **X-F42A (Plug) pin 4** | **X-F02V (Plug) pin 6** | There should be continuity. |

   A. If continuity is detected, pass on to point **8**

   B. If there is no continuity, locate and repair or replace the damaged conductors.
3. Check the correct operation of the sensor inside the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)** )

   A. If the sensor is okay, pass on to point **3** .

   B. If the sensor is not working correctly, replace the sensor inside the SCR pump module **M-F42A** and go to step **3**

4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3363-12 230D0C - Stuck in range check of DEF/AdBlue tank temperature sensor

## Control Module: FPT ECU

**Fault Description:**

The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the tank heater **Y-F60**.

- If the ECU **A-F02** detects that the increase is lower than expected, this fault occurs.

**Cause:**

- "air bubble" heater with frozen UREA;
- faulty tank heater **Y-F60**.
- faulty wiring;

**Possible failure modes:**

1. Fault in the wiring.
2. Faulty tank heater **Y-F60**.
3. Faulty ECU **A-F02**, hardware or software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **6**.
2. Check the correct operation of the wiring of the pump module SCR motor **M-F42A**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Disconnect the wiring from the tank heater **Y-F60** at connector **X-F60**.

   With the ignition switch set to OFF, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F60 (Plug) pin 3** | **X-F02E (Plug) pin 70** | There should be continuity. |
| **X-F60 (Plug) pin 1** | **X-F247** pin 87 | There should be continuity. |

   A. If continuity is detected, go to step **8**

   B. If there is no continuity, locate and repair or replace the damaged conductors.
3. Check the correct operation of the tank heater **Y-F60** by following the test procedure indicated ( **CROSSOVER VALVE - Test (50.74)** )

   A. If the heater operates correctly, contact the Technical Help Desk.

   B. If the heater does not operate correctly, go to step **3**
4. Replace the tank heater **Y-F60**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Then carry out the SCR fault verification if necessary.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 4354-5 021105 - Open Load error of DEF/AdBlue Pressure Line Heater Actuator power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors correct operation of the resistor (pressure line) of the SCR heater contactor. When the ECU **A-F02** detects an open circuit in the wiring of the resistor (pressure line) of the SCR heater contactor, this fault occurs.

**Cause:**
There are broken or disconnected wires, or a faulty resistor.

**Possible failure modes:**

1. Fault in the wiring, open circuit.
2. Fault in the resistor (pressure line) of the SCR heater contactor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **6**.
2. Check for an open circuit in the wiring of the resistor (pressure line) .

   Disconnect the wiring from the ECU **A-F02** at connector .

   Disconnect the wiring of the resistor (pressure line).

   With the ignition switch set to OFF, use a multimeter to check the continuity:

   A. If continuity is detected, continue to step **8**

   B. If there is no continuity, locate and repair or replace the damaged conductors.
3. Check the correct operation of the resistor (pressure line) .

   A. If the resistor is working correctly, check that the correct operation of the fuel filter resistor.

   B. If the resistor is not working correctly, continue to step **6**
4. As there is no method for field testing, replace the resistor (pressure line) . Check if the fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 021103 4354-3 - Short circuit to battery in the DEF/AdBlue Pressure Line Heater

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the correct operation of the resistor (pressure line) of the SCR heater contactor. When the ECU **A-F02** detects a short circuit to positive in the wiring of the resistor (pressure line) of the SCR heater contactor, this fault occurs.

**Cause:**
Short circuit to positive in the wiring or faulty resistor.

**Possible failure modes:**

1. Faulty wiring, short circuit to positive.
2. Fault in the resistor (pressure line) of the SCR heater contactor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **6**.
2. Check the correct power supply voltage of the resistor (pressure line) of the SCR heater contactor.

   Disconnect the wiring from the ECU **A-F02**.

   With the ignition switch set to ON, use a multimeter to measure the voltage to check for a short circuit to ground.

   A. If the correct voltage is detected, continue to step **8**

   B. If the correct voltage is not detected, continue to step **2**.
3. Check the correct power supply voltage of the resistor (pressure line) of the SCR heater contactor.

   With the ignition switch set to ON, use a multimeter to measure the voltage. The fault is in the wiring between the resistor (pressure line) and the SCR reagent heater contactor or the contactor is faulty.

   A. If the correct voltage is detected. Locate the error and correct it.

   B. If the correct voltage is not detected, leave the connector disconnected and go to **3**.
4. Check the correct power supply voltage of the resistor (pressure line) of the SCR heater contactor.

   With the ignition switch set to ON, use a multimeter to check the voltage:

   A. If a voltage of **12 V** is detected,locate and repair or replace the damaged conductors.

   B. If a voltage of **12 V** is not detected,Replace the fuse.
5. Check the correct operation of the resistor (pressure line) .

   A. If the resistor is working correctly, check that the correct operation of the fuel filter resistor.

   B. If the resistor is not working correctly, continue to step **6**
6. As there is no method for field testing, replace the resistor (pressure line) . Check if the fault has been resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 021104 4354-4 7ABA1F 520538-4 5AF1E4 31418-31 - Short Circuit to Ground of DEF/AdBlue Pressure Line Heater Actuator power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the resistor (pressure line) of the SCR heater contactor. When the ECU **A-F02** detects a short circuit to ground in the wiring of the resistor (pressure line) of the SCR heater contactor, this fault occurs.

**Cause:**
There is a short circuit to ground in the wiring or the resistor is faulty.

**Possible failure modes:**

1. Faulty wiring, short circuit to ground.
2. Fault in the resistor (pressure line) of the SCR heater contactor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **6**.
2. Check for a short circuit to ground in the wiring of the resistor (pressure line) .

   Disconnect the wiring of the resistor (pressure line).

   With the ignition switch set to OFF, use a multimeter to check for continuity to check for a short circuit to ground.

   A. If there is no continuity, continue to step **8**

   B. If continuity is detected, locate and repair or replace the damaged conductors.
3. Check the correct operation of the resistor (pressure line) .

   A. If the resistor is working correctly, check that the correct operation of the fuel filter resistor.

   B. If the resistor is not working correctly, continue to step **6**
4. As there is no method for field testing, replace the resistor (pressure line) . Check if the fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3363-5 230D05 - Open Load error of DEF/AdBlue Tank Heater Actuator power stage

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the level and temperature of the diesel engine fluid **AdBlue®**. When the ECU **A-F02** detects an open circuit in the wiring of the SCR heater solenoid valve **Y-F60**, this fault occurs.

**Cause:**
There are broken or disconnected wires, or the SCR heater solenoid valve **Y-F60** is faulty.

**Possible failure modes:**

1. Fault in the wiring, open circuit.
2. Faulty SCR heater solenoid valve **Y-F60**.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **6**.
2. Check for an open circuit in the wiring of the SCR heater solenoid valve **Y-F60**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Disconnect the wiring from the SCR heater solenoid valve **Y-F60** at connector **X-F60**.

   With the ignition switch set to OFF, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F60 (Plug) pin 1** | **X-F247** pin 87 | There should be continuity. |
| **X-F60 (Plug) pin 3** | **X-F02E (Plug) pin 70** | There should be continuity. |

   A. If continuity is detected, go to step **8**

   B. If there is no continuity, locate and repair or replace the damaged conductors.
3. Check the correct operation of the SCR heater solenoid valve **Y-F60** by following the test procedure indicated ( **CROSSOVER VALVE - Test (50.74)**)

   A. If the solenoid valve is operating correctly, contact the Technical Help Desk.

   B. If the solenoid valve is not operating correctly, go to step **6**
4. replace the SCR heater solenoid valve **Y-F60**. Verify that the fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 230D06 3363-6 - Over Temperature error of DEF/AdBlue Tank Heater Actuator power stage

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the level and temperature of the diesel engine DEF/AdBlue® fluid. When the ECU **A-F02** detects that the fluid temperature is too high, this fault occurs.

**Cause:**

An excessively high temperature can be caused by:

1. Battery voltage too high;
2. High temperature inside the ECU;
3. SCR heater solenoid valve **Y-F60** faulty;
4. A problem of high load or a problem in the wiring.

**Possible failure modes:**

1. Fault in the wiring.
2. Fault in the battery.
3. Faulty SCR heater solenoid valve **Y-F60**.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify the DEF/AdBlue® tank temperature.

   Measure the temperature of the DEF/AdBlue® tank with a device such as infra-red heat gun to obtain relative DEF/AdBlue® fluid temperature.

   A. If the relative temperature is high, go to step **2**.

   B. If the relative temperature is not high, go to step **5**

2. Once again, check that the battery voltage is correct.

   Use the multimeter to check the correct voltage:

| From | To | Value |
|---|---|---|
| Battery terminal (+) | Battery terminal (–) | There should be a voltage of **12 V**. |

   A. If the voltage measured is approximately **12 V**, go to step **4** .

   B. If the voltage measured is not approximately **12 V**, replace the battery.

3. Check the conditions of the SCR heater solenoid valve **Y-F60**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   Disconnect the wiring from the SCR heater solenoid valve **Y-F60** at connector **X-F60**.

   With the ignition switch set to OFF, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F60 (Plug) pin 1** | **X-F247** pin 87 | There should be continuity. |
| **X-F60 (Plug) pin 3** | **X-F02E (Plug) pin 70** | There should be continuity. |

A. If continuity is detected, go to step **8**

B. If there is no continuity, locate and repair or replace the damaged conductors.

4. Check the correct operation of the SCR heater solenoid valve **Y-F60** by following the test procedure indicated ( **CROSSOVER VALVE - Test (50.74)**)

   A. The solenoid valve is working correctly, contact the Technical Help Desk.

   B. The solenoid valve is not working correctly, replace the SCR heater solenoid valve **Y-F60** and go to step **5**.

5. If necessary, use the diagnostic instrument to check the control unit and perform Reset ECU Data configuration.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 230D03 3363-3 - Short Circuit to Battery of DEF/AdBlue Tank Heater Actuator power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the level and temperature of the diesel engine fluid **AdBlue®**. When the ECU **A-F02** detects a short circuit to positive in the wiring of the SCR heater solenoid valve **Y-F60**, this fault occurs.

**Cause:**
Short circuit to positive in the wiring or faulty SCR heater solenoid valve **Y-F60**.

**Possible failure modes:**

1. Faulty wiring, short circuit to positive.
2. Faulty SCR heater solenoid valve **Y-F60**.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **6**.
2. Check the correct power supply voltage of the SCR heater solenoid valve **Y-F60**

   Disconnect the wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to ON, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F247** pin 87 | Battery positive | There should be no continuity |

   A. If there is no continuity, go to step **8**

   B. If continuity is detected, locate the error and correct it.
3. Check the correct operation of the SCR heater solenoid valve **Y-F60** by following the test procedure indicated ( **CROSSOVER VALVE - Test (50.74)**)

   A. If the solenoid valve is operating correctly, contact the Technical Help Desk.

   B. If the solenoid valve is not operating correctly, go to step **6**
4. replace the SCR heater solenoid valve **Y-F60**. Verify that the fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 230D04 3363-4 - Short Circuit to Ground of DEF/AdBlue Tank Heater Actuator power stage

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the level and temperature of the diesel engine fluid **AdBlue®**. When the ECU **A-F02** detects a short circuit to ground in the wiring of the SCR heater solenoid valve **Y-F60**, this fault occurs.

**Cause:**
There is a short circuit to ground in the wiring or the SCR heater solenoid valve **Y-F60** is faulty.

**Possible failure modes:**

1. Faulty wiring, short circuit to ground.
2. Faulty SCR heater solenoid valve **Y-F60**.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **6**.
2. Check for a short circuit to ground in the wiring of the SCR heater solenoid valve **Y-F60**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02E (Plug) pin 70** | Chassis ground | There should be no continuity |

   A. If there is no continuity, go to step **8**

   B. If continuity is detected, locate and repair or replace the damaged conductors.
3. Check the correct operation of the SCR heater solenoid valve **Y-F60** by following the test procedure indicated ( **CROSSOVER VALVE - Test (50.74)**)

   A. If the solenoid valve is operating correctly, contact the Technical Help Desk.

   B. If the solenoid valve is not operating correctly, go to step **6**
4. replace the SCR heater solenoid valve **Y-F60**. Verify that the fault has been resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 C31B02 7107-2 - Communication with the DEF/AdBlue not successful

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** that contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The pump module operates in temperature measuring mode (to determine whether it is necessary to increase or reduce it) and then switches to the pump actuation mode to reach the pressure required by the UREA **AdBlue®** to be injected. When the ECU **A-F02** detects an error in the pump module, this fault occurs.

**Possible failure modes:**

1. Fault in the SCR pump module **M-F42A**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **8**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **6**.
2. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. If the module is working correctly, contact the Technical Help Desk.

   B. If the module is not working correctly, go to step **3**
3. Replace the SCR pump module **M-F42A**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault verification if necessary.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3B1506 5435-6 - Over temperature error on power stage for DEF/AdBlue Supply Module pump motor

## Control Module: FPT ECU

***NOTE:*** *If the error is no longer present after a short time, no corrective actions are required.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** which contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The fault occurs when the ECU **A-F02** reports an overtemperature error.

**Cause:**

The fault could depend on:

- power supply voltage of the SCR motor of the pump module **M-F42A** too high;
- ECU **A-F02** internal temperature too high;
- wiring defects.

**Possible failure modes:**

1. Fault in the wiring.
2. Faulty SCR pump module **M-F42A**.
3. Faulty ECU **A-F02**, hardware or software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the temperature of the motor of the pump module **M-F42A**.

   A. If the temperature is high, go to step **2**.

   B. If the temperature is within the normal range, go to step **5**
3. Check for an open circuit in the wiring of the SCR motor of the pump module **M-F42A**.

   Disconnect the wiring from the ECU **A-F02** at connector **X-F02V**.

   Disconnect the pump motor wiring at connector **X-F42A**.

   With the ignition switch set to OFF, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F42A (Plug) pin 8** | **X-F02V (Plug) pin 89** | There should be continuity. |
| **X-F42A (Plug) pin 9** | **X-F02V (Plug) pin 50** | There should be continuity. |
| **X-F42A (Plug) pin 10** | **X-F02V (Plug) pin 84** | There should be continuity. |

   A. If continuity is detected, go to step **3**

   B. If there is no continuity, locate and repair or replace the damaged conductors.
4. Check for a short circuit in the wiring of the SCR motor of the pump module **M-F42A**.

Disconnect the pump motor wiring at connector **X-F42A**.

With the ignition switch set to ON, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F42A (Plug) pin 8** | **X-F42A (Plug) pin 9** | There should be no continuity. |
| **X-F42A (Plug) pin 9** | all other pins **X-F42A** | There should be no continuity. |
| **X-F42A (Plug) pin 8** | all other pins **X-F42A** | There should be no continuity. |

A. If there is no continuity, go to step **5**

B. If continuity is detected, locate and repair or replace the damaged conductors.

5. Check the correct operation of the motor of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)** )

   A. If the motor operates correctly, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the module is not working correctly, go to step **3**

6. Replace the motor of the SCR pump module **M-F42A**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault verification if necessary.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, go to step **5**

7. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

8. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 7107-16 C31B10 - The working cycle of the DEF/AdBlue internal pump is above the maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** that contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The pump module operates in temperature measuring mode (to determine whether it needs to be increased or reduced) and then switches to the pump actuation mode to reach the pressure required by the UREA **AdBlue®** to be injected.

**Possible failure modes:**

1. Fault in the SCR pump module **M-F42A**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. If the module is working correctly, pass on to point **5** .

   B. If the module is not working correctly, replace the SCR pump module **M-F42A** go to step **5**
3. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 7107-18 C31B12 - The working cycle of the DEF/AdBlue internal pump is below the minimum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** that contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The pump module operates in temperature measuring mode (to determine whether it needs to be increased or reduced) and then switches to the pump actuation mode to reach the pressure required by the UREA **AdBlue®** to be injected.

**Possible failure modes:**

1. Fault in the SCR pump module **M-F42A**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **8**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. If the module is working correctly, pass on to point **5** .

   B. If the module is not working correctly, replace the SCR pump module **M-F42A**, go to step **5**
3. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 5706-16 4A1610 - The working cycle of the DEF/AdBlue heater module is above the maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** that contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The pump module operates in temperature measuring mode (to determine whether it needs to be increased or reduced) and then switches to the pump actuation mode to reach the pressure required by the UREA **AdBlue®** to be injected.

**Possible failure modes:**

1. Fault in the SCR pump module **M-F42A**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the wiring of the pump **M-F42A**.

   With the key in the OFF position, use the a multimeter to perform the following continuity check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F42A pin 11** | Battery positive (+) | There should be continuity. |
| **X-F42A pin 12** | Chassis ground | There should be continuity. |

   A. If there is no continuity, if necessary, use the appropriate service manual to locate and repair the shorted conductor.

   B. If continuity is detected, go to step **3**.
3. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. If the module is working correctly, contact the Technical Help Desk.

   B. If the module is not working correctly, go to step **4**
4. Replace the SCR pump module **M-F42A**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault verification if necessary.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 5706-18 4A1612 - The working cycle of the DEF/AdBlue heater module is below the minimum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** that contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The pump module operates in temperature measuring mode (to determine whether it needs to be increased or reduced) and then switches to the pump actuation mode to reach the pressure required by the UREA **AdBlue®** to be injected.

**Possible failure modes:**

1. Fault in the SCR pump module **M-F42A**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the wiring of the pump **M-F42A**.

   With the key in the OFF position, use the a multimeter to perform the following continuity check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F42A pin 11** | Battery positive (+) | There should be continuity. |
| **X-F42A pin 12** | Chassis ground | There should be continuity. |

   A. If there is no continuity, If necessary, use the appropriate service manual to locate and repair the shorted conductor.

   B. If continuity is detected, go to step **3**.
3. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. If the module is working correctly, contact the Technical Help Desk.

   B. If the module is not working correctly, go to step **4**
4. Replace the SCR pump module **M-F42A**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault verification if necessary.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 C31B0F 7107-15 - The speed of the DEF/AdBlue pump is above the maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** that contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The pump module operates in temperature measuring mode (to determine whether it needs to be increased or reduced) and then switches to the pump actuation mode to reach the pressure required by the UREA **AdBlue®** to be injected.

**Possible failure modes:**

1. Fault in the SCR pump module **M-F42A**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the wiring of the pump **M-F42A**.

   With the key in the OFF position, use the a multimeter to perform the following continuity check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F42A pin 2** | **X-F02E (Receptacle) pin 10** | There should be continuity. |
| **X-F42A pin 3** | **X-F247 pin 87** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 2** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 4** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 6** | There should be continuity. |
| **X-F02V pin 5** | **X-F02E pin 29** | There should be continuity. |
| **X-F42A pin 6** | **X-F02E pin 5** | There should be continuity. |
| **X-F42A pin 8** | **X-F02V pin 15** | There should be continuity. |
| **X-F42A pin 9** | **X-F02V pin 46** | There should be continuity. |
| **X-F42A pin 10** | **X-F02V pin 42** | There should be continuity. |
| **X-F42A pin 11** | Battery positive (+) | There should be continuity. |
| **X-F42A pin 12** | Chassis ground | There should be continuity. |

   A. If there is no continuity, if necessary, use the appropriate service manual to locate and repair the shorted conductor.

   B. If continuity is detected, pass on to point **3**.
3. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. If the module is working correctly, pass on to point **5**

   B. If the module is not working correctly, replace the SCR pump module **M-F42A**, go to step **5**
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 C31B11 7107-17 - The speed of the DEF/AdBlue pump is below the minimum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** that contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The pump module operates in temperature measuring mode (to determine whether it needs to be increased or reduced) and then switches to the pump actuation mode to reach the pressure required by the UREA **AdBlue®** to be injected.

**Possible failure modes:**

1. Fault in the SCR pump module **M-F42A**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the wiring of the pump **M-F42A**.

   With the key in the OFF position, use the a multimeter to perform the following continuity check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F42A pin 2** | **X-F02E (Receptacle) pin 10** | There should be continuity. |
| **X-F42A pin 3** | **X-F247 pin 87** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 2** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 4** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 6** | There should be continuity. |
| **X-F02V pin 5** | **X-F02E pin 29** | There should be continuity. |
| **X-F42A pin 6** | **X-F02E pin 5** | There should be continuity. |
| **X-F42A pin 8** | **X-F02V pin 15** | There should be continuity. |
| **X-F42A pin 9** | **X-F02V pin 46** | There should be continuity. |
| **X-F42A pin 10** | **X-F02V pin 42** | There should be continuity. |
| **X-F42A pin 11** | Battery positive (+) | There should be continuity. |
| **X-F42A pin 12** | Chassis ground | There should be continuity. |

   A. If there is no continuity, if necessary, use the appropriate service manual to locate and repair the shorted conductor.

   B. If continuity is detected, pass on to point **3**.
3. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. If the module is working correctly, pass on to point **5** .

   B. If the module is not working correctly, replace the SCR pump module **M-F42A**, go to step **5** .
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 E6160F 5862-15 - Temperature above the maximum limit in the DEF/AdBlue module

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** that contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The pump module operates in temperature measuring mode (to determine whether it needs to be increased or reduced) and then switches to the pump actuation mode to reach the pressure required by the UREA **AdBlue®** to be injected.

**Possible failure modes:**

1. Fault in the SCR pump module **M-F42A**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the wiring of the pump **M-F42A**.

   With the key in the OFF position, use the a multimeter to perform the following continuity check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F42A pin 2** | **X-F02E (Receptacle) pin 10** | There should be continuity. |
| **X-F42A pin 3** | **X-F247 pin 87** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 2** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 4** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 6** | There should be continuity. |
| **X-F02V pin 5** | **X-F02E pin 29** | There should be continuity. |
| **X-F42A pin 6** | **X-F02E pin 5** | There should be continuity. |
| **X-F42A pin 8** | **X-F02V pin 15** | There should be continuity. |
| **X-F42A pin 9** | **X-F02V pin 46** | There should be continuity. |
| **X-F42A pin 10** | **X-F02V pin 42** | There should be continuity. |
| **X-F42A pin 11** | Battery positive (+) | There should be continuity. |
| **X-F42A pin 12** | Chassis ground | There should be continuity. |

   A. If there is no continuity, if necessary, use the appropriate service manual to locate and repair the shorted conductor.

   B. If continuity is detected, go to step **3**.
3. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. If the module is working correctly, contact the Technical Help Desk.

   B. If the module is not working correctly, go to step **4**
4. Replace the SCR pump module **M-F42A**.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Then carry out the SCR fault verification if necessary.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 5862-17 E61611 - Temperature below the minimum limit in the DEF/AdBlue module

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the pump module **M-F42A** that contains the SCR pump motor, the SCR return valve, and the SCR pressure sensor. The pump module operates in temperature measuring mode (to determine whether it needs to be increased or reduced) and then switches to the pump actuation mode to reach the pressure required by the UREA **AdBlue®** to be injected.

**Possible failure modes:**

1. Fault in the SCR pump module **M-F42A**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the wiring of the pump **M-F42A**.

   With the key in the OFF position, use the a multimeter to perform the following continuity check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F42A pin 2** | **X-F02E (Receptacle) pin 10** | There should be continuity. |
| **X-F42A pin 3** | **X-F247 pin 87** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 2** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 4** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V pin 6** | There should be continuity. |
| **X-F02V pin 5** | **X-F02E pin 29** | There should be continuity. |
| **X-F42A pin 6** | **X-F02E pin 5** | There should be continuity. |
| **X-F42A pin 8** | **X-F02V pin 15** | There should be continuity. |
| **X-F42A pin 9** | **X-F02V pin 46** | There should be continuity. |
| **X-F42A pin 10** | **X-F02V pin 42** | There should be continuity. |
| **X-F42A pin 11** | Battery positive (+) | There should be continuity. |
| **X-F42A pin 12** | Chassis ground | There should be continuity. |

   A. If there is no continuity, if necessary, use the appropriate service manual to locate and repair the shorted conductor.

   B. If continuity is detected, go to step **3**.
3. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. If the module is working correctly, contact the Technical Help Desk.

   B. If the module is not working correctly, go to step **4**
4. Replace the SCR pump module **M-F42A**.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Then carry out the SCR fault verification if necessary.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3232-5 A00C05 - NOx sensor downstream - Internal error: Open circuit error of the heater for the NOx downstream sensor

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor downstream of the Selective Catalytic Reduction (SCR) system **B-F49** is provided with an internal monitoring system to detect any open wires or short circuits and to send an error state should a fault be detected. This fault is the result of an open circuit in the heater circuit of the sensor.

**Cause:**
The NOx sensor downstream of the SCR **B-F49** has reported an interruption in the heater control circuit to the ECU **A-F02** through the CAN (Controller Area Network).

**Possible failure modes:**

1. Faulty NOx sensor downstream of the SCR **B-F49**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **8**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to **3**
2. Check that the NOx sensor downstream of the SCR **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, go to **2**
3. Replace the NOx sensor downstream of the SCR **B-F49**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault verification if necessary.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3232-6 A00C06 - NOx sensor downstream - Internal error: short circuit error of the heater for the NOx downstream sensor

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor downstream of the Selective Catalytic Reduction (SCR) system **B-F49** is provided with an internal monitoring system to detect any open wires or short circuits and to send an error state should a fault be detected. This fault is the result of a short circuit in the heater circuit of the sensor.

**Cause:**
The NOx sensor downstream of the SCR **B-F49** has reported a short circuit in the heater control circuit to the ECU **A-F02** through the CAN (Controller Area Network).

**Possible failure modes:**

1. Faulty NOx sensor downstream of the SCR **B-F49**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **1**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **4**

2. Check the integrity of the control of the NOx sensor downstream of the SCR **B-F49**. Check for a short circuit to battery.

   Disconnect the connector **X-F49** at the NOx sensor downstream of the SCR **B-F49**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F49 (Plug) pin 2** | **X-F49 (Plug) pin 1** | There should be no continuity |
| **X-F49 (Plug) pin 3** | **X-F49 (Plug) pin 1** | There should be no continuity |
| **X-F49 (Plug) pin 4** | **X-F49 (Plug) pin 1** | There should be no continuity |

   A. If there is no continuity, repair or replace as required.

   B. If continuity is detected, go to step **2**

3. Check the integrity of the control of the NOx sensor downstream of the SCR **B-F49**. Check for a short circuit to ground.

   Disconnect the connector **X-F49** at the NOx sensor downstream of the SCR **B-F49**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F49 (Plug) pin 1** | **X-F49 (Plug) pin 2** | There should be no continuity |
| **X-F49 (Plug) pin 3** | **X-F49 (Plug) pin 2** | There should be no continuity |

| From | To | Value |
|---|---|---|
| **X-F49 (Plug) pin 4** | **X-F49 (Plug) pin 2** | There should be no continuity |

A. If there is no continuity, repair or replace as required.

B. If continuity is detected, go to step **2**

4. Check that the NOx sensor downstream of the SCR **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, go to step **3**

5. Replace the NOx sensor downstream of the SCR **B-F49**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault verification if necessary.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3232-12 A00C0C - NOx sensor downstream - Internal error: plausibility error of heater performance

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor downstream of the selective catalytic reduction (SCR) system **B-F49** is provided with an internal monitoring system and sends information regarding the relative error state and the results of the self-diagnostics procedure to the engine control unit (ECU) **A-F02** through the CAN (Controller Area Network). One of the conditions monitored is the reaching of the appropriate operational temperature by the NOx sensor downstream of the SCR **B-F49** within the set time. Once reached the dew point, the sensor must heat up. If the sensor heating is not completed within the set time, this fault occurs.

**Cause:**
The NOx sensor downstream of the SCR **B-F49** has reported to the ECU **A-F02** via CAN that the sensor failed to reach heater working temperature in the set time.

**Possible failure modes:**

1. Faulty NOx sensor downstream of the SCR **B-F49**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, Go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **4**.
2. Check the integrity of the control of the NOx sensor downstream of the SCR **B-F49**. Check for a short circuit to battery.

   Disconnect the connector **X-F49** at the NOx sensor downstream of the SCR **B-F49**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F49 (Plug) pin 2** | **X-F49 (Plug) pin 1** | There should be no continuity |
| **X-F49 (Plug) pin 3** | **X-F49 (Plug) pin 1** | There should be no continuity |
| **X-F49 (Plug) pin 4** | **X-F49 (Plug) pin 1** | There should be no continuity |

   A. If continuity is detected, repair or replace as required.

   B. If there is no continuity, go to step **2**
3. Check for other relevant faults.

   Use the operator display or the diagnostic instrument to check for the presence of the fault **18318-31 478E-1F 478E1F 520380-31 3226-31 – Upstream NOx Sensor - Not Ready in Time or possible poisoned sensor (NOx or Lambda signals)**.

   A. If the fault occurs, resolve it. Then check whether this fault is also resolved or not.

B. If the fault is not present, go to step **5**.

4. Check that the NOx sensor downstream of the SCR **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to step **3**.

5. Replace the NOx sensor downstream of the SCR **B-F49**.

   Then use the diagnostic instrument to perform the "Replacement of NOx Downstream Sensor - Reset ECU Data" configuration.

   Run the machine and use the diagnostic instrument to view parameters to verify that the sensor has reached dew point.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, the machine can resume service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3234-5 A20C05 - NOx sensor downstream - Internal error: open circuit error for the downstream NOx and oxygen level

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor downstream of the Selective Catalytic Reduction (SCR) system **B-F49** is provided with an internal monitoring system to detect any open wires or short circuits and to send an error state should a fault be detected. This fault is the result of an open circuit in the NOx sensor circuit and/or of the oxygen level.

**Cause:**
The NOx sensor downstream of the SCR **B-F49** has indicated to the engine control unit **A-F02**, through the CAN (Controller Area Network), the presence of an interruption in the circuit of the NOx sensor and/or of the oxygen level.

**Possible failure modes:**

1. Faulty NOx sensor downstream of the SCR **B-F49**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **1**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **4**
2. Check the integrity of the control of the NOx sensor downstream of the SCR **B-F49**. Check for an open circuit.

   Disconnect the connector **X-F49** at the NOx sensor downstream of the SCR **B-F49**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F49 (Plug) pin 1** | Battery positive | There should be continuity |
| **X-F49 (Plug) pin 2** | Chassis ground | There should be continuity |
| **X-F49 (Plug) pin 3** | **X-F02V (Plug) pin 80** | There should be continuity |
| **X-F49 (Plug) pin 4** | **X-F02V (Plug) pin 81** | There should be continuity |

   A. If there is no continuity, repair or replace as required.

   B. If continuity is detected, go to step **2**
3. Check that the NOx sensor downstream of the SCR **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, go to step **3**
4. Replace the NOx sensor downstream of the SCR **B-F49**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Then carry out the SCR fault verification if necessary.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 A20C06 3234-6 - NOx sensor downstream - Internal error: short circuit error for the downstream NOx and oxygen level

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor downstream of the Selective Catalytic Reduction (SCR) system **B-F49** is provided with an internal monitoring system to detect any open wires or short circuits and to send an error state should a fault be detected. This fault is the result of a short circuit in the NOx sensor circuit and/or of the oxygen level.

**Cause:**
The NOx sensor downstream of the SCR **B-F49** has indicated to the engine control unit **A-F02**, through the CAN (Controller Area Network), the presence of a short circuit in the circuit of the NOx sensor and/or of the oxygen level.

**Possible failure modes:**

1. Faulty NOx sensor downstream of the SCR **B-F49**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **1**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **4**

2. Check the integrity of the control of the NOx sensor downstream of the SCR **B-F49**. Check for a short circuit to battery.

   Disconnect the connector **X-F49** at the NOx sensor downstream of the SCR **B-F49**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F49 (Plug) pin 2** | **X-F49 (Plug) pin 1** | There should be no continuity |
| **X-F49 (Plug) pin 3** | **X-F49 (Plug) pin 1** | There should be no continuity |
| **X-F49 (Plug) pin 4** | **X-F49 (Plug) pin 1** | There should be no continuity |

   A. If there is no continuity, repair or replace as required.

   B. If continuity is detected, go to step **2**

3. Check the integrity of the control of the NOx sensor downstream of the SCR **B-F49**. Check for a short circuit to ground.

   Disconnect the connector **X-F49** at the NOx sensor downstream of the SCR **B-F49**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F49 (Plug) pin 1** | **X-F49 (Plug) pin 2** | There should be no continuity |
| **X-F49 (Plug) pin 3** | **X-F49 (Plug) pin 2** | There should be no continuity |

| From | To | Value |
|---|---|---|
| **X-F49 (Plug) pin 4** | **X-F49 (Plug) pin 2** | There should be no continuity |

A. If there is no continuity, repair or replace as required.

B. If continuity is detected, go to step **2**

4. Check that the NOx sensor downstream of the SCR **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, go to step **3**

5. Replace the NOx sensor downstream of the SCR **B-F49**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault verification if necessary.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518867-9 D3EAE9 - Timeout error of CAN-receive-frame NOXData from the NOx sensor downstream

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor downstream of the Selective Catalytic Reduction (SCR) system **B-F49** is required for reporting information at regular intervals to the Engine Control Unit (ECU) **A-F02** via the CAN. If this information is not communicated within the set time, this timeout error in the ECU **A-F02** occurs.

**Cause:**
The ECU **A-F02** has reported, via the engine sensor CAN bus, that a timeout of the NOx sensor downstream of the SCR message **B-F49** has occurred.

**Possible failure modes:**

1. Fault in the power supply voltage of the NOx sensor downstream of the SCR **B-F49**, outside the required range.
2. Faulty CAN bus wiring, open or short circuit.
3. Faulty NOx sensor downstream of the SCR **B-F49**, hardware or firmware.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **8**.
2. Check for the presence of supply voltage fault.

   Use the diagnostic instrument to determine the presence of a fault **18318-31 478E-1F 478E1F 520380-31 3226-31 – Upstream NOx Sensor - Not Ready in Time or possible poisoned sensor (NOx or Lambda signals)**.

   A. If the fault is present, resolve it. Then determine if this fault is also resolved.

   B. If the fault is not present, go to step **3**.
3. Determine the conditions of the CAN circuit of the NOx sensor downstream of the SCR **B-F49**.

   Disconnect the wiring from the NOx sensor downstream of the SCR **B-F49**, connector **X-F49**.

   Use a multimeter to measure the resistance of the CAN circuit:

| From | To | Value |
|---|---|---|
| **X-F49 (Plug) pin 3** | **X-F49 (Plug) pin 4** | There should be **60 Ω** |

   A. If the measured resistance is correct, go to **5**.

   B. If the measured resistance is not correct, go to **5**.
4. Check that the NOx sensor downstream of the SCR **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

B. If the sensor is not working correctly, go to step **4**.

5. Replace the NOx sensor downstream of the SCR **B-F49**.

   Then use the diagnostic instrument to perform the Replacement of NOx Downstream Sensor - Reset ECU Data configuration.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Identify the problem of the CAN circuit of the NOx sensor downstream of the SCR **B-F49**.

   Disconnect the CAN line connector **X-F301**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the CAN connection on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F301 (Plug) pin 12** | **X-F301 (Plug) pin 13** | The resistance should be **120 Ω**. |

   A. If the measured resistance is correct, the problem found in the CAN circuit of the $NO_x$ sensor downstream of the SCR **B-F49** is in the engine wiring.locate and repair or replace the damaged conductors.

   B. If the measured resistance is not correct, go to step **7**.

7. Identify the problem of the CAN circuit of the $NO_x$ sensor downstream of the SCR **B-F49**.

   Disconnect the wiring from the CAN termination resistor **R-F300**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance on the CAN termination resistor **R-F300**:

| From | To | Value |
|---|---|---|
| **R-F300** H CAN line terminal | **R-F300** L CAN line terminal | There should be **120 Ω**. |

   A. If the measured resistance is correct, the problem found in the CAN circuit of the $NO_x$ sensor downstream of the SCR system **B-F49** is in the CAN line wiring.locate and repair or replace the damaged conductors.

   B. If the measured resistance is incorrect, the CAN termination resistor **R-F300** is faulty. Replace the CAN termination resistor **R-F300**.

8. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 970C05 3223-5 - NOx sensor upstream - Internal error: Open circuit error of the heater for the NOx upstream sensor

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor upstream of the DOC **B-F67** has internal monitoring for open wire or short circuit and sends an error status in case of a detected fault. This fault is the result of an open circuit of the sensor heater circuit.

**Cause:**
The NOx sensor upstream of the DOC **B-F67** has reported an interruption in the heater control circuit to the ECU **A-F02** through the CAN (Controller Area Network).

**Possible failure modes:**

1. Faulty DOC upstream NOx sensor **B-F67**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **5**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to **3**.
2. Check that the NOx sensor upstream of the DOC **B-F67** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to **2**.
3. Replace the NOx sensor upstream of the DOC **B-F67**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault verification if necessary.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3223-6 970C06 - NOx sensor upstream - Internal error: short circuit error of the heater for the NOx upstream sensor

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor upstream of the DOC **B-F67** has internal monitoring for open wire or short circuit and sends an error status in case of a detected failure. This fault is the result of a short circuit of the sensor heater circuit.

**Cause:**
The NOx sensor upstream of the DOC **B-F67** has reported a short circuit in the heater control circuit to the ECU **A-F02** through the CAN.

**Possible failure modes:**

1. Faulty DOC upstream NOx sensor **B-F67**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **1**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **4**
2. Check the integrity of the control of the NOx sensor upstream of the DOC **B-F67**. Check for a short circuit to battery.

   Disconnect the connector **X-F67** at the NOx sensor upstream of the DOC **B-F67**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F67 (Plug) pin 2** | **X-F67 (Plug) pin 1** | There should be no continuity |
| **X-F67 (Plug) pin 3** | **X-F67 (Plug) pin 1** | There should be no continuity |
| **X-F67 (Plug) pin 4** | **X-F67 (Plug) pin 1** | There should be no continuity |

   A. If continuity is detected, repair or replace as required.

   B. If there is no continuity, go to step **2**
3. Check the integrity of the control of the NOx sensor upstream of the DOC **B-F67**. Check for a short circuit to ground.

   Disconnect the connector **X-F67** at the NOx sensor upstream of the DOC **B-F67**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F67 (Plug) pin 1** | **X-F67 (Plug) pin 2** | There should be no continuity |
| **X-F67 (Plug) pin 3** | **X-F67 (Plug) pin 2** | There should be no continuity |
| **X-F67 (Plug) pin 4** | **X-F67 (Plug) pin 2** | There should be no continuity |

A. If continuity is detected, repair or replace as required.

B. If there is no continuity, go to step **2**

4. Check that the NOx sensor upstream of the DOC **B-F67** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, go to step **3**

5. Replace the NOx sensor upstream of the DOC **B-F67**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault verification if necessary.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 960C0C 3222-12 - NOx sensor upstream - Internal error: plausibility error of heater performance

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor upstream of the DOC **B-F67** is provided with an internal monitoring system and sends information regarding the relative error state and the results of the self-diagnostics procedure to the engine control unit (ECU) **A-F02** through the CAN (Controller Area Network). One of the conditions monitored is the reaching of the appropriate operational temperature by the NOx sensor upstream of the DOC **B-F67** within the set time. Once reached the dew point, the sensor must heat up. If the sensor heating is not completed within the set, this fault occurs.

**Cause:**
The NOx sensor upstream of the DOC **B-F67** has reported to the ECU **A-F02** via CAN that the sensor failed to reach heater working temperature in the set time.

**Possible failure modes:**

1. Faulty DOC upstream NOx sensor **B-F67**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **1**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **4**
2. Check the integrity of the control of the NOx sensor upstream of the DOC **B-F67**. Check for a short circuit to battery.

   Disconnect the connector **X-F67** at the NOx sensor upstream of the DOC **B-F67**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F67 (Plug) pin 2** | **X-F67 (Plug) pin 1** | There should be no continuity |
| **X-F67 (Plug) pin 3** | **X-F67 (Plug) pin 1** | There should be no continuity |
| **X-F67 (Plug) pin 4** | **X-F67 (Plug) pin 1** | There should be no continuity |

   A. If continuity is detected, repair or replace as required.

   B. If there is no continuity, go to step **2**
3. Check that the NOx sensor upstream of the DOC **B-F67** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, go to step **3**
4. Replace the NOx sensor upstream of the DOC **B-F67**.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Then carry out the SCR fault verification if necessary.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 980C06 3224-6 - NOx sensor downstream - Internal error: short circuit error for the downstream NOx and oxygen level

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor upstream of the DOC **B-F67** has internal monitoring for open wire or short circuit and sends an error status in case of a detected fault. This fault is the result of a short circuit in the circuit of the NOx sensor and/or of the oxygen level.

**Cause:**
The NOx sensor upstream of the DOC **B-F67** has indicated to the engine control unit (ECU) **A-F02**, through the CAN (Controller Area Network), the presence of a short circuit in the circuit of the NOx sensor and/or of the oxygen level.

**Possible failure modes:**

1. Faulty DOC upstream NOx sensor **B-F67**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **1**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. continue to step **4**

2. Check the integrity of the control of the NOx sensor upstream of the DOC **B-F67**. Check for a short circuit to battery.

   Disconnect the connector **X-F67** at the NOx sensor upstream of the DOC **B-F67**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F67 (Plug) pin 2** | **X-F67 (Plug) pin 1** | There should be no continuity |
| **X-F67 (Plug) pin 3** | **X-F67 (Plug) pin 1** | There should be no continuity |
| **X-F67 (Plug) pin 4** | **X-F67 (Plug) pin 1** | There should be no continuity |

   A. If continuity is detected, repair or replace as required.

   B. If there is no continuity, continue to step **2**

3. Check the integrity of the control of the NOx sensor upstream of the DOC **B-F67**. Check for a short circuit to ground.

   Disconnect the connector **X-F67** at the NOx sensor upstream of the DOC **B-F67**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F67 (Plug) pin 1** | **X-F67 (Plug) pin 2** | There should be no continuity |
| **X-F67 (Plug) pin 3** | **X-F67 (Plug) pin 2** | There should be no continuity |

| From | To | Value |
|---|---|---|
| **X-F67 (Plug) pin 4** | **X-F67 (Plug) pin 2** | There should be no continuity |

A. If continuity is detected, repair or replace as required.

B. If there is no continuity, continue to step **2**

4. Check that the NOx sensor upstream of the DOC **B-F67** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, continue to step **3**

5. Replace the NOx sensor upstream of the DOC **B-F67**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault verification if necessary.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 980C05 3224-5 - NOx sensor downstream - Internal error: open circuit error for the downstream NOx and oxygen level

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor upstream of the DOC **B-F67** has internal monitoring to identify open wires or short circuits and sends an error status if a fault is detected. This fault is the result of an open circuit in the circuit of the NOx sensor and/or of the oxygen level.

**Cause:**
The NOx sensor upstream of the DOC **B-F67** has reported to the engine control unit (ECU) **A-F02**, through the CAN (Controller Area Network), the presence of a short circuit in the circuit of the NOx sensor and/or of the oxygen level.

**Possible failure modes:**

1. Faulty DOC upstream NOx sensor **B-F67**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **1**

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **4**
2. Check the integrity of the control of the NOx sensor upstream of the DOC **B-F67**. Check for an open circuit.

   Disconnect the connector **X-F67** at the NOx sensor upstream of the DOC **B-F67**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F67 (Plug) pin 1** | Battery positive | There should be continuity |
| **X-F67 (Plug) pin 2** | Chassis ground | There should be continuity |
| **X-F67 (Plug) pin 3** | **X-F02V (Plug) pin 80** | There should be continuity |
| **X-F67 (Plug) pin 4** | **X-F02V (Plug) pin 81** | There should be continuity |
| **X-F67 (Plug) pin 5** | Battery negative | There should be continuity |

   A. If there is no continuity, repair or replace as required.

   B. If continuity is detected, go to step **2**
3. Check that the NOx sensor upstream of the DOC **B-F67** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, go to step **3**
4. Replace the NOx sensor upstream of the DOC **B-F67**.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Then carry out the SCR fault verification if necessary.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518868-9 D4EAE9 - Timeout error of CAN-receive-frame NOXData from the NOx sensor upstream

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The NOx sensor upstream of the DOC **B-F67** is required for reporting information at regular intervals to the Engine Control Unit (ECU) **A-F02** via the CAN (Controller Area Network). If this information is not communicated within the set time, this timeout error in the ECU **A-F02** occurs.

**Cause:**
The ECU **A-F02** has reported, via the engine sensor CAN bus, that a timeout of the NOx sensor upstream of the DOC **B-F67** message has occurred.

**Possible failure modes:**

1. Fault in the power supply voltage of the NOx sensor upstream of the DOC **B-F67**, outside the required range.
2. Faulty CAN bus wiring, open or short circuit.
3. Faulty DOC upstream NOx sensor **B-F67**, hardware or firmware.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **8**.
2. Check for the presence of supply voltage fault.

   Use the diagnostic instrument to determine the presence of a fault **4A8E1F 4A8E-1F 3216-31 19086-31 520381-31 – Upstream NOx Sensor - Sensor Supply Voltage is out of Range.**.

   A. If the fault is present, resolve it. Then determine if this fault is also resolved.

   B. If the fault is not present, go to step **3**.
3. Determine the conditions of the CAN circuit of the NOx sensor upstream of the DOC **B-F67**.

   Disconnect the engine wiring from the NOx sensor upstream of the DOC **B-F67**, connector **X-F67**.

   Use a multimeter to measure the resistance on the CAN circuit on the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F67 (Plug) pin 3** | **X-F67 (Plug) pin 4** | There should be **60 Ω** |

   A. If the measured resistance is correct, go to step **5**.

   B. If the measured resistance is not correct, go to step **5**.
4. Check that the NOx sensor upstream of the DOC **B-F67** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

B. If the sensor is not working correctly, go to step **4**.

5. Replace the NOx sensor upstream of the DOC **B-F67**.

   Then use the diagnostic instrument to perform the Replacement of NOx Upstream Sensor - Reset ECU Data configuration.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Identify the problem of the CAN circuit of the NOx sensor upstream of the DOC **B-F67**.

   Disconnect the CAN line connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the CAN connection on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 13** | **X-F02V (Plug) pin 14** | The resistance should be **120 Ω**. |

   A. If the measured resistance is correct, the problem found in the CAN circuit of the NOx sensor upstream of the DOC **B-F67** is in the engine wiring.locate and repair or replace the damaged conductors.

   B. If the measured resistance is not correct, go to step **7**.

7. Identify the problem of the CAN circuit of the NOx sensor upstream of the DOC **B-F67**.

   Disconnect the wiring from the CAN termination resistor **R-F300**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance on the CAN termination resistor **R-F300**:

| From | To | Value |
|---|---|---|
| **R-F300** H CAN line terminal | **R-F300** L CAN line terminal | There should be **120 Ω**. |

   A. If the measured resistance is correct, the problem found in the CAN circuit of the NOx sensor upstream of the DOC **B-F67** is in the CAN line wiring.locate and repair or replace the damaged conductors.

   B. If the measured resistance is incorrect, the CAN termination resistor **R-F300** is faulty. Replace the CAN termination resistor **R-F300**.

8. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 A20C02 3234-2 - Downstream NOx sensor lambda signal deviation - NOx sensor possible removal detected

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The $NO_X$ sensor downstream of the SCR **B-F49** is provided with an internal monitoring system for the operational conditions and reports the status together with the measured data. If the Lambda sensor data value is outside the values set by the minimum/maximum curves specified in the engine control unit (ECU) **A-F02** according to the Lambda value, this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the $NO_X$ sensor downstream of the SCR **B-F49** is not measuring the correct Lambda values.

**Possible failure modes:**

1. Fault in the $NO_X$ sensor downstream of the SCR **B-F49**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Determine proper installation of the $NO_X$ sensor downstream of the SCR **B-F49**.

   Remove and re-install, if necessary, the $NO_X$ sensor downstream of the SCR **B-F49** to make sure that it is properly aligned and securely fitted.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault repair verification if necessary.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, return the machine to service.

   B. If fault has not been resolved, go to **5**.
2. Check that the NOx sensor downstream of the SCR **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to **2**.
3. Replace the $NO_X$ sensor **B-F49** downstream of the SCR.

   Then use the diagnostic instrument to perform the "Replacement of NOx Downstream Sensor - Reset ECU Data" configuration.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault repair verification if necessary.

   Then check to see that this fault is resolved.

A. If this fault is resolved, return the machine to service.

B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 3224-2 980C02 - Upstream NOx sensor lambda signal deviation - NOx sensor possible removal detected

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The $NO_X$ sensor upstream of the DOC **B-F67** is provided with an internal monitoring system for the work conditions and reports the status and the detected data. If the value of the Lambda sensor data is outside the values defined by the minimum/maximum curves specified in the engine control unit (ECU) **A-F02**, according to the lambda value, this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the DOC upstream $NO_X$ sensor **B-F67** is not measuring correct lambda values.

**Possible failure modes:**

1. Faulty DOC upstream $NO_X$ sensor **B-F67**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Determine proper installation of the DOC upstream $NO_X$ sensor **B-F67**.

   Remove and re-install, if necessary, the $NO_X$ sensor upstream of the DOC **B-F67** to assure that it is properly aligned and securely installed.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault repair verification .

   Then check to see that this fault is resolved.

   A. If this fault is resolved, return the machine to service.

   B. If fault has not been resolved, go to **5**.
2. Check that the $NO_X$ sensor upstream of the DOC **B-F67** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to **2**.
3. Replace the $NO_X$ sensor **B-F67** upstream of the DOC.

   Then use the diagnostic instrument to perform the "Replacement of NOx Downstream Sensor - Reset ECU Data" configuration.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault repair verification .

   Then check to see that this fault is resolved.

   A. If this fault is resolved, return the machine to service.

B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 3226-10 9A0C0A - NOX sensor measured value stuck

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The $NO_X$ sensor downstream of the SCR **B-F49** is provided with an internal monitoring system for the operating conditions and reports the status and the detected data. If the value of the $No_X$ sensor is outside the values defined by the minimum/maximum curves specified in the engine control unit (ECU) **A-F02**, according to the expected value, this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the $NO_X$ sensor downstream of the SCR **B-F49** is not measuring the correct values.

**Possible failure modes:**

1. Faulty $NO_X$ sensor downstream of the SCR **B-F49**, hardware or firmware.
2. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check the correct installation of the $NO_X$ sensor downstream of the SCR **B-F49**.

   Remove and re-install, if necessary, the $NO_X$ sensor downstream of the SCR **B-F49** to assure that it is properly aligned and securely installed.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault repair verification .

   Check to see that this fault is resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, continue to step **5**.
2. Check that the NOx sensor downstream of the SCR **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, continue to step **2**.
3. Replace the $NO_X$ sensor **B-F49** downstream of the SCR.

   Then use the diagnostic instrument to perform the "Replacement of NOx Downstream Sensor - Reset ECU Data" configuration.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then carry out the SCR fault repair verification if necessary.

   Then check to see that this fault is resolved.

   A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.

# 295467 3216-14 900C0E - Upstream NOx sensor - Plausibility error

## Control Module: FPT ECU

**Fault Description:**
The $NO_x$ sensor downstream of the Selective Catalytic Reduction system (SCR) **B-F49** and the $NO_x$ sensor upstream of the diesel oxidation catalyst (DOC) **B-F67** are used for the closed circuit check of the **Diesel Exhaust Fluid (DEF)/ AdBlue®** dosing. An incorrect signal from the $NO_x$ sensor directly influences the $NO_x$ emissions and may cause non-reacted ammonia (NH3 slip). The fundamental principle of the plausibility monitoring by the engine control unit (ECU) **A-F02** is the integration and comparison of values measured by the $NO_x$ sensor with the values of $NO_x$ expected in three independent zones defined by the effective expected values of NOx. In each zone the values are integrated during an adjustable time interval. At the end of the integration time interval, the ratio between the integrated $NO_x$ values is saved. An error assessment is carried out at the end of the integration time interval in all three zones. If the ratios exceed the respective thresholds in all three zones, the fault detection counter is increased, otherwise it is decreased. If the ratio between the measured $NO_x$ values integrated and the calculated values integrated exceeds the calibration limit for all 3 zones defined, this fault occurs.

**Cause:**
The ECU **A-F02** has detected that one or more $NO_x$ sensors measure data not within the permitted range.

**Possible failure modes:**

1. Fault in the $NO_x$ **B-F49** sensor downstream of the SCR , contaminated sensor or internal fault.
2. Fault in the $NO_x$ **B-F67** sensor upstream of the DOC system, contaminated sensor or internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check that the $NO_x$ sensor downstream of the SCR **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, continue with **1**.
2. Replace the $NO_x$ sensor **B-F49** downstream of the SCR.

   Then use the diagnostic instrument to perform the Replacement of NOx Downstream Sensor - Reset ECU Data configuration.

   Then check to see that this fault is resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If fault has not been resolved, Go to step **5**.
3. Check that the $NO_x$ sensor upstream of the DOC **B-F67** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, continue with step **2**.
4. Replace the $NO_x$ sensor **B-F67** upstream of the DOC.

   Then use the diagnostic instrument to perform the Replacement of NOx Upstream Sensor - Reset ECU Data configuration.

   Then check to see that this fault is resolved.

   A. If the fault has been resolved, return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 AA0C0E 3242-14 - Temperature sensor signal upstream of SCR during cold start implausible

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the signal from the exhaust temperature sensor upstream of the Selective Catalytic Reduction (SCR) system **B-F38**. If the ECU **A-F02** determines that this fault has not been deactivated due to another fault - not at high altitudes - and that the last driving cycle was not cold, and the temperature detected by the sensor at the exhaust upstream of the SCR system **B-F38** deviates from the value detected by the temperature sensor at the exhaust downstream of the diesel oxidation catalyst (DOC) **B-F32**, from the temperature sensor at the exhaust downstream of the (DOC) **B-F33** and from the temperature sensor at the exhaust downstream of the SCR system **B-F39**, this fault occurs.

**Cause:**
The ECU **A-F02** determines that the signal of the temperature sensor at the exhaust upstream of the SCR system **B-F38** has drifted during a cold start.

**Possible failure modes:**

1. Abrupt variations of the ambient temperature surrounding the temperature sensor at the exhaust upstream of the SCR system **B-F38**.
2. Faulty temperature sensor at the exhaust upstream of the SCR system **B-F38**, internal or wiring fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. go to step **6**.
2. Use the operator display or the diagnostic instrument to check the status of the following correlated faults.

   **1A1A1F 520530-0 1A1A-1F 4360-3 6682-31 – SCR high for SCR catalyst upstream temperature sensor**

   **520530-1 2B1A1F 11034-31 2B1A-1F 4360-4 – SCR low for SCR catalyst upstream temperature sensor**

   **3242-31 362C-1F 13868-31 362C1F 520366-2 – Upstream SCR temperature sensor comparison to a calculated temperature value failure**

   A. If either of the faults are active, carry out the diagnostics, then check that the faults have been resolved.

   B. If neither of the listed faults is active, go to step **3**.
3. Use the diagnostic instrument to compare the value measured by the temperature sensor at the exhaust upstream of the SCR system **B-F38** with the values measured by the temperature sensor at the exhaust downstream of the DOC **B-F33**, by the temperature sensor at the exhaust upstream of the DOC **B-F32** and by the temperature sensor at the exhaust downstream of the SCR system **B-F39**. Monitor any possible signal drift caused by rapid variations of the ambient temperature. The sensors must have similar characteristics.

   Monitoring must be done after a cold soak condition to avoid any residual heat.

   A. If no faults are detected, go to step **4**.

   B. If any faults are found, check that they are not caused by sudden changes in ambient temperature.
4. Check the integrity of the circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

Disconnect the exhaust wiring from the temperature sensor at the exhaust upstream of the SCR system **B-F38**, connector **X-F38**.

Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Inspect the relative wiring and connectors checking for damaged, bent, or displaced pins, corroded terminals, or open wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector **X-F38** disconnected and go to step **5**.

5. Check the correct operation of the temperature sensor at the exhaust upstream of the SCR system **B-F38** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to step **5**.

6. Replace the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   Perform an engine cold start to verify that this fault has been resolved.

   A. If the fault has been corrected, return the machine to service.

   B. If the fault has not been corrected, check that the software of ECU **A-F02** is correct and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, then erase the fault code and continue operation.

# 295467 519550-2 7EEDE2 - Temperature sensor upstream of the DPF - Deviation in relation to other sensors in cold start conditions

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the exhaust temperature sensor signal downstream of the selective catalytic reduction system (SCR) **B-F39**. If the ECU **A-F02** determines that this fault has not been deactivated due to another fault – not at high altitudes – and that the last driving cycle was not cold, and the temperature measured by the exhaust sensor downstream of the SCR **B-F39** differs from the value measured by the exhaust temperature sensor upstream downstream of the diesel oxidation catalyst (DOC) **B-F32**, by the exhaust temperature sensor downstream of the DOC **B-F33** and by the exhaust temperature sensor upstream of the SCR system **B-F38**, this fault occurs.

**Cause:**
The ECU **A-F02** determines that the signal of the temperature sensor at the exhaust downstream of the SCR system **B-F39** has drifted during a cold start.

**Possible failure modes:**

1. Abrupt variations of the ambient temperature surrounding the temperature sensor at the exhaust downstream of the SCR **B-F39**.
2. Faulty temperature sensor at the exhaust downstream of the SCR system **B-F39**, internal fault or faulty wiring.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. go to step **6**.
2. Use the operator display or diagnostic tool to check the status of the following related faults related to DPF and SCR.

   A. If either of the faults are active, carry out the diagnostics, then check that the faults have been resolved.

   B. If neither of the listed faults is active, go to step **3**.
3. Use the EST to compare the value measured by the temperature sensor at the exhaust downstream of the SCR system **B-F39** with the values measured by the temperature sensor at the exhaust downstream of the DOC **B-F33**, by the temperature sensor at the exhaust upstream of the DOC **B-F32** and by the temperature sensor at the exhaust upstream of the SCR system **B-F38**. Monitor any possible signal drift caused by rapid variations of the ambient temperature. The sensors must have similar characteristics.

   Monitoring must be done after a cold soak condition to avoid any residual heat.

   A. If no faults are detected, go to step **4**.

   B. If any faults are found, check that they are not caused by sudden changes in ambient temperature.
4. Check the integrity of the circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F39**.

   Disconnect the exhaust wiring from the temperature sensor at the exhaust downstream of the SCR system **B-F39** at connector **X-F39**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   Inspect the relative wiring and connectors checking for damaged, bent, or displaced pins, corroded terminals, or open wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector **X-F39** disconnected and go to step **5**.

5. Check the correct operation of the temperature sensor at the exhaust downstream of the SCR system **B-F39** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, continue to step **5**.

6. Replace the temperature sensor at the exhaust downstream of the SCR system **B-F39**.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   Perform an engine cold start to verify that this fault has been resolved.

   A. If the fault has been corrected, return the machine to service.

   B. If the fault has not been corrected, check that the software of ECU **A-F02** is correct and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 C61402 5318-2 - Exhaust gas temperature sensor - Plausibility error in recorded values between two or more sensors

## Control Module: FPT ECU

**Fault Description:**
Various temperature sensors are compared to one another during a cold start. If more than one sensor differs from the others, it is not possible to define which sensor is faulty, therefore this general fault is activated. The system compares the following sensors: temperature sensor at the exhaust upstream of the DPF, (if available), temperature sensor at the exhaust downstream of the DPF, (if available), temperature sensor at the exhaust upstream of the EGR system outlet (if available), and temperature sensor at the exhaust on the exhaust manifold inlet (if available). Various sensors have incorrect measurement values. After a long period of inactivity, compare the coolant temperatures with the exhaust gas temperatures. Replace the sensor that is not within this tolerance.

**Cause:**
Several temperature sensors have incorrect values.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.

2. Check that the coolant temperature value is in accordance with the temperature value of the various exhaust gases. The temperatures of the various sensors must be approx. **10 °C**.

   A. If the sensors are within tolerance, Contact the THD.

   B. If the sensors are not within tolerance, replace the relevant sensor.

3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 081102 4360-2 - Downstream SCR temperature sensor comparison to a calculated temperature value failure

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the value measured by the temperature sensor at the exhaust **B-F38** upstream of the Selective Catalytic Reduction system (SCR). If the ECU **A-F02** determines that the value measured by the temperature sensor at the exhaust upstream of the SCR system **B-F38** is greater or lower than a certain operational limit – which depends on the engine speed, on the load, and on ambient conditions – set by the ECU **A-F02**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an excessive difference between measured and calculated temperature values.

**Possible failure modes:**

1. Faulty engine operation, incorrect injection pressure or incorrect injection start.
2. Faulty wiring in the circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**; damaged insulation, corroded connection, etc.
3. Faulty temperature sensor at the exhaust upstream of the SCR system **B-F38**, internal fault.
4. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. go to step **5**.
2. Check the conditions of the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Disconnect the exhaust wiring from the temperature sensor at the exhaust upstream of the SCR system **B-F38**, connector **X-F38**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the temperature sensor upstream of the SCR system **B-F38**:

| From | To | Value |
|---|---|---|
| **X-F38 pin 1** | **X-F38 pin 2** | The value must be between **169.7 – 738.2 Ω** dependant upon the temperature at the exhaust **-40 – 800 °C** (**-40 – 1472 °F**). |

   A. If the measured resistance is not within specification, the temperature sensor at the exhaust upstream of the SCR system **B-F38**has failed internally. Replace the sensor.

   B. If the measured resistance is within specification, leave the connector **X-F38** disconnected and go to step **3**.
3. Check the integrity of the circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

Inspect the wiring and relative connectors checking for damaged, bent, or displaced pins, corroded terminals, or open or stripped wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector **X-F38** disconnected and go to step **5**.

4. Check the correct operation of the temperature sensor at the exhaust upstream of the SCR system **B-F38** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to step **4**.

5. Replace the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Use the diagnostic tool to check again the status of this fault.

   A. If the fault has been corrected, return the machine to service.

   B. If the fault has not been corrected, check that the software of ECU **A-F02** is correct and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 7AEDE2 519546-2 - Temperature sensor upstream of DPF - Deviation between measured temperature values and expected temperature values

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the value measured by the temperature sensor at the exhaust **B-F39** downstream of the Selective Catalytic Reduction system (SCR) . If the ECU **A-F02** determines that the value measured by the temperature sensor at the exhaust downstream of the SCR system **B-F39** is greater or lower than a certain operational limit (which depends on the engine speed, on the load, and on ambient conditions) set by the ECU **A-F02**, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an excessive difference between measured and calculated temperature values.

**Possible failure modes:**

1. Faulty engine operation, incorrect injection pressure or incorrect injection start.
2. Faulty wiring in the circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F39**; damaged insulation, corroded connection, etc.
3. Faulty temperature sensor at the exhaust downstream of the SCR system **B-F39**, internal fault.
4. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. go to step **5**.
2. Check the conditions of the temperature sensor at the exhaust downstream of the SCR system **B-F39**.

   Disconnect the exhaust wiring from the temperature sensor at the exhaust downstream of the SCR system **B-F39**, connector **X-F39**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the temperature sensor downstream of the SCR system **B-F39**:

| From | To | Value |
|---|---|---|
| **X-F39 pin 1** | **X-F39 pin 2** | The value must be between **169.7 – 738.2 Ω** dependant upon the temperature at the exhaust **-40 – 800 °C** (**-40 – 1472 °F**). |

   A. If the measured resistance is not within specification, the temperature sensor at the exhaust downstream of the SCR system **B-F39**has failed internally. Replace the sensor.

   B. If the measured resistance is within specification, leave the connector **X-F39** disconnected and go to step **3**.
3. Check the integrity of the circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F39**.

Disconnect the vehicle engine wiring from the ECU **A-F02** at the connector **X-F02V**.

Inspect the wiring and relative connectors checking for damaged, bent, or displaced pins, corroded terminals, or open or stripped wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector **X-F39** disconnected and go to step **5**.

4. Check the correct operation of the temperature sensor at the exhaust downstream of the SCR system **B-F39** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to step **4**.

5. Replace the temperature sensor at the exhaust downstream of the SCR system **B-F39**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Use the diagnostic tool to check again the status of this fault.

   A. If the fault has been corrected, return the machine to service.

   B. If the fault has not been corrected, check that the software of ECU **A-F02** is correct and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 9A0C1F 3226-31 - NOx Sensor - Not Ready in Time or possible contaminated sensor (NOx or Lambda signals)

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The $NO_X$ sensor downstream of the Selective Catalytic Reduction system (SCR) **B-F49** monitors internally the operational conditions and reports the state and the measured data – through the CAN network – to the engine control unit (ECU) **A-F02**. If the key switch is set to ON, the battery voltage is higher than the permitted value, none of the CAN control units is in the "bus-off" status and the ECU **A-F02** is not in the after-run phase, the $NO_X$ sensor downstream of the SCR system **B-F49** transmits status information and data. If the $NO_X$ sensor downstream of the SCR system **B-F49** sends the " sensor supply not OK " message (sensor power supply not detected), this fault occurs.

**Cause:**
The $NO_X$ sensor downstream of the SCR system **B-F49** has reported to the ECU **A-F02** – through the CAN – that the expected voltage is out of range.

**Possible failure modes:**

1. Faulty supply voltage, out of range.
2. Fault in the $NO_X$ sensor downstream of the SCR **B-F49**, hardware or firmware.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. go to step **4**.
2. Check supply voltage.

   Disconnect the wiring from the $NO_X$ sensor downstream of the SCR **B-F49**, connector **X-F49**.

   Use a multimeter to measure the voltage on the wiring side:

| From | To | Value |
|---|---|---|
| **X-F49 (Plug) pin 1** | **X-F49 (Plug) pin 2** | The resistance must be between **10.0 – 16.0 V**. |

   A. If the power supply voltage is not within the specified range, the vehicle charging system is fault, repair as necessary.

   B. If the supply voltage is within the specified range, leave the connector **X-F49** disconnected and go to step **5**.
3. Check that the $NO_X$ sensor downstream of the SCR **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to step **3**.
4. Replace the $NO_X$ sensor downstream of the SCR **B-F49** on field.

Then use the diagnostic instrument to perform the Replacement of NOx Downstream Sensor - Reset ECU Data configuration.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Then carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 900C1F 3216-31 - Upstream NOx Sensor - Sensor Supply Voltage is out of Range.

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The $NO_x$ sensor upstream of the diesel oxidation catalyst (DOC) **B-F67** monitors internally the operational conditions and reports the state and the measured data – through the CAN – to the engine control unit (ECU) **A-F02**. If the key switch is set to ON, the battery voltage is higher than the permitted value, none of the CAN control units is in the "bus-off" status and the ECU **A-F02** is not in the after-run phase, the $NO_x$ sensor upstream of the DOC **B-F67** transmits status information and data. If the $NO_x$ sensor upstream of the DOC **B-F67** sends the " sensor supply not OK " message (sensor power supply not detected), this fault occurs.

**Cause:**
The $NO_x$ sensor upstream of the DOC **B-F67** has reported to the ECU **A-F02** – through the CAN – that the expected voltage is out of range.

**Possible failure modes:**

1. Faulty supply voltage, out of range.
2. Faulty DOC upstream $NO_x$ sensor **B-F67**, hardware or firmware.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **4**.
2. Check supply voltage.

   Disconnect the engine wiring from the $NO_x$ sensor upstream of the DOC **B-F67** at connector **X-F67**.

   Use a multimeter to check the voltage on the vehicle engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F67 (Plug) pin 1** | **X-F67 (Plug) pin 2** | The voltage should be between **10.0 – 16.0 V**. |

   A. If the power supply voltage is not within the specified range, the vehicle charging system is fault, repair as necessary.

   B. If the supply voltage is within the specified range, leave connector **X-F67** disconnected and go to **5**.
3. Check that the $NO_x$ sensor upstream of the DOC on field **B-F67** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, continue with step **3**.
4. Replace the $NO_x$ sensor upstream of the DOC on field **B-F67**.

Then use the diagnostic instrument to perform the Replacement of NOx Upstream Sensor - Reset ECU Data configuration.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Then carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If this fault is resolved, return the machine to service.

B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 E10611 1761-17 - DEF/AdBlue level too low warning is active - Stage 1

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the level and temperature of the **Diesel Exhaust Fluid (DEF)/AdBlue®** fluid. If the fluid level falls below the minimum level , this fault occurs.

**Cause:**
The signal of the SCR temperature/level sensor **B-F56** transmitted to the ECU **A-F02** is too low in relation to 100% full.

**Possible failure modes:**

1. Fluid level in the tank **AdBlue®** too low.
2. Fault in the SCR level/temperature sensor **B-F56**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Top up the tank **AdBlue®** to the appropriate level.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, pass on to point **2**.
2. Check the conditions of the SCR level/temperature sensor **B-F56**.

   Disconnect the wiring of the urea tank (UT) from the DEF/AdBlue® tank temperature and level sensor **B-F56** at connector **X-F56**.

   Use a multimeter to measure the resistance of the SCR level/temperature sensor **B-F56**:

| From | To | Value |
|---|---|---|
| **X-F56 (Plug) pin 1** | **X-F56 (Plug) pin 2** | There should be a value greater than **12,000 Ω**. |

   A. If the measured resistance is greater than **12,000 Ω**, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is less than **12,000 Ω**, the SCR level/temperature sensor **B-F56** has failed internally. pass on to point **8**
3. Check the correct operation of the DEF/AdBlue® tank level and temperature sensor **B-F56** following the procedure indicated ( **AD-BLUE INDICATOR - Test (50.74)**)

   A. The sensor is operating correctly pass on to point **5**

   B. The sensor is not operating correctly, replace the DEF/AdBlue® tank level and temperature sensor **B-F56** and go to step **5**

   ***NOTE:*** *After having removed the SCR temperature/level sensor **B-F56** inspect the equipment to determine if the magnet of the filler inlet discharge pipe has come out of its seat and became lodged thereby causing a false reading.*
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 1761-18 E10612 - DEF/AdBlue level too low warning is active - Stage 2

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the level and temperature of the **Diesel Exhaust Fluid (DEF)/AdBlue®** fluid. If the fluid level falls below the minimum level , this fault occurs.

**Cause:**
The signal of the SCR temperature/level sensor **B-F56** transmitted to the ECU **A-F02** is too low in relation to 100% full.

**Possible failure modes:**

1. Fluid level in the tank **AdBlue®** too low.
2. Fault in the SCR level/temperature sensor **B-F56**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Top up the tank **AdBlue®** to the appropriate level.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, pass on to point **2**.
2. Verify the condition of the DEF/AdBlue® tank level and temperature sensor **B-F56**.

   Disconnect the wiring of the urea tank (UT) from the DEF/AdBlue® tank temperature and level sensor **B-F56** at connector **X-F56**.

   Use a multimeter to measure the resistance of the DEF/AdBlue® tank level and temperature sensor **B-F56**:

| From | To | Value |
|---|---|---|
| **X-F56 (Plug) pin 1** | **X-F56 (Plug) pin 2** | There should be a value greater than **12,000 Ω**. |

   A. If the measured resistance is greater than **12,000 Ω**, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is less than **12,000 Ω**, the SCR level/temperature sensor **B-F56** has failed internally. pass on to point **8**
3. Check the correct operation of the DEF/AdBlue® tank temperature and level sensor **B-F56** following the procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The sensor is operating correctly pass on to point **5**

   B. The sensor is not operating correctly, replace the DEF/AdBlue® tank level and temperature sensor **B-F56** and go to step **5**

   ***NOTE:*** *After having removed the SCR temperature/level sensor **B-F56** inspect the equipment to determine if the magnet of the filler inlet discharge pipe has come out of its seat and became lodged thereby causing a false reading.*

4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 181102 4376-2 - DEF/AdBlue dosing system backflow line pressure too high plausibility failure

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** determines the conditions of the back-flow pipes and fitting (accelerator) to check for any correlated blocks by monitoring the pressure in the Diesel Exhaust Fluid (DEF)/AdBlue® system. It is possible to detect frozen or blocked back-flow piping or fitting. The metering system of the selective catalytic reduction (SCR) must be emptied while the ignition key is set to OFF. The reversing valve inside the SCR pump module SCR **M-F42A** is activated in the back-flow pipe and the pressure must be automatically reduced. The ECU **A-F02** monitors the operation of the DEF/AdBlue® system. If the battery voltage is above **10.0 V**, the DEF/AdBlue® system is in "detection mode", no emptying procedure has been carried out beforehand, and a pressure drop is not detected during the application period, this fault occurs. If the DEF/AdBlue® system is not frozen, it switches to the "pressure reducing" mode (the reversing valve is opened and the pump is operated by means of a valid value).

**Cause:**
The ECU **A-F02** has determined that an expected pressure drop has not taken place.

**Possible failure modes:**

1. Faulty DEF/AdBlue® back-flow line (tube), restricted.
2. Faulty DEF/AdBlue® connector (throttle), restricted.
3. Faulty DEF/AdBlue® system heater, ineffective.
4. Fault in the SCR pump module **M-F42A**, clogged filter or internal damage.
5. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, replace the SCR pump module **M-F42A** go to step **1**
2. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 4334-10 EE100A - Pressure stabilisation error

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
Monitoring of the selective catalytic reduction (SCR) of the DEF/AdBlue® system by the engine control unit (ECU) **A-F02** detects a suction pipe which has already defrosted. A pressure sensor is installed in the SCR pump module **M-F42A** downstream of the pump and before the delivery duct. This is why the pressure sensor can show the required pressure although it is not certain that the delivery duct itself is ready for dosing. The duct could still be partially frozen. The system checks also whether the delivery duct is frozen before the dosage can begin; when the pressure stabilises, the dosing valve is operated. If the opening of the valve causes a drop in pressure, it is assumed that the tube is free of ice. If battery voltage is higher than **10.0 V**, the DEF/AdBlue® system is in "Detection mode", an emptying procedure was not performed previously and a pressure drop is not detected during the application time, then this fault occurs. If the DEF/AdBlue® system is not in a defrosting state, it switches to "Pressure reduction" mode (the reverting valve is opened and the pump is operated via a valid value). Otherwise, defrosting is maintained for a valid time and the check is repeated for a valid number of times.

**Cause:**
The ECU **A-F02** has determined that an expected pressure drop has not taken place.

**Possible failure modes:**

1. Fault in the delivery duct (pipe) DEF/AdBlue®, frozen, clogged or damaged.
2. Fault in the SCR pump module **M-F42A**, clogged filter or internal damage.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, replace the SCR pump module **M-F42A** go to step **5**
2. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 4334-14 EE100E - SCR Monitoring: pressure drop error

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
Monitoring of the Selective Catalytic Reduction system (SCR) carried out by the engine control unit (ECU) **A-F02** detects an intake pipe and a delivery duct which have been defrosted before dosing can begin. When the pressure stabilises, the DEF/AdBlue® dosing valve is operated. If the valve opening causes a drop in pressure, it can be presumed that the system is ice free. If the pressure does not drop after a valid number of attempts, this fault occurs.

**Cause:**
The ECU **A-F02** has determined that an expected pressure drop has not taken place.

**Possible failure modes:**

1. Fault in the delivery duct (pipe) DEF/AdBlue®, frozen, clogged or damaged.
2. Faulty DEF/AdBlue® metering valve , internal damage.
3. Faulty DEF/AdBlue® system heater, ineffective.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the correct operation of the DEF/AdBlue® dosing valve following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)** )

   A. The component is working correctly, contact the Technical Help Desk.

   B. The component is not working correctly, replace the DEF/AdBlue® metering valve and go to step **5**
2. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 EE100F 4334-15 - Pressure monitoring: Urea pressure too high

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** determines the conditions of the DEF/AdBlue® of the selective catalytic reduction system (SCR). If the DEF/AdBlue® metering system is in normal operating state (ready for metering), it is monitored to check the correct pressure; this check is mandatory to obtain a correct metering quantity. If the pressure of the DEF/AdBlue® metering system is above the set threshold, it is not possible to ensure a correct metering quantity and this fault occurs.

**Cause:**
The ECU **A-F02** has determined the presence of an overpressure in the DEF/AdBlue® system.

**Possible failure modes:**

1. Fault relating to the DEF/AdBlue® level, too low.
2. Faulty DEF/AdBlue® back-flow line (tube), restricted or damaged.
3. Faulty SCR pump module **M-F42A**, pump motor operation at maximum speed due to an electrical fault or a non-valid pressure signal.
4. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check that the DEF/AdBlue® tank is filled at the correct level and that the back-flow pipe is not restricted or damaged.

   Check the tank level and the conditions of the back-flow pipe.

   A. If the tank needs topping up or if the back-flow pipe cannot be subjected to maintenance, refill, repair or replace as needed. Then, reset the engine restart counter / unlock inducement configuration with the diagnostic tool.

   B. If the tank level is correct and the back-flow pipe can be subjected to maintenance, pass on to point **8**.
2. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, replace the SCR pump module **M-F42A** and go to step **5**
3. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 4334-17 EE1011 - Pressure monitoring: Urea Pressure Too Low

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** determines the conditions of the DEF/AdBlue® fluid of the selective catalytic reduction (SCR) system. If the DEF/AdBlue® dosing system is in a normal operating condition (ready for metering), it is monitored to check the correct pressure; this check is mandatory to achieve a correct metering amount. If the DEF/AdBlue® metering system pressure falls below the minimum value, it is assumed that there is an air bubble present. If the pressure of the DEF/AdBlue® metering system falls below the minimum threshold, it is assumed that there is a broken delivery duct. A correct metering quantity cannot be guaranteed and this fault occurs.

**Cause:**
The ECU **A-F02** has determined the presence of an underpressure condition in the DEF/AdBlue® system.

**Possible failure modes:**

1. Fault relating to the DEF/AdBlue® level, too low.
2. Fault in the lines (pipes) and in the components of the DEF/AdBlue® system, internal or external leaks.
3. Fault in the SCR pump module **M-F42A**, insufficient pump pressure or pressure signal not valid.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Check that the DEF/AdBlue® tank is filled to the correct level and that there is no DEF/AdBlue® leak.

   Check the tank level and the DEF/AdBlue® system to check that there are no leaks present.

   A. If the tank needs to be topped up or if leaks are detected, refill, repair or replace as needed. Then, reset the engine restart counter / unlock inducement configuration with the diagnostic tool.

   B. If the tank level is correct and no leaks are detected, pass on to point **8**.
2. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, replace the SCR pump module **M-F42A** and go to step **5**
3. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 4334-0 EE1000 - Monitoring of over pressure

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** determines the conditions of the DEF/AdBlue® fluid of the selective catalytic reduction (SCR) system. If the DEF/AdBlue® metering system is in normal operating status (ready for metering), it is monitored to check the correct pressure; this check is mandatory to obtain the correct metering quantity. If the DEF/AdBlue® metering system pressure is above the threshold, this fault occurs and the system switches to a stand-by mode (metering locked). This is a second level 2 fault (of two faults relating to a pressure level), check that the corresponding fault has been saved.

**Cause:**
The ECU **A-F02** has determined the presence of a level 2 overpressure condition in the DEF/AdBlue® system.

**Possible failure modes:**

1. Fault relating to the DEF/AdBlue® level, too low.
2. Faulty DEF/AdBlue® back-flow line (tube), restricted or damaged.
3. Faulty SCR pump module **M-F42A**, pump motor operation at maximum speed due to an electrical fault or a non-valid pressure signal.
4. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check that the DEF/AdBlue® tank is filled at the correct level and that the back-flow pipe is not restricted or damaged.

   Check the tank level and the conditions of the back-flow pipe.

   A. If the tank needs topping up or if the back-flow pipe cannot be subjected to maintenance, refill, repair or replace as needed. Then, reset the engine restart counter / unlock inducement configuration with the diagnostic tool.

   B. If the tank level is correct and the back-flow pipe can be subjected to maintenance, pass on to point **8**.
2. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The module is working correctly, pass on to point **5** .

   B. The module is not working correctly, replace the SCR pump module **M-F42A** and go to step **5**
3. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 10150E 5392-14 - SCR reagent supply: pressurisation after start-up is not possible

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** determines the conditions of the DEF/AdBlue® fluid of the selective catalytic reduction system (SCR). Since the system is emptied after each stop in order to prevent damaging the metering valve due to frozen fluid, it must be topped up and pressurised (pressure accumulation) after each start-up. If the fluid pressure does not reaches the final accumulation pressure within a set time, this fault occurs. The DEF/AdBlue® system switches to "Stand-By" mode (impossible pressurisation and metering) and it is possible to reduce the power in order to protect the metering valve against overheating, since injection cooling is not possible.

**Cause:**
The ECU **A-F02** has determined that the DEF/AdBlue® system is not able to accumulate the requested pressure.

**Possible failure modes:**

1. Fault relating to the DEF/AdBlue® tank level, too low (suction of air).
2. Faulty DEF/AdBlue® tank intake pipe, leakage.
3. Faulty SCR pump module **M-F42A**, internal or external leakage.
4. Faulty DEF/AdBlue® metering valve , internal damage (blocked in the open position).
5. Faulty SCR pump module **M-F42A**, internal pump motor (not effective), reversing valve (blocked in the open position) or faulty pressure sensor.
6. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the correct operation of the SCR pump module **M-F42A** and of the DEF/AdBlue® metering module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)** )

   A. If both of them operate correctly, pass on to point **1**.

   B. If at least one of the two is not operating correctly, replace the faulty component and go to step **1**
2. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 3362-7 220D07 - SCR Monitoring: leak detected while no dosing in operation

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** determines the conditions of the DEF/AdBlue® fluid of the selective catalytic reduction system (SCR). If the DEF/AdBlue® metering system is in normal operation state (metering control), the metering valve is not operated (closed), the battery voltage is above **10.0 V**, the DEF/AdBlue® fluid temperature is equal to or lower than the threshold, the ambient pressure and temperature are in standard conditions, and the pressure difference between the slow and fast filter is above the saved value, this fault occurs.

**Cause:**
The ECU **A-F02** has determined the presence of leakage in the DEF/AdBlue® system.

**Possible failure modes:**

1. Faulty DEF/AdBlue® intake pipe or tank, leakage.
2. Faulty DEF/AdBlue ® delivery duct (pipe), leakage.
3. Faulty SCR pump module **M-F42A**, internal or external leakage.
4. Faulty DEF/AdBlue® metering valve , internal or external leakage.
5. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the correct operation of the SCR pump module **M-F42A** and of the DEF/AdBlue® metering module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)** )

   A. If both of them operate correctly, pass on to point **5** .

   B. If at least one of the two is not operating correctly, replace the faulty component and go to step **5** .
2. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 D70B06 3031-6 - DEF/AdBlue tank temperature is not within acceptable limits

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the diesel engine DEF/AdBlue® level and temperature. The DEF/AdBlue® fluid is heated by the engine cooling fluid.

**Cause:**
The temperature signal of the SCR system temperature/level sensor **B-F56** transmitted to the ECU **A-F02** is not within the permitted range.

**Possible failure modes:**

1. DEF/AdBlue® tank over heated, high temperature operating conditions.
2. Faulty DEF/AdBlue® tank heating system, control valve stuck open.
3. Faulty SCR system temperature/level sensor **B-F56**, internal damage.
4. Fault in the ECU **A-F02**, software.

**Solution:**

1. Verify the DEF/AdBlue® tank temperature.

   Measure the temperature of the DEF/AdBlue® tank with a device such as infra-red heat gun to obtain relative DEF/AdBlue® fluid temperature.

   A. If the relative temperature is high, greater than **69.96 °C** (**157.93 °F**), pass on to point **2**.

   B. If the relative temperature is not high, less than **69.96 °C** (**157.93 °F**), pass on to point **4**
2. Check for related tank heater failure.

   Use the diagnostic instrument to check for **759A-1F 3363-4 759A1F 30106-31 – Short Circuit to Ground of DEF/AdBlue Tank Heater Actuator power stage**.

   A. If the fault **759A-1F 3363-4 759A1F 30106-31 – Short Circuit to Ground of DEF/AdBlue Tank Heater Actuator power stage** is present, resolve the fault **759A-1F 3363-4 759A1F 30106-31 – Short Circuit to Ground of DEF/AdBlue Tank Heater Actuator power stage**. Then determine if this fault is also resolved.

   B. If the fault **759A-1F 3363-4 759A1F 30106-31 – Short Circuit to Ground of DEF/AdBlue Tank Heater Actuator power stage** is not present, pass on to point **4**.
3. Check the conditions of the SCR system temperature/level sensor **B-F56**.

   Disconnect the wiring of the urea tank from the SCR system temperature/level sensor **B-F56** at connector **X-F56**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the SCR system temperature/level sensor **B-F56**:

| From | To | Value |
|---|---|---|
| **X-F56 (Plug) pin 3** | **X-F56 (Plug) pin 2** | There should be a value greater than **214.90 Ω**. |

   A. If the measured resistance is greater than **214.90 Ω**, check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is lower than **214.90 Ω**, the SCR temperature/level sensor **B-F56** has failed internally. Go to step **8**

4. Check the correct operation of the DEF/AdBlue® tank temperature and level sensor **B-F56** following the procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The sensor is operating correctly pass on to point **5** .

   B. The sensor is not operating correctly, replace the DEF/AdBlue® tank level and temperature sensor **B-F56** and go to step **5**

5. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 121507 5394-7 - DEF/AdBlue dosing valve is blocked

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The monitoring of the selective catalytic reduction (SCR) system of the DEF/AdBlue® fluid carried out by the engine control unit (ECU) **A-F02** includes the functionality of the DEF/AdBlue® metering valve . The DEF/AdBlue® metering valve is checked to detect the needle movement, called "beginning of the injection period" (BIP). The needle opens due to a magnetic field energised by a coil which is operated by a solenoid valve. The inductivity of the coil changes when the needle reaches the rear limit switch, causing a variation in current (negative peak). If the needle does not move, this negative current peak does not occur. During the opening phase a pulse width modulation signal with higher frequency is generated, in order to ensure a fast and reliable opening. Subsequently the maintenance current is reduced switching to a PWM signal with slightly lower frequency. The current sampling occurs in various points during the actuation. IF the battery voltage is above **11.0 V**, the DEF/AdBlue® system is in pressure control or metering control mode and a BIP is not detected for more than fifteen total actuations, this fault occurs and the DEF/AdBlue® system is emptied. It is possible to reduce the engine power to prevent overheating of the DEF/AdBlue® metering valve, since this uses the injection for cooling.

**Cause:**
The ECU **A-F02** has determined that the DEF/AdBlue® metering valve has not open because the BIP of the DEF/AdBlue® metering valve has not been detected during actuation.

**Possible failure modes:**

1. Fault in the delivery duct (pipe) DEF/AdBlue®, frozen, clogged or damaged.
2. Faulty DEF/AdBlue® metering valve , freezing or internal damage.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check the correct operation of the DEF/AdBlue® metering valve following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)** )

   A. The component is working correctly, contact the Technical Help Desk.

   B. The component is not working correctly, pass on to point **2**
2. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 7EECE2 519294-2 - Plausibility error in the supply module

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the operation of the exhaust temperature sensor upstream of the Selective Catalytic Reduction (SCR) system **B-F38**. The ECU **A-F02** compares the temperature value of the exhaust temperature sensor upstream of the SCR system **B-F38** and the value of the heater of the fuel module **M-F42D**.

**Cause:**
The temperature sensor at the exhaust upstream of the SCR system **B-F38** is faulty.

**Possible failure modes:**

1. Fault in the wiring of the temperature sensor at the exhaust upstream of the SCR system **B-F38**.
2. Fault in the temperature sensor at the exhaust upstream of the SCR system **B-F38**.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **6**.
2. Check the correct operation of the connector **X-F38** of the temperature sensor at the exhaust upstream of the SCR system **B-F38** and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to step **4**.
3. Check the correct operation of the temperature sensor at the exhaust upstream of the SCR system **B-F38** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, go to step **6**.

   B. If the sensor is not working correctly, go to step **5**.
4. Replace the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 F11002 4337-2 - Plausibility error in the SCR supply module temperature sensor

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors operation of the temperature sensor at the exhaust upstream of the Selective Catalytic Reduction system (SCR) **B-F38**. The ECU **A-F02** compares the temperature value of the temperature sensor at the exhaust upstream of the SCR system **B-F38** and the value of the supply module heater **M-F42D**. The plausibility check of the temperature values is carried out in dynamic mode.

**Cause:**
The temperature sensor at the exhaust upstream of the SCR system **B-F38** is faulty.

**Possible failure modes:**

1. Fault in the wiring of the temperature sensor at the exhaust upstream of the SCR system **B-F38**.
2. Fault in the temperature sensor at the exhaust upstream of the SCR system **B-F38**.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **6**.
2. Check the correct operation of the connector **X-F38** of the temperature sensor at the exhaust upstream of the SCR system **B-F38** and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to step **4**.
3. Check the correct operation of the temperature sensor at the exhaust upstream of the SCR system **B-F38** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, go to step **6**.

   B. If the sensor is not working correctly, go to step **5**.
4. Replace the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 EE1003 4334-3 - Supply module pump: SCR reagent concentration high

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the operation of the DEF/AdBlue® fluid pressure sensor inside the SCR pump module **M-F42A**. If the sensor signal exceeds the expected threshold, this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the pressure signal level of the DEF/AdBlue® fluid pressure sensor inside the SCR pump module **M-F42A** is too high.

**Possible failure modes:**

1. Faulty signal cable of the DEF/AdBlue® fluid pressure sensor inside the SCR pump module **M-F42A**, short circuit towards a high voltage source.
2. Faulty pressure sensor of the DEF/AdBlue® fluid inside the SCR pump module **M-F42A**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **5**.
2. Check the signal circuit of the DEF/AdBlue® fluid pressure sensor inside the SCR pump module **M-F42A** for a short circuit towards another circuit.

   Disconnect the wiring from the SCR pump module **M-F42A** at the connector **X-F42A**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02E**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E (Plug) pin 10** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit.Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connectors disconnected and go to **3**.
3. Check the signal circuit of the DEF/AdBlue® fluid pressure sensor inside the SCR pump module **M-F42A** for a short circuit towards a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E (Plug) pin 10** | Chassis ground | There should be no voltage. |

   A. If voltage is detected, there is a short circuit towards a voltage source.Locate and repair the damaged conductors.

   B. If there is no voltage, pass on to point **8**.
4. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

A. The module is working correctly, contact the Technical Help Desk.

B. The module is not working correctly, pass on to point **4**

5. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 E10603 1761-3 - DEF/AdBlue tank level sensor voltage too high

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the operation of the level/temperature sensor of the selective catalytic reduction system (SCR) **B-F56**.

**Cause:**
The ECU **A-F02** has determined that the signal level of the level/temperature sensor of the SCR system **B-F56** is higher than the permitted value.

**Possible failure modes:**

1. Fault in the wire of the SCR system temperature/level sensor signal **B-F56**, short circuit to high voltage source.
2. Fault inside the SCR system temperature/level sensor **B-F56**.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **9**.
2. Check the circuit of the SCR system temperature/level sensor **B-F56** to check for a short circuit towards another circuit.

   Disconnect the wiring of the urea tank (UT) from the SCR system temperature/level sensor **B-F56** at connector **X-F56**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 80** | All other pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Plug) pin 81** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit condition to another circuitLocate and repair the shorted conductors.

   B. If no continuity is detected, leave the connectors disconnected and go to **5**.
3. Check the signal circuit of the SCR system temperature/level sensor **B-F56** to check for a short circuit to voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 80** | Chassis ground | There should be no voltage. |
| **X-F02V (Plug) pin 81** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit to a voltage source in the signal circuit of the SCR system temperature/level sensor **B-F56**.Locate and repair the damaged conductors.

   B. If there is no voltage, pass on to point **8**.

4. Check the correct operation of the SCR system temperature/level sensor **B-F56** following the test procedure indicated ( **AD-BLUE INDICATOR - Test (50.74)**)

   A. The sensor is operating correctly pass on to point **8** .

   B. The sensor is not operating correctly, replace the DEF/AdBlue® tank level and temperature sensor **B-F56** and go to step **8**

5. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 EE1004 4334-4 - Supply module pump: SCR reagent concentration low

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the operation of the DEF/AdBlue® fluid pressure sensor inside the SCR pump module **M-F42A**.

**Cause:**
The ECU **A-F02** has determined that the pressure signal level of the DEF/AdBlue® fluid pressure sensor inside the SCR pump module **M-F42A** is below the expected value.

**Possible failure modes:**

1. Faulty signal cable of the pressure sensor of the DEF/AdBlue® fluid inside the SCR pump module **M-F42A**, short circuit towards a low voltage source (ground).
2. Faulty pressure sensor of the DEF/AdBlue® fluid inside the SCR pump module **M-F42A**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Go to step **4**.
2. Check the signal circuit of the DEF/AdBlue® fluid DPF pressure sensor inside the SCR pump module **M-F42A** to check for a short circuit towards another circuit or to ground.

   Disconnect the wiring from the SCR pump module **M-F42A** at the connector **X-F42A**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 46** | All other pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Plug) pin 46** | Chassis ground | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit or to ground.Locate and repair the damaged conductors.

   B. If no continuity is detected, pass on to point **8**.
3. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. The module is working correctly, contact the Technical Help Desk.

   B. The module is not working correctly, pass on to point **3**
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 1761-4 E10604 - DEF/AdBlue tank level sensor voltage too low

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the operation of the level/temperature sensor of the selective catalytic reduction system (SCR) **B-F56**.

**Cause:**
The ECU **A-F02** has determined that the signal level of the level/temperature sensor of the SCR system **B-F56** is lower than the set threshold.

**Possible failure modes:**

1. Faulty signal wire of the level/temperature sensor of the SCR system **B-F56**, short circuit towards a low voltage source (ground).
2. Fault inside the SCR system temperature/level sensor **B-F56**.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **9**.
2. Check the circuit of the SCR system temperature/level sensor **B-F56** to check for a short circuit towards another circuit.

   Disconnect the wiring of the urea tank (UT) from the SCR system temperature/level sensor **B-F56** at connector **X-F56**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 80** | All other pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Plug) pin 81** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit condition to another circuitLocate and repair the shorted conductors.

   B. If no continuity is detected, leave the connectors disconnected and go to **5**.
3. Check the signal circuit of the SCR system temperature/level sensor **B-F56** to check for a short circuit to voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 80** | Chassis ground | There should be no voltage. |
| **X-F02V (Plug) pin 81** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit to a voltage source in the signal circuit of the SCR system temperature/level sensor **B-F56**.Locate and repair the damaged conductors.

B. If there is no voltage, pass on to point **8**.

4. Check the correct operation of the SCR system temperature/level sensor **B-F56** following the test procedure indicated ( **AD-BLUE INDICATOR - Test (50.74)**)

   A. The sensor is operating correctly pass on to point **8** .

   B. The sensor is not operating correctly, replace the DEF/AdBlue® tank level and temperature sensor **B-F56** and go to step **8** .

5. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 5841-16 D11610 - SCR inducement: level 1 (torque reduction), triggered by DEF/AdBlue Quality fault

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is generated only for information and therefore no corrective actions are required other than for resolving the active fault associated to the quality of **Diesel Exhaust Fluid (DEF)/AdBlue®** which causes this fault if it remains active for longer than expected.

# 295467 D11600 5841-0 - SCR inducement: level 3 (reduction mode), triggered by DEF/AdBlue Quality fault

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is generated only for information and therefore no corrective actions are required other than for resolving the active fault associated to the quality of **Diesel Exhaust Fluid (DEF)/AdBlue®** which causes this fault if it remains active for too long.

# 295467 5841-15 D1160F - SCR inducement: warning, triggered by fault relating to DEF/AdBlue quality

## Control Module: FPT ECU

***NOTE:*** *Since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service, unless this was carried out while resolving the error which has caused the fault.*

**Fault Description:**
This fault is reported for information purposes only and no actions are required other than resolving the active error that has caused this fault. Any of the **Diesel Exhaust Fluid (DEF)/AdBlue®** tampering detection faults of the selective catalytic reduction system (SCR) that remain active for longer than the set threshold will cause this fault.

# 295467 4363-3 0B1103 - SCR high for SCR catalyst downstream temperature sensor

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature sensor at the exhaust upstream of the selective catalytic reduction (SCR) system **B-F39** to check the presence of a short circuit towards a high voltage source. If the ECU **A-F02** determines the presence of a short circuit towards a high voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F39**, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** on the last valid value detected or on a default value once the fault has been validated.

**Cause:**
The ECU **A-F02** has detected a voltage higher than expected in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F39**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature sensor at the exhaust downstream of the SCR **B-F39**, short circuit towards a high voltage source.
2. Faulty temperature sensor at the exhaust downstream of the SCR system **B-F39**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive, continue to step **6**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR **B-F39** for a short circuit towards another circuit.

   Disconnect the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 47** | All other pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Plug) pin 24** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F39**, locate and repair the conductors in a short circuit condition.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.
3. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR **B-F39** for a short circuit towards a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 47** | Chassis ground | There must be no voltage. |

A. If there is voltage, there is a short circuit towards a voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F39**, locate and repair the conductors in a short circuit condition.

B. If there is no voltage, continue to step **4**.

4. Check the correct operation of the temperature sensor at the exhaust downstream of the DOC **B-F39** following the procedure indicated **TEMPERATURE SENSOR - Test (50.74)**.

   A. If the sensor is okay, continue to step **6**.

   B. If the sensor is not working correctly, continue to step **5**.

5. Replace the temperature sensor at the exhaust downstream of the SCR system **B-F39**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, then erase the fault code and continue operation.

# 295467 0B1104 4363-4 - SCR low for SCR catalyst downstream temperature sensor

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature signal circuit of the temperature sensor at the exhaust **B-F39** downstream of the selective catalytic reduction system (SCR) . If the ECU **A-F02** senses that the voltage in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR **B-F39** is below the expected value, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** at the last valid value detected or at a default replacement value, once the fault is validated.

**Cause:**
The ECU **A-F02** has detected a voltage lower than expected in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR **B-F39**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature sensor at the exhaust downstream of the SCR **B-F39**, short circuit to ground.
2. Faulty temperature sensor at the exhaust downstream of the SCR system **B-F39**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, continue to step **5**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR **B-F39** for a short circuit to ground.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 47** | Chassis ground | There should be no continuity. |
| **X-F02V (Plug) pin 47** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity during one of the checks, there is a short circuit to ground or towards another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR **B-F39**, Locate and repair the shorted conductors.

   B. If there is no continuity on either check, continue to step **3**.
3. Check the correct operation of the temperature sensor at the exhaust downstream of the SCR **B-F39** following the procedure indicated **TEMPERATURE SENSOR - Test (50.74)**.

   A. If the sensor is okay, continue to step **5**.

   B. If the sensor is not working correctly, continue to step **4**.
4. Replace the temperature sensor at the exhaust downstream of the SCR system **B-F39**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 4360-3 081103 - SCR high for SCR catalyst upstream temperature sensor

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the temperature sensor at the exhaust upstream of the selective catalytic reduction (SCR) system **B-F38** to check the presence of a short circuit towards a high voltage source. If the ECU **A-F02** determines the presence of a short circuit towards a high voltage source in the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** on the last valid value detected or on a default replacement value once the fault has been validated.

**Cause:**
The ECU **A-F02** has detected a voltage higher than permitted in the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature sensor at the exhaust upstream of the SCR system **B-F38**, short circuit towards a high voltage source.
2. Faulty temperature sensor at the exhaust upstream of the SCR system **B-F38**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38** for a short circuit towards another circuit.

   Disconnect the Stage 5 (S5) engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 29** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F38**, Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to **3**.
3. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38** for a short circuit towards a voltage source.

   With the ignition switch set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 29** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards a voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F38**, Locate and repair the shorted conductors.

B. In the absence of voltage, go to step **4**.

4. Check the correct operation of the temperature sensor at the exhaust upstream of the SCR system **B-F38** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, go to **6**.

   B. If the sensor is not working correctly, go to step **5**.

5. Replace the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 081104 4360-4 - SCR low for SCR catalyst upstream temperature sensor

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the circuit of the temperature signal of the temperature sensor at the exhaust upstream of the selective catalytic reduction (SCR) system **B-F38**. If the ECU **A-F02** senses that the voltage in the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system ambient temperature **B-F38** is below the expected value, this fault occurs. If this fault occurs, the temperature value is locked by the ECU **A-F02** on the last valid value detected or on a default replacement value, once the fault is validated.

**Cause:**
The ECU **A-F02** has detected a voltage lower than permitted in the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

**Possible failure modes:**

1. Faulty temperature signal wire of the temperature sensor at the exhaust upstream of the SCR system **B-F38**, short circuit to ground.
2. Faulty temperature sensor at the exhaust upstream of the SCR system **B-F38**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive, continue to step **6**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38** for a short circuit to ground.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 29** | Chassis ground | There should be no continuity. |
| **X-F02V (Plug) pin 29** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity during one of the checks, this indicates a short circuit to ground or towards another circuit of the temperature signal circuit, locate and repair the conductors in a short circuit condition.

   B. If there is no continuity on either check, continue to step **4**.
3. Check the correct operation of the temperature sensor at the exhaust upstream of the SCR system **B-F38** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, continue to step **6**.

   B. If the sensor is not working correctly, continue to step **5**.
4. Replace the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If the fault has been corrected, return the machine to service.

B. If the fault has not been corrected, check that the software of ECU **A-F02** is correct and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, then erase the fault code and continue operation.

# 295467 1761-1 E10601 - Remaining DEF/AdBlue is below the empty threshold

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the DEF/AdBlue® fluid level and temperature. If the fluid level reaches the minimum percentage in relation to 100% full (i.e. empty), this fault occurs.

**Cause:**
The level signal of the DEF/AdBlue® tank level and temperature sensor **B-F56** to the ECU **A-F02** is at minimum in relation to 100% full.

**Possible failure modes:**

1. DEF/AdBlue® tank fluid level, too low.
2. Faulty DEF/AdBlue® level and temperature sensor **B-F56**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Fill the DEF/AdBlue® tank to the appropriate level.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, pass on to point **2**.
2. Remove the DEF/AdBlue® tank level and temperature sensor **B-F56** and then inspect the appliance to determine if the magnet of the filler inlet discharge pipe has come out of its seat and became lodged thereby causing a false reading.

   Disconnect the wiring from the DEF/AdBlue® tank temperature and level sensor **B-F56** at connector **X-F56**.

   Use a multimeter to measure the resistance of the DEF/AdBlue® tank level and temperature sensor **B-F56**:

| From | To | Value |
|---|---|---|
| **X-F56 (Plug) pin 1** | **X-F56 (Plug) pin 2** | There should be a value greater than **12,000 Ω**. |

   A. If the measured resistance is greater than **12,000 Ω**, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is less than **12,000 Ω**, this indicates a fault in the DEF/AdBlue® tank level and temperature sensor **B-F56** pass on to point **3**.
3. Check the correct operation of the DEF/AdBlue® tank level and temperature sensor **B-F56** following the procedure indicated **AD-BLUE INDICATOR - Test (50.74)**.

   A. If the sensor is okay, return the machine to service.

   B. If the sensor is not working correctly, replace the DEF/AdBlue® tank level and temperature sensor unit **B-F56** and go to step **5**.
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 5394-31 12151F - Open circuit in power stage of DEF/AdBlue dosing valve actuator

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the circuit of the metering valve **Diesel Exhaust Fluid (DEF)/AdBlue®** . If the ECU **A-F02** detects an interruption on the circuit of the metering valve of **AdBlue®** , this fault occurs.

**Cause:**
The ECU **A-F02** has detected an interruption in the circuit of the metering valve of **AdBlue®**.

**Possible failure modes:**

1. Internal fault of the metering valve of **AdBlue®** .
2. Faulty wiring of the metering valve of **AdBlue®** .
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **5**.
2. Check the metering valve of **AdBlue® Y-F233** for an internal fault.

   Disconnect the wiring from the **AdBlue®** dosing valve.

   Use a multimeter to check the resistance between the pins of the dosing valve.

   A. If the resistance is within the **11 – 16 Ω**, leave the connector disconnected and continue to Step **3**.

   B. If the resistance is within the **11 – 16 Ω**, go to step **4**.
3. Check the circuit of the metering valve of **AdBlue® Y-F233** for an interruption.

   Disconnect the wiring from the ECU **A-F02**.

   The key must be in the OFF position.

   Use a multimeter to check the continuity between the valve and the control unit.

   A. If there is no continuity, there is an interruption in the circuit of the metering valve of **AdBlue®** locate and repair the shorted conductor.

   B. If continuity is detected, go to step **4**.
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 5394-3 121503 - Short circuit to battery in power stage of DEF/AdBlue dosing valve actuator

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the circuit of the dosing valve **Diesel Exhaust Fluid (DEF)/AdBlue®** . If the ECU **A-F02** detects a short circuit towards the power supply of the battery in the dosing valve circuit of the **AdBlue®** , this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit towards the battery power supply in the dosing valve circuit of **AdBlue®**.

**Possible failure modes:**

1. Internal fault of the metering valve of **AdBlue®** .
2. Faulty wiring of the metering valve of **AdBlue®** .
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **6**.
2. Check the metering valve of **AdBlue® Y-F233** for an internal fault.

   Disconnect the engine wiring from the **AdBlue®** dosing valve.

   Use a multimeter to check the resistance of the pins of the dosing valve.

   A. If the value is not between **11 – 16 Ω** leave the connector disconnected and continue to Step **3**.

   B. If there is between **11 – 16 Ω** go to step **5**.
3. Check the circuit of the dosing valve **AdBlue® Y-F233** for a short circuit to battery power supply.

   Disconnect the engine wiring from the ECU **A-F02**.

   The key must be in the OFF position.

   Use a multimeter to check the continuity to check for a short circuit between the pins of the dosing valve.

   A. If continuity is detected, locate and repair the shorted conductor.

   B. If there is no continuity, go to step **4**.
4. Check the circuit of the dosing valve **AdBlue®** for a short circuit towards the key-protected battery power supply.

   The key must be in the ON position.

   Use a multimeter to check the voltage to check for a short circuit to key-activated battery supply of the dosing valve.

   A. If voltage is detected, Locate and repair the shorted conductor.

   B. If there is no voltage, go to step **5**.

5. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings,then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 121505 5394-5 - Short circuit to ground in power stage of DEF/AdBlue dosing valve actuator

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the dosing valve circuit **Diesel Exhaust Fluid (DEF)/AdBlue®**. If the ECU **A-F02** detects a short circuit to ground in the circuit , this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground in the dosing valve of **AdBlue®**.

**Possible failure modes:**

1. Internal fault of the metering valve of **AdBlue®** .
2. Faulty wiring of the metering valve of **AdBlue®** .
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **7**.
2. Check the metering valve of **AdBlue® Y-F233** for an internal fault.

   Disconnect the wiring from the **AdBlue®** dosing valve.

   Use a multimeter to check the resistance between the pins of the dosing valve.

   A. If the resistance is within the **11 – 16 Ω**,repair or replace as required.

   B. If the resistance is not between **11 – 16 Ω**,pass on to point **3**.
3. Check the correct operation of the **AdBlue®** metering valve following the procedure indicated **AD-BLUE SYSTEM - Test (50.74)**

   A. If the valve is working correctly, pass on to point **5**.

   B. If the valve is not working correctly, pass on to point **4**.
4. Check the circuit of the dosing valve of **AdBlue®** for a short circuit to ground.

   Disconnect the wiring from the ECU **A-F02**.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check to check for a short circuit condition in the dosing valve.

   A. If continuity is detected, locate and repair the shorted conductor.

   B. If no continuity is detected, pass on to point **5**.
5. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 02110E 4354-14 - DEF/AdBlue pressure line heater failure and DEF/AdBlue tank temperature is too low

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the **Diesel Exhaust Fluid (DEF)/AdBlue®** fluid temperature. If pressure accumulates after defrosting, the injection fluid temperature **AdBlue®** falls below the expected value and the engine coolant temperature is sufficiently high [higher than expected] to provide sufficient heating, this fault occurs. Furthermore, the **AdBlue®** fluid injection system will be stopped to protect the **AdBlue®** supply module.

**Cause:**
The ECU **A-F02** has detected a fault or a mechanical problem in the **AdBlue®** heating system and the **AdBlue®** temperature is too low to maintain system operation.

**Possible failure modes:**

1. Fault in the **AdBlue®** heating system, heating valve failed to open.
2. Fault in the **AdBlue®** heating system, heating pipes clogged and/or damaged.
3. Fault in the **AdBlue®** heating system, heating pipes incorrectly fitted (connected) or external / additional heating unit incorrectly fitted, if used (connected).

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **4**.
2. Check the correct operation of the DEF/AdBlue® dosing valve following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)** )

   A. The component is working correctly, contact the Technical Help Desk.

   B. The component is not working correctly, replace the DEF/AdBlue® metering valve and go to step **3**
3. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3B1505 5435-5 - Open circuit failure in the power stage of the DEF/AdBlue motor pump

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the internal pump module **M-F42A**of the SCR control unit (supply module). If the ECU **A-F02** detects an open load in the circuit of the internal pump module **M-F42A** in the control unit (supply module) SCR, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an open load failure in the **AdBlue®** pump motor circuit **M-F42A**.

**Possible failure modes:**

1. Fault in the internal pump motor **M-F42A** of the SCR control unit (supply module), open circuit.
2. Fault in the internal pump module **M-F42A** of the SCR control unit (supply module).
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **5**.
2. Check the wiring of the internal pump module **M-F42A** of the SCR control unit (supply module) to check for an open circuit.

   Disconnect the engine wiring from the SCR control unit, (supply module) **M-F42A**, connector **X-F42A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F42A (Plug) pin 8** | **X-F02V (Plug) pin 89** | There should be continuity. |
| **X-F42A (Plug) pin 9** | **X-F02V (Plug) pin 50** | There should be continuity. |
| **X-F42A (Plug) pin 10** | **X-F02V (Plug) pin 84** | There should be continuity. |

   A. If no continuity is detected, this indicates an open circuit in the wiring of the internal pump motor **M-F42A** of the SCR control unit (supply module), Locate and repair the broken conductor.

   B. If continuity is detected, go to step **3**.
3. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 5435-3 3B1503 - Short circuit to battery error on power stage for DEF/AdBlue Supply Module pump motor

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the circuit of the SCR control unit internal pump motor **M-F42A** to check for any excessive current/temperature conditions. If the ECU **A-F02** detects an overtemperature/overcurrent condition, this fault occurs.

**Cause:**
The ECU **A-F02** has detected an overtemperature/overcurrent condition in the circuit of the SCR control unit internal pump motor **M-F42A**.

**Possible failure modes:**

1. Fault in the SCR control unit internal pump motor **M-F42A**, wiring.
2. Fault in the SCR control unit internal pump motor **M-F42A**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **7**.
2. Check the following related faults:

   **24890-31 613A-1F 5435-3 613A1F 520539-3 – Short circuit to battery error on powerstage for DEF/AdBlue Supply Module pump motor**

   A. If the fault listed is active, diagnose them first and then return to this fault.

   B. Is the fault is not active, go to step **3**.
3. Check the wiring of the SCR control unit internal pump motor **M-F42A**, to check for a short circuit in the battery power supply.

   Disconnect the Stage 5 (S5) wiring from the SCR control unit, (supply module) **M-F42A**, connector **X-F42A**.

   Disconnect the Stage 5 (S5) engine wiring from the ECU **A-F02** at connector **X-F02V**.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 2** | **X-F02V (Plug) pin 8** | There should be no continuity. |
| **X-F02V (Plug) pin 2** | All pins in connector **X-F02V** | There should be no continuity. |

A. If continuity is detected, this indicates a short circuit in the cable of the SCR control unit internal pump motor **M-F42A**. Locate and repair the shorted conductor.

B. If no continuity is detected, leave the connectors disconnected and go to **4**.

4. Check the wiring of the SCR control unit internal pump motor **M-F42A**, to check for a short circuit to key battery power supply.

   The key must be in the ON position.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 2** | Chassis ground | There should be no voltage. |

   A. If voltage is detected, this indicates a short circuit to the key activated battery power supply of the SCR control unit internal pump motor **M-F42A**, locate and repair the shorted conductor.

   B. If there is no voltage, go to step **5**.

5. Check the correct operation of the internal pump motor **M-F42A** of the SCR control unit following the procedure indicated ( **AD-BLUE INDICATOR - Test (50.74)**.

   A. If the internal pump motor is working correctly, go to step **6**.

   B. If the internal pump motor is not working correctly, replace the internal pump motor **M-F42A** of the SCR control unit,

6. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 5435-4 3B1504 - Short circuit to ground on powerstage for DEF/AdBlue Supply Module pump motor

## Control Module: FPT ECU

**Fault Description:**
The electronic control unit (ECU) **A-F02** monitors the internal pump circuit **M-F42A** of the control unit (supply module) SCR to check for a short circuit to ground. If the ECU **A-F02** detects a short circuit to ground, this fault code is generated.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground in the battery of the internal pump circuit **M-F42A** of the control unit (supply module) SCR.

**Possible failure modes:**

1. Fault of the internal pump wiring **M-F42A** of the control unit (supply module) SCR.
2. Internal fault of the pump **M-F42A** inside the control unit (supply module) SCR.
3. Fault in **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to step **5**.
2. Check the wiring of the internal pump **M-F42A** of the control unit (supply module) SCR for a short circuit to ground.

   Disconnect the engine wiring from the SCR control unit, (supply module) **M-F42A**, connector **X-F42A**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 2** | **X-F02V (Plug) pin 22** | There should be no continuity. |
| **X-F02V (Plug) pin 2** | All pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Plug) pin 2** | Chassis ground | There should be no continuity. |

   A. If there is continuity, there is a short circuit in the wiring of the internal pump **M-F42A** of the control unit (supply module) SCR. Locate and repair the shorted conductor.

   B. If no continuity is detected, leave the connectors disconnected and go to **4**.
3. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 D70B03 3031-3 - DEF/AdBlue temperature sensor voltage too high

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the level and temperature of the **Diesel Exhaust Fluid (DEF)/AdBlue®**. If the temperature detection signal of the SCR system level and temperature sensor **B-F56** is higher than the permitted value, this fault occurs.

**Cause:**
The temperature signal of the SCR system level and temperature sensor **B-F56** transmitted to the ECU **A-F02** is higher than the permitted value.

**Possible failure modes:**

1. Fault in the SCR system level and temperature sensor **B-F56**, internally damaged.
2. Fault in the wiring of the temperature signal of the SCR system level and temperature sensor **B-F56**, open circuit or short circuit to a high voltage source.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.pass on to point **7**.
2. Check the conditions of the SCR system level and temperature sensor **B-F56**.

   Disconnect the wiring from the DEF/AdBlue® tank temperature and level sensor **B-F56** at connector **X-F56**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F56 (Plug) pin 3** | **X-F56 (Plug) pin 2** | The value read should be **25.56 – 23342.00 Ω** |

   A. If the resistance is within the specified range, leave the connector disconnected and continue to Step **3**.

   B. If the resistance is outside the set range, there is an internal fault of the level and temperature sensor of the SCR system **B-F56**, pass on to point **6**.
3. Check the wiring of the temperature signal circuit of the SCR tank level and temperature sensor **B-F56** to check for a short circuit to a high voltage source.

   Disconnect the Stage 5 (S5) engine wiring from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 35** | Chassis ground | There should be a voltage of **0 V**. |

A. If it is higher than **0 V**, this indicates a short circuit to a high voltage source in the temperature signal circuit of the SCR tank level and temperature sensor **B-F56**.Locate and repair the shorted conductor.

B. If there is no voltage, pass on to point **4**.

4. Check the wiring of the temperature signal circuit of the temperature and level sensor of the SCR tank **B-F56** for a short circuit to ground.

   Disconnect the Stage 5 (S5) engine wiring from the ECU **A-F02** at connector **X-F02V (Plug) pin 35**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 35** | all other pins **X-F02V** | There should not be continuity. |

A. If there is continuity, there is a short circuit in the temperature signal of the temperature and level sensor of the SCR tank **B-F56**.Locate and repair the shorted conductor.

B. If no continuity is detected, pass on to point **5**.

5. Check the wiring of the temperature signal circuit of the SCR system level and temperature sensor **B-F56** to check for an open circuit.

   Disconnect the wiring from the DEF/AdBlue® tank temperature and level sensor **B-F56** at connector **X-F56**.

   Set the ignition switch to OFF

   Use a multimeter to check for continuity:

| From | To | Value |
|---|---|---|
| **X-F43-46 (Plug) pin 3** | **X-F02V (Plug) pin 35** | There should be continuity. |

A. If there is no continuity present, this indicates an interruption in the temperature signal circuit of the SCR tank level and temperature sensor **B-F56**.Locate and repair the broken conductor.

B. If no continuity is detected, pass on to point **6**.

6. Check the correct operation of the level and temperature sensor of the SCR tank **B-F56** following the test procedure indicated **AD-BLUE INDICATOR - Test (50.74)**.

A. If the sensor is okay, pass on to point **8**.

B. If the sensor is not working correctly, replace the SCR system level and temperature sensor unit **B-F56** and go to step **8**.

7. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

8. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 3031-4 D70B04 - DEF/AdBlue temperature sensor voltage too low

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the level and the temperature of the **Diesel Exhaust Fluid (DEF)/ AdBlue®** through the level and temperature sensor of the SCR tank **B-F56**. If the ECU **A-F02** detects that the raw voltage value of the temperature signal transmitted by the level and temperature sensor of the SCR tank **B-F56** is below the permitted value, this fault occurs.

**Cause:**
The ECU **A-F02** has detected that the raw voltage value of the temperature signal transmitted by the level and temperature sensor of the SCR tank **B-F56** is below the permitted value.

**Possible failure modes:**

1. Faulty SCR tank level and temperature sensor **B-F56**, internal fault.
2. Faulty temperature signal wire of the level and temperature sensor of the SCR tank **B-F56**, short circuit to ground.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **5**.
2. Check the conditions of the SCR system level and temperature sensor **B-F56**.

   Disconnect the wiring from the DEF/AdBlue® tank temperature and level sensor **B-F56** at connector **X-F56**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F56 (Plug) pin 3** | **X-F56 (Plug) pin 2** | The value read should be **25.56 – 23342.00 Ω** |

   A. If the resistance is within the specified range, leave the connector disconnected and continue to Step **3**.

   B. If the resistance is outside the set range, there is an internal fault of the level and temperature sensor of the SCR system **B-F56**, pass on to point **4**.
3. Check the wiring of the temperature signal circuit of the temperature and level sensor of the SCR tank **B-F56** for a short circuit to ground.

   Disconnect the Stage 5 (S5) engine wiring from the ECU **A-F02** at connector **X-F02V**.

   Set the ignition switch to OFF.

   Use a multimeter to perform the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02V (Plug) pin 35** | Chassis ground | There should not be continuity. |
| **X-F02V (Plug) pin 35** | all other pins **X-F02V** | There should not be continuity. |

A. If there is continuity, there is a short circuit in the temperature signal of the temperature and level sensor of the SCR tank **B-F56**.Locate and repair the shorted conductor.

B. If no continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Check the correct operation of the level and temperature sensor of the SCR tank **B-F56** following the test procedure indicated **AD-BLUE INDICATOR - Test (50.74)**.

   A. If the sensor is okay, pass on to point **5**.

   B. If the sensor is not working correctly, replace the SCR system level and temperature sensor unit **B-F56** and go to step **5**.

5. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 8AEBE9 519050-9 - Timeout error of CAN-receive-frame A1DEFI from DEF/AdBlue quality sensor

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** is necessary to periodically report information to the engine control unit (ECU) **A-F02** through the CAN (Controller Area Network) regarding temperature, concentration, conductivity, errors, and type of catalytic reagent. If the ECU **A-F02** detects a timeout in message A1DEFI that transmits this information, this fault occurs.

**Cause:**

- Voltage of quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** below the threshold;
- Error on CAN line, disconnected or broken cables;
- Short circuit;
- Faulty quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56**.

**Possible failure modes:**

1. Faulty quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56**, hardware or software;
2. Faulty wiring of the quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56**, interruption or short circuit;
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **3**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **8**.
2. Determine the conditions of the CAN circuit between the quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** and the ECU **A-F02**.

   Disconnect the wiring from the quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** at connector **X-F56**.

   With the switch set to OFF use a multimeter to measure the continuity:

| From | To | Value |
|---|---|---|
| **X-F56 (Plug) pin 2** | **X-F305 (Receptacle) pin 1** | There should be continuity |
| **X-F56 (Plug) pin 1** | **X-F305 (Receptacle) pin 2** | There should be continuity |

   A. If continuity is detected, pass on to point **4**.

   B. If there is no continuity, the fault could be on the wiring or on the junction **X-F305 (Receptacle)** .Locate and repair the fault.
3. Determine the conditions of the CAN circuit between the quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** and the ECU **A-F02**.

   Disconnect the connector from the junction connector **X-F305 (Receptacle)** .

With the switch set to OFF use a multimeter to measure the continuity:

| From | To | Value |
|---|---|---|
| **X-F02E (Plug) pin 17** | **X-F305 (Receptacle) pin 1** | There should be continuity |
| **X-F02E (Plug) pin 18** | **X-F305 (Receptacle) pin 2** | There should be continuity |

A. If continuity is detected, pass on to point **5**.

B. If there is no continuity, Locate and repair the damaged conductor.

4. Determine the presence of a short circuit in the CAN circuit between the quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** and the ECU **A-F02**.

   Disconnect the wiring from the ECU **A-F02**, connector **X-F02E (Plug)** .

   With the switch set to ON use a multimeter to measure the continuity:

| From | To | Value |
|---|---|---|
| **X-F02E (Plug) pin 17** | Chassis ground | There should be no continuity |
| **X-F02E (Plug) pin 18** | Chassis ground | There should be no continuity |

   A. If there is continuity, there is a short circuitLocate and repair the damaged conductor.

   B. If there is no continuity, pass on to point **6**.

5. Check the correct operation of the quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56**, following the procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)**)

   A. If the sensor is okay,contact the Technical Help Desk.

   B. If the sensor is not working correctly, pass on to point **7**.

6. Replace the quality sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56**.

   Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 519051-9 8BEBE9 - Timeout error of CAN-receive-frame AT1T1I from DEF/AdBlue tank level sensor

## Control Module: FPT ECU

***NOTE:*** *since this fault causes inducement, it is necessary to perform the Fault Repair Verification Test of the Selective Catalytic Reduction (SCR) once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The tank level sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** is necessary to periodically report information to the engine control unit (ECU) **A-F02** through the CAN (Controller Area Network) regarding temperature, concentration, conductivity, errors, and type of catalytic reagent. If the ECU **A-F02** detects a timeout in message AT1T1I that transmits this information, this fault occurs.

**Cause:**

- Voltage of tank level sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** below the threshold;
- Error on CAN line, disconnected or broken cables;
- Short circuit;
- Faulty tank level sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56**.

**Possible failure modes:**

1. Faulty tank level sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56**, hardware or software;
2. Faulty wiring of the tank level sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56**, interruption or short circuit;
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue with step **3**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **8**.
2. Determine the conditions of the CAN circuit between the level sensor of the tank **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** and the ECU **A-F02**.

   Disconnect the wiring from the tank level sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** at connector **X-F56**.

   With the switch set to OFF use a multimeter to measure the continuity:

| From | To | Value |
|---|---|---|
| **X-F56 (Plug) pin 2** | **X-F305 (Receptacle) pin 1** | There should be continuity |
| **X-F56 (Plug) pin 1** | **X-F305 (Receptacle) pin 2** | There should be continuity |

   A. If continuity is detected, continue with **4**.

   B. If there is no continuity, the fault could be on the wiring or on the junction **X-F305 (Receptacle)** .Locate and repair the fault.
3. Determine the conditions of the CAN circuit between the level sensor of the tank **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** and the ECU **A-F02**.

   Disconnect the connector from the junction connector **X-F305 (Receptacle)** .

With the switch set to OFF use a multimeter to measure the continuity:

| From | To | Value |
|---|---|---|
| **X-F02E (Plug) pin 17** | **X-F305 (Receptacle) pin 1** | There should be continuity |
| **X-F02E (Plug) pin 18** | **X-F305 (Receptacle) pin 2** | There should be continuity |

A. If continuity is detected, go to step **5**.

B. If there is no continuity, Locate and repair the damaged conductor.

4. Determine the presence of a short circuit in the CAN circuit between the tank level sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** and the ECU **A-F02**.

   Disconnect the wiring from the ECU **A-F02**, connector **X-F02E (Plug)** .

   With the switch set to ON use a multimeter to measure the continuity:

| From | To | Value |
|---|---|---|
| **X-F02E (Plug) pin 17** | Frame ground | There should be no continuity |
| **X-F02E (Plug) pin 18** | Frame ground | There should be no continuity |

   A. If there is continuity, there is a short circuitLocate and repair the damaged conductor.

   B. If there is no continuity, go to **6**.

5. Check the correct operation of the tank level sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56**, following the procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)**)

   A. If the sensor is okay,contact the Technical Help Desk.

   B. If the sensor is not working correctly, continue with **7**.

6. Replace the tank level sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56**.

   Use the diagnostic instrument to replace the tank level sensor **Diesel Exhaust Fluid (DEF)/AdBlue® B-F56** and restore the ECU data configuration.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 4425-31 49111F - SCR system: Excessive NOX emissions

## Control Module: FPT ECU

**Fault Description:**
The efficiency of the SCR catalytic converter is monitored by calculating the ratio between the NOx measured downstream of the SCR and the raw emission of NOx from the engine upstream of the SCR in a predefined period of timZCe. This efficiency ratio is then compared with an expected catalytic converter ratio based on the temperature of the catalytic converter and the speed of the exhaust flow in the catalytic converter. The efficiency of the "expected/measured" ratio should generally be 1. When the ECU **A-F02** detects a value less than 1, this fault occurs.

**Cause:**

The efficiency of the "expected/measured" ratio of the SCR integrated system is less than 1. This may be due to:

- operating error of the SCR catalytic converter (fault in the component);
- tampering error (catalytic converter removed or Urea dosing inhibited);
- incorrect readings from the NOx sensors (a large discrepancy unless the ECU has already recognised an error in a NOx sensor and has not inhibited this control).
-

**Possible failure modes:**

1. Fault in the catalyst;
2. Fault in the NOx sensors **B-F67** and **B-F49**;
3. Fault in Urea dosing **Y-F44**;
4. Fault in the ECU **A-F02**, error in the software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the correct operation of the catalytic converter and the wiring to which it is connected.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to **3**.
3. Check the correct operation of the NOx sensor upstream of the catalytic converter **B-F67**, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**).

   A. If the sensor is not working correctly, go to **4**

   B. If the sensor is okay, go to step **3**.
4. Replace the NOx sensor before the catalytic converter **B-F67**.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, return the machine to service.

   B. If the fault has not been resolved, go to step **3**.
5. Check the correct operation of the NOx sensor downstream of the catalytic converter **B-F49** is operating correctly, following the test procedure indicated ( **NOX DETECTION SENSOR - Test (50.74)**).

A. If the sensor is not working correctly, go to **6**

B. If the sensor is okay, go to **7**.

6. Replace the NOx sensor downstream of the catalytic converter **B-F49**.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, return the machine to service.

   B. If the fault has not been resolved, go to **7**.

7. Check the correct operation of the Urea dosing module **Y-F44** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)** ).

   A. If the module is not working correctly, go to **8**

   B. If the sensor is okay, contact the Technical Help Desk.

8. Replace the Urea dosing module **Y-F44**.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 90EBE7 519056-7 - DEF/AdBlue dosing valve stuck closed with low voltage levels

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved.*

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors operation of the dosing module by detecting movement of the needle. This is known as injection period start (BIP). If there is no current variation (negative peak) resulting from the needle reaching the rear stop, this fault occurs.

**Cause:**
The ECU **A-F02** is not sensing full needle movement when the dosing module solenoid is mechanically blocked or frozen.

**Possible failure modes:**

1. Faulty dosing module solenoid valve, damaged or restricted.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, pass on to point **5**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **4**.
2. Check that the dosing module is open.

   Check that the pipe between the pump inside the pump module **M-F42A** and the dosing module is not blocked.

   Check the DEF/AdBlue® dosing module , following the procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**).

   A. If the sensor is incorrectly mounted, loose or damaged, replace the DEF/AdBlue® dosing module .

   B. If there are no failures found, replace the sensor and go to step **3**.
3. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

4. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 4337-31 F1101F - Plausibility error in the SCR supply module temperature sensor in cold start conditions

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors operation of the temperature sensor at the exhaust upstream of the Selective Catalytic Reduction system (SCR) **B-F38**. The ECU **A-F02** compares the temperature value of the temperature sensor at the exhaust upstream of the SCR system **B-F38** and the value of the supply module heater **M-F42D**. The plausibility check of the temperature values is carried out at each cold start.

**Cause:**
The temperature sensor at the exhaust upstream of the SCR system **B-F38** is faulty.

**Possible failure modes:**

1. Fault in the wiring of the temperature sensor at the exhaust upstream of the SCR system **B-F38**.
2. Fault in the temperature sensor at the exhaust upstream of the SCR system **B-F38**.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive, go to step **6**.
2. Check the correct operation of the connector **X-F38** of the temperature sensor at the exhaust upstream of the SCR system **B-F38** and the wiring to which it is connected.

   Check the correct insulation and check there are no problems with the contacts.

   A. If a fault is detected, intervene and repair if necessary.

   B. If no fault is detected, go to step **4**.
3. Check the correct operation of the temperature sensor at the exhaust upstream of the SCR system **B-F38** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, go to step **6**.

   B. If the sensor is not working correctly, go to step **5**.
4. Check the conditions of the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Disconnect the exhaust wiring from the temperature sensor at the exhaust upstream of the SCR system **B-F38**, connector **X-F38**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the temperature sensor upstream of the SCR system **B-F38**:

| From | To | Value |
|---|---|---|
| **X-F38 pin 1** | **X-F38 pin 2** | The value must be between **169.7 – 738.2 Ω** dependant upon the temperature at the exhaust **-40 – 800 °C** (**-40 – 1472 °F**). |

   A. If the measured resistance is not within specification, the temperature sensor at the exhaust upstream of the SCR system **B-F38**has failed internally. Replace the sensor.

B. If the measured resistance is within specification, go to step **5**.

5. Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 3516-1 BC0D01 - Urea Quality Sensor: low Urea concentration (estimate in terms of time)

## Control Module: FPT ECU

**Fault Description:**
The concentration of the DEF/AdBlue® inside the tank is controlled by the DEF/AdBlue® urea quality sensor **B-F56** which evaluates the amount of fluid to be used in relation to the standard. If the concentration value is too low, this fault occurs.

**Cause:**
The DEF/AdBlue® urea quality sensor **B-F56** has reported to the ECU **A-F02** that the DEF/AdBlue® fluid concentration level is too low.

**Possible failure modes:**

1. Faulty DEF/AdBlue® fluid concentration level, too low.
2. Faulty DEF/AdBlue® urea quality sensor **B-F56** hardware or firmware.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the DEF/AdBlue® concentration inside the tank.
   A. If the DEF/AdBlue® concentration level is too low, replace it with a compliant fluid.
   B. If the DEF/AdBlue® concentration level is not too low, continue with step **2**
2. Check the correct operation of the DEF/AdBlue® urea quality sensor **B-F56** following the test procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)** ).
   A. If the sensor is working correctly, contact the Technical Help Desk.
   B. If the sensor is not working correctly, go to step **2**
3. Replace the DEF/AdBlue® urea quality sensor **B-F56**.

   Then check to see that this fault is resolved.
   A. If the fault has been resolved, the machine can resume service.
   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 240D12 3364-18 - Urea Quality Sensor: low Urea concentration (estimate in terms of time)

## Control Module: FPT ECU

**Fault Description:**
The concentration of the DEF/AdBlue® inside the tank is controlled by the DEF/AdBlue® urea quality sensor **B-F56** which evaluates the amount of fluid to be used in relation to the standard. If the concentration value is lower than the permitted percentage, this fault occurs.

**Cause:**
The DEF/AdBlue® urea quality sensor **B-F56** has reported to the ECU **A-F02** that the DEF/AdBlue® fluid concentration level is lower than the permitted percentage.

**Possible failure modes:**

1. Faulty DEF/AdBlue® fluid concentration level, too low.
2. Faulty DEF/AdBlue® urea quality sensor **B-F56** hardware or firmware.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the DEF/AdBlue® concentration inside the tank.
   A. If the DEF/AdBlue® concentration is less than **29%**, replace it with a compliant fluid.
   B. If the DEF/AdBlue® concentration is not less than **29%**, continue with step **2**
2. Check the correct operation of the DEF/AdBlue® urea quality sensor **B-F56** following the test procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)** ).
   A. If the sensor is working correctly, contact the Technical Help Desk.
   B. If the sensor is not working correctly, go to step **2**
3. Replace the DEF/AdBlue® urea quality sensor **B-F56**.

   Then check to see that this fault has been resolved.

   A. If this fault is resolved, return the machine to service.
   B. If this fault is not resolved, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 121506 5394-6 - Over temperature error on powerstage of DEF/AdBlue dosing valve actuator

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the engine restart counter reset/unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the electric current used to energise the dosing module (valve). If the current request is too high, the ECU **A-F02** will interrupt the flow of current to prevent any damage and this fault will appear.

**Cause:**
The ECU **A-F02** detects an over current (temperature) condition in the DEF/AdBlue® dosing module solenoid high side control circuit.

**Possible failure modes:**

1. Faulty DEF/AdBlue® dosing module solenoid coil, shorted.
2. Faulty DEF/AdBlue® dosing module high side control circuit wiring, shorted to ground.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **4**.
2. Check the conditions of the DEF/AdBlue® dosing module .

   Place the key switch to the OFF position.

   Disconnect the vehicle wiring from the DEF/AdBlue® dosing module.

   Use a multimeter to measure the resistance of the DEF/AdBlue® dosing module solenoid coil:

   A. If the resistance is between **11 Ω** and **12 Ω**, pass on to point**3**.

   B. If the resistance is not between **11 Ω** and **12 Ω**, pass on to point **5**
3. Check high side driver control wiring for a ground connection.

   With the ignition switch set to OFF, use a multimeter to check for a short circuit to ground.

   A. If continuity is detected in the pin connected to battery, Locate and repair the damaged conductor.

   B. If continuity is not detected in the pin connected to battery, check that the ECU software **A-F02** is correct, re-flash and go to step **5**.
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 4355-5 031105 - Fault in the DEF/AdBlue dosing system backflow pipe heater: open circuit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** checks the correct operation of the urea pipes heating contactor which controls the return flow pipe heater of the DEF/AdBlue® supply module and the delivery duct heater of the DEF/AdBlue® supply module . If the ECU **A-F02** detects an open circuit in the shared circuit of the delivery pipe heater of the DEF/AdBlue® supply module and the return flow pipe heater of the DEF/AdBlue® supply module, this fault is generated.

**Cause:**
The ECU **A-F02** has detected an open circuit in the circuit of the delivery pipe heater of the DEF/AdBlue® supply module and the return flow pipe heater of the DEF/AdBlue® supply module.

**Possible failure modes:**

1. Fault in the wiring of the delivery pipe heater of the DEF/AdBlue® supply module and the return flow pipe heater of the DEF/AdBlue® supply module , open circuit.
2. Fault in the urea pipes heating contactor , internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **4**.
2. Check the vehicle wiring harness circuit wiring for a short to voltage condition.

   Disconnect the vehicle wiring from the urea pipe heating contactor

   Disconnect the vehicle wiring from the ECU **A-F02**.

   Disconnect the vehicle wiring from the heater of the DEF/AdBlue® supply module delivery flow pipe.

   Disconnect the vehicle wiring from the heater of the DEF/AdBlue® supply module return flow pipe.

   Use a multimeter to check for continuity on the wiring side.

   A. If continuity is detected,pass on to point **5**.

   B. If there is no continuity,locate and repair the broken wiring.
3. Check the correct operation of the urea pipes heating contactor following the test procedure indicated ( **RELAY' - Test (76.63)**).

   A. If the unit is working correctly, contact the Technical Help Desk.

   B. If the unit is not working correctly, replace the urea pipes heating contactor and go to step **3**.
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 4355-3 031103 - Fault in the DEF/AdBlue dosing system backflow pipe heater: short-circuit to battery

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** checks the correct operation of the urea pipes heating contactor which controls the return flow pipe heater of the DEF/AdBlue® supply module and the delivery duct heater of the DEF/AdBlue® supply module. If the ECU **A-F02** detects a short circuit to high voltage source in the shared circuit of the delivery pipe heater of the DEF/AdBlue® supply module and the return flow pipe heater of the DEF/AdBlue® supply module, this fault is generated.

**Cause:**
The ECU **A-F02** has detected a short circuit to high voltage source in the circuit of the delivery pipe heater of the DEF/AdBlue® supply module and the return flow pipe heater of the DEF/AdBlue® supply module.

**Possible failure modes:**

1. Fault in the wiring of the delivery pipe heater of the DEF/AdBlue® supply module and the return flow pipe heater of the DEF/AdBlue® supply module , short circuit to voltage source.
2. Fault in the urea pipes heating contactor , internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **4**.
2. Check the vehicle wiring harness circuit wiring for a short to voltage condition.

   Disconnect the vehicle wiring from the urea pipe heating contactor.

   With the ignition switch set to ON, use a multimeter to measure the voltage on the wiring side to check for a short circuit to ground.

   A. If there is no voltage, pass on to point **5**.

   B. If voltage is detected, Use the appropriate service manual, if necessary, to locate and repair the damaged conductors.
3. Check the correct operation of the urea pipes heating contactor following the test procedure indicated ( **RELAY' - Test (76.63)**).

   A. If the unit is working correctly, contact the Technical Help Desk.

   B. If the unit is not working correctly, replace the urea pipes heating contactor and go to step **3**.
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 031104 4355-4 - Fault in the DEF/AdBlue dosing system backflow pipe heater: short circuit to ground

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** checks the correct operation of the urea pipes heating contactor **A-F45** which controls and monitors the return flow pipe heater of the DEF/AdBlue® supply module **R-F45e** and the delivery duct heater of the DEF/AdBlue® supply module **R-F45d**. If the ECU **A-F02** detects a short circuit to ground in the shared circuit of the delivery pipe heater of the DEF/AdBlue® supply module **R-F45d** and the return flow pipe heater of the DEF/AdBlue® supply module **R-F45e**, this fault is generated.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground in the circuit of the delivery pipe heater of the DEF/AdBlue® supply module **R-F45d** and the return flow pipe heater of the DEF/AdBlue® supply module **R-F45e**.

**Possible failure modes:**

1. Fault in the wiring of the delivery pipe heater of the DEF/AdBlue® supply module **R-F45d** and the return flow pipe heater of the DEF/AdBlue® supply module **R-F45e**, short circuit to ground.
2. Fault in the urea pipes heating contactor **A-F45**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. Go to step **4**.
2. Check the circuit wiring of the vehicle wiring for a short circuit to ground condition.

   Disconnect the vehicle wiring from the urea pipes heating contactor **A-F45** at connector **X-F45_A**.

   With the ignition switch set to ON, use a multimeter to check for continuity on the vehicle wiring side:

| From | To | Value |
|---|---|---|
| **X-F45_A (Plug) pin 1** | Chassis ground | There should be no continuity |

   A. If no continuity is detected, continue to step **5**.

   B. If there is continuity, a short circuit to ground is present.Use the appropriate service manual, if necessary, to locate and repair the damaged conductors.
3. Check the correct operation of the urea pipes heating contactor **A-F45** following the test procedure indicated ( **RELAY' - Test (76.63)**).

   A. If the unit is working correctly, contact the Technical Help Desk.

   B. If the unit is not working correctly, replace the urea pipes heating contactor and go to step **3**.
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic tool to carry out the Urea Dosing Module Test (UDST) indicated ( **AD-BLUE SYSTEM - Test (50.74)** ) and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is detected and normal values are shown on the display, delete the fault code.

# 295467 7107-8 C31B08 - The work cycle of the DEF/AdBlue internal pump has the duty-cycle out of range

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the signals from the pump module **M-F42A** which includes the SCR pump motor, the SCR return valve and the SCR pressure sensor. If there is incorrect communication between the ECU and the pump module, this fault occurs.

**Cause:**
Incorrect communication between the ECU and the pump module, signal receiving time is out of range.

**Possible failure modes:**

1. Fault in the wiring.
2. Fault in the SCR pump module **M-F42A**.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.
2. Check the electric wiring of the pump module **M-F42A**.

   Disconnect the wiring of the pump module **M-F42A**, connector **X-F42A**.

   Disconnect the wiring from the ECU **A-F02**, connector **X-F02V**.

   Use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F42A (Plug) pin 8** | **X-F02V (Plug) pin 89** | There should be continuity. |
| **X-F42A (Plug) pin 9** | **X-F02V (Plug) pin 50** | There should be continuity. |
| **X-F42A (Plug) pin 10** | **X-F02V (Plug) pin 84** | There should be continuity. |

   A. If continuity is detected, pass on to point **8**.

   B. If there is no continuity, locate and repair the broken connector.
3. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**)

   A. If the module is working correctly, pass on to point **3**

   B. If the module is not working correctly, replace the SCR pump module **M-F42A** go to step **3**
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 519044-14 84EBEE - Accumulation of DEF/AdBlue deposit present: at low temperature

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit **A-F02** has an algorithm which controls the formation and decomposition of any **AdBlue®** deposits. When accumulation of the **AdBlue®** deposit at low temperatures exceeds a specific value, this fault is activated. The problem should resolve itself thanks to regeneration or after a high load or high temperatures. If the problem does not resolve itself, check that there is the correct quantity in **AdBlue®** dosing.

# 295467 240D06 3364-6 - Urea Quality Sensor: short circuit to battery in quality signal

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

***NOTE:*** *The sensor status is monitored via a CAN message.*

**Fault Description:**
The DEF/AdBlue® urea quality sensor **B-F56** is equipped with internal monitoring for operating conditions and to report the status together with data detected on the engine control unit (ECU) **A-F02**. If the sensor determines the presence of a short circuit to battery, this fault occurs.

**Cause:**
The DEF/AdBlue® urea quality sensor **B-F56** has reported a short circuit to battery to the ECU **A-F02**.

**Possible failure modes:**

1. Fault in the wiring, short circuit to battery.
2. Faulty DEF/AdBlue® urea quality sensor **B-F56** hardware or firmware.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check for a short circuit to battery in the wiring of the DEF/AdBlue® urea quality sensor **B-F56**.

   Disconnect the connector **X-F56**from the DEF/AdBlue® urea quality sensor **B-F56**.

   The key must be in the ON position.

   Use a multimeter to check the voltage on the CAN line.

   A. If voltage is detected, this indicates a short to battery in the wiring of the DEF/AdBlue® urea quality sensor **B-F56**.Contact the Technical Help Desk.

   B. If there is no voltage, go to **8**
2. Check the correct operation of the DEF/AdBlue® urea quality sensor **B-F56** following the procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)**)

   A. The sensor is operating correctly contact the Technical Help Desk.

   B. The sensor is not operating correctly, go to **1**
3. Replace the DEF/AdBlue® urea quality sensor **B-F56**.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 3364-5 240D05 - Urea Quality Sensor: short circuit to ground in quality signal

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

***NOTE:*** *The sensor status is monitored via a CAN message.*

**Fault Description:**
The DEF/AdBlue® urea quality sensor **B-F56** is equipped with internal monitoring for operating conditions and to report the status together with data detected on the engine control unit (ECU) **A-F02**. If the sensor determines the presence of a short circuit to ground.

**Cause:**
The DEF/AdBlue® urea quality sensor **B-F56** has reported a short circuit to ground to the ECU **A-F02**.

**Possible failure modes:**

1. Fault in the wiring of the DEF/AdBlue® urea quality sensor **B-F56**, short circuit to ground.
2. Faulty DEF/AdBlue® urea quality sensor **B-F56** hardware or firmware.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check for a short circuit to ground in the wiring of the DEF/AdBlue® urea quality sensor **B-F56**.

   Disconnect the connector **X-F56**from the DEF/AdBlue® urea quality sensor **B-F56**.

   The key must be in the ON position.

   Use a multimeter to check the voltage between the CAN line and ground.

   A. If the voltage is not 0, there is a short to ground.contact the Technical Help Desk.

   B. If the voltage is 0,continue with step **2**
2. Check the correct operation of the DEF/AdBlue® urea quality sensor **B-F56** following the test procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)**).

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to **1**
3. Replace the DEF/AdBlue® urea quality sensor **B-F56**.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 84EBFF 519044-31 - Urea Quality Sensor: quality signal error

## Control Module: FPT ECU

**Fault Description:**
The DEF/AdBlue® urea quality sensor **B-F56** is equipped with internal monitoring for operating conditions and to report the status together with data detected on the Engine Control Unit (ECU) **A-F02**. If a system error is detected, this fault occurs.

**Cause:**
The DEF/AdBlue® urea quality sensor **B-F56** has reported to the ECU **A-F02** that it has an internal sensor system error.

**Possible failure modes:**

1. Faulty DEF/AdBlue® urea quality sensor **B-F56** hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the correct operation of the DEF/AdBlue® urea quality sensor **B-F56** following the procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)**)

   A. If the sensor is working correctly, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to **1**
2. Replace the DEF/AdBlue® urea quality sensor **B-F56**.

   Then check to see that this fault is resolved.

   A. If the fault has been resolved, the machine can resume service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 0D1106 4365-6 - Urea Quality Sensor: short circuit to battery in temperature signal

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

***NOTE:*** *the temperature sensor is installed inside the LQT sensor (temperature, quality, level) of the DEF/AdBlue®* ***B-F56****.*

***NOTE:*** *The sensor status is monitored via a CAN message.*

**Fault Description:**
The DEF/AdBlue® LQT sensor **B-F56** is equipped with internal monitoring for operating conditions and to report the status together with data detected on the Engine Control Unit (ECU) **A-F02**. If a short circuit to battery is detected, this fault occurs.

**Cause:**
The DEF/AdBlue® LQT sensor **B-F56** has reported a short circuit to battery to the ECU **A-F02**.

**Possible failure modes:**

1. Fault in the wiring of the DEF/AdBlue® LQT sensor **B-F56**, short circuit to battery.
2. Fault in the DEF/AdBlue® LQT sensor **B-F56**, hardware or firmware.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check for a short circuit to battery in the wiring of the DEF/AdBlue® LQT sensor **B-F56**.

   Disconnect the connector **X-F56** from the DEF/AdBlue® LQT sensor **B-F56**.

   The key must be in the ON position.

   Use a multimeter to check the voltage on the CAN line.

   A. If voltage is detected, there is a short to battery in the wiring of the DEF/AdBlue® LQT sensor **B-F56**.Contact the Technical Help Desk.

   B. If there is no voltage, go to step **8**
2. Check the correct operation of the DEF/AdBlue® LQT sensor **B-F56**following the test procedure indicated ( **AD-BLUE COOLANT LEVEL SENSOR - Test (50.74)** )

   A. The sensor is operating correctly contact the Technical Help Desk.

   B. The sensor is not operating correctly, go to step **1**
3. Replace the DEF/AdBlue® LQT sensor **B-F56**.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 4365-5 0D1105 - Urea Quality Sensor: short circuit to ground in temperature signal

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

***NOTE:*** *the temperature sensor is installed inside the LQT sensor (temperature, quality, level) of the DEF/AdBlue®* ***B-F56****.*

***NOTE:*** *The sensor status is monitored via a CAN message.*

**Fault Description:**
The DEF/AdBlue® LQT sensor **B-F56** is equipped with internal monitoring for operating conditions and to report the status together with data detected on the Engine Control Unit (ECU) **A-F02**. If a short circuit to ground is detected, this fault occurs.

**Cause:**
The DEF/AdBlue® LQT sensor **B-F56** has reported a short circuit to ground to the ECU **A-F02**.

**Possible failure modes:**

1. Fault in the wiring of the DEF/AdBlue® LQT sensor **B-F56**, short circuit to ground.
2. Fault in the DEF/AdBlue® LQT sensor **B-F56**, hardware or firmware.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check for a short circuit to ground in the wiring of the DEF/AdBlue® LQT sensor **B-F56**.

   Disconnect the connector **X-F56** from the DEF/AdBlue® LQT sensor **B-F56**.

   The key must be in the ON position.

   Use a multimeter to check the voltage between the CAN line and ground.

   A. If the voltage is not 0, there is a short to ground.contact the Technical Help Desk.

   B. If the voltage is 0,go to step **8**
2. Check the correct operation of the DEF/AdBlue® LQT sensor **B-F56**following the test procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)** )

   A. The sensor is operating correctly contact the Technical Help Desk.

   B. The sensor is not operating correctly, go to step **1**
3. Replace the DEF/AdBlue® LQT sensor **B-F56**.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, use the diagnostic tool to perform the Engine Restart Counter Reset/Unlock inducement configuration then return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 0D111F 4365-31 - Urea Quality Sensor: temperature signal error

## Control Module: FPT ECU

**Fault Description:**
The DEF/AdBlue® urea quality sensor **B-F56** is equipped with internal monitoring for operating conditions and to report the status together with data detected on the Engine Control Unit (ECU) **A-F02**. If a system error is detected, this fault occurs.

**Cause:**
The DEF/AdBlue® urea quality sensor **B-F56** has reported to the ECU **A-F02** that it has an internal sensor system error.

**Possible failure modes:**

1. Faulty DEF/AdBlue® urea quality sensor **B-F56**, hardware or firmware.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the correct operation of the DEF/AdBlue® urea quality sensor **B-F56** following the procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)**)

   A. If the sensor is working correctly, contact the Technical Help Desk.

   B. If the sensor is not working correctly, go to **1**
2. Replace the DEF/AdBlue® urea quality sensor **B-F56**.

   Then check to see that this fault is resolved.

   A. If the fault has been resolved, the machine can resume service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and re-flash if necessary.

# 295467 C10D1F 3521-31 - Urea Quality Sensor: fluid in critical condition

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the "Engine Restart Counter Reset/Unlock inducement" configuration with the diagnostic tool before you return the machine to service.*

**Fault Description:**
The **DEF/AdBlue® B-F56** quality sensor is provided with internal monitoring of the operational conditions and reports the status together with the detected data to the engine control unit (ECU) **A-F02**. If the **DEF/AdBlue® B-F56** quality sensor detects a critical substance instead of the reagent inside the tank, this fault occurs.

**Cause:**
The **DEF/AdBlue® B-F56** quality sensor detects a critical substance instead of the reagent.

**Possible failure modes:**

1. Faulty **DEF/AdBlue®** fluid concentration level, too high or too low.
2. Faulty **DEF/AdBlue® B-F56** quality sensor.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Determine **DEF/AdBlue®** fluid concentration level.

   Use a refractometer to check the concentration level of the **DEF/AdBlue®** fluid.

   A. If the concentration is not within range, replace the **DEF/AdBlue®** fluid.

   B. If the concentration is within range, go to **5**.
2. Check the correct operation of the DEF/AdBlue® urea quality sensor **B-F56** following the procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)**).

   A. If the sensor is incorrectly mounted, loose or damaged, repair as necessary.

   B. If there are no failures found, go to **2**.
3. Replace the **DEF/AdBlue®** quality sensor **B-F56**.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Then perform the SCR Fault Verification Test.

   Then check to see that this fault is resolved.

   A. If this fault is resolved, the machine can resume service.

   B. If fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 E1060E 1761-14 - Urea Level Sensor: system error

## Control Module: FPT ECU

***NOTE:*** *Since this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.*

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** receives information from the diesel exhaust fluid tank LQT sensor (DEF)/AdBlue® **B-F56** via the CAN network (Controller Area Network). Furthermore, the DEF/AdBlue® tank LQT sensor **B-F56** monitors itself and reports its status. If the level part of the DEF/AdBlue® tank LQT sensor **B-F56** sends an incorrect message, the level sensor might be faulty and this fault occurs. This fault indicates that the DEF/AdBlue® temperature and level sensor **B-F56** must be replaced.

**Cause:**
The ECU **A-F02** has received an incorrect message from the DEF/AdBlue® tank LQT sensor **B-F56** that monitors the level.

**Possible failure modes:**

1. Faulty DEF/AdBlue® LQT sensor **B-F56**, float jammed.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the part of the DEF/AdBlue® tank LQT sensor **B-F56** that monitors the level to check it is working correctly.

   A. If the float that monitors the tank level is working correctly, pass on to point **2**.

   B. If the float that monitors the tank level is not working correctly, repair it or replace it as necessary.
2. Check the correct operation, quality, level and temperature of the sensor of the DEF / AdBlue® tank **B-F56** following the test procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)** ).

   Then check the status of this fault again.

   A. If the fault has been resolved, the machine can resume service.

   B. If the fault has not been resolved, replace the sensor and go to step **5**.
3. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, the machine can resume service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 3031-11 D70B0B - AdBlue tank temperature sensor: system error

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** receives information from the diesel exhaust fluid tank temperature, level and quality sensor (DEF)/AdBlue® **B-F56** via the CAN network (Controller Area Network). Furthermore, the DEF/AdBlue® tank temperature, level and quality sensor **B-F56** monitors itself and reports its status. If the temperature part of the DEF/AdBlue® tank temperature, level and quality sensor **B-F56** sends an incorrect message, this indicates that the temperature sensor is faulty and this fault occurs.

**Cause:**
The ECU **A-F02** has received an incorrect message from the DEF/AdBlue® tank temperature, level and quality sensor **B-F56** that monitors the temperature.

**Possible failure modes:**

1. Faulty DEF/AdBlue® quality, level and temperature sensor **B-F56**, obstruction.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the part of the DEF/AdBlue® tank temperature, level and quality sensor **B-F56** that monitors the detection area of the temperature to check it is not blocked.

   A. If no blockage is detected, continue with step **2**.

   B. If a blockage is found, repair, clean or replace as required.
2. Check the correct operation of the DEF/AdBlue® quality, level and temperature sensor **B-F56** following the test procedure indicated ( **UREA QUALITY SYSTEM - Test (50.74)** ).

   Then check the status of this fault again.

   A. If the fault has been resolved, the machine can resume service.

   B. If the fault has not been resolved, replace the sensor and go to **3**.
3. Update the ECU **A-F02** with the correct software.

   Then check the status of this fault again.

   A. If the fault has been resolved, the machine can resume service.

   B. If the fault has not been resolved, send a request to the Technical Help Desk.

# 295467 D70B14 3031-20 - DEF/AdBlue tank temperature sensor plausibility max threshold

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** compares the temperature of the DEF/AdBlue® fluid sensed by the DEF/AdBlue® tank level and temperature sensor **B-F56** with the ambient temperature detected by the humidity sensor via the intake air temperature sensor **B-F65**. If the fluid temperature is higher than permitted in relation to the ambient temperature, this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the temperature of the DEF/AdBlue® tank level and temperature sensor **B-F56** is higher than permitted and therefore higher than the temperature detected by the humidity sensor via the intake air temperature sensor **B-F65**.

**Possible failure modes:**

1. DEF/AdBlue® tank heating system, externally heated or associated fault active.
2. Fault in the DEF/AdBlue® tank level and temperature sensor **B-F56**, internal damage.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check the DEF/AdBlue® tank external heating.

   Determine if an external heating source was used to heat the DEF/AdBlue® tank.

   A. If an external heater was not previously used, continue to step **2**.

   B. If an external heater was previously used, ignore this fault and return vehicle to service.
2. Check for related tank heater failure.

   Use the diagnostic instrument to check for the presence of the associated fault.

   A. If other faults are present, resolve them and then check to see if this fault has been resolved.

   B. If there are no other faults present, continue to step **3**.
3. Disconnect the vehicle wiring from the DEF/AdBlue® tank level and temperature sensor **B-F56** at connector **X-F56**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the DEF/AdBlue® **B-F56** tank level and temperature sensor.

| From | To | Value |
|---|---|---|
| **X-F56 (Plug) pin 3** | **X-F56 (Plug) pin 2** | There should be a value greater than **214.90 Ω** |

   Use a device (such as an Infra-red heat gun) to acquire the DEF/AdBlue® tank temperature and compare that relative value with the resistor temperature value which was measured previously.

   A. If the measured resistance temperature value and heat gun values are reasonably close, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistor temperature value and heat gun values are not reasonably similar, the DEF/AdBlue® tank level and temperature sensor **B-F56** has failed internally continue to step **2**.
4. Check the correct operation of the DEF/AdBlue® tank level and temperature sensor **B-F56** following the test procedure indicated ( **AD-BLUE INDICATOR - Test (50.74)**).

   A. If the sensor is okay, contact the Technical Help Desk.

B. If the sensor is not working correctly, replace the sensor.

# 295467 3031-21 D70B15 - DEF/AdBlue tank temperature sensor plausibility min threshold

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** compares the temperature of the **AdBlue®** fluid detected by the **AdBlue®** tank level and temperature sensor **B-F56** with the ambient air temperature detected by the humidity sensor via the intake air temperature sensor **B-F65**. If the vehicle has been exposed to extremely low external temperatures and then transferred to a warmer environment, this fault can occur. If the difference in temperature of the fluid in relation to ambient temperature differs, this fault occurs.

**Cause:**
The ECU **A-F02** has determined that the temperature of the **AdBlue®** tank level and temperature sensor **B-F56** is higher than permitted and therefore lower than the temperature detected by the humidity sensor via the intake air temperature sensor **B-F65**.

**Possible failure modes:**

1. Fault in the **AdBlue®** tank level and temperature sensor **B-F56**, internal damage.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Disconnect the vehicle wiring from the **AdBlue®** tank level and temperature sensor **B-F56** at connector **X-F56**.

   With the ignition switch set to OFF, use a multimeter to measure the resistance of the **AdBlue®** tank level and temperature sensor **B-F56**.

| From | To | Value |
|---|---|---|
| **X-F56 (Plug) pin 3** | **X-F56 (Plug) pin 2** | There should be less than **23342 Ω**. |

   Use a device such as an Infra-red heat gun to acquire the **AdBlue®** tank temperature and compare that relative value to the resistance temperature value which was measured previously.

   A. If the measured resistance temperature value and heat gun values are reasonably close, continue to step **2**.

   B. If the measured resistor temperature value and the heat gun values are not reasonably similar, the **AdBlue®** tank level and temperature sensor **B-F56** has failed internally continue to step **2**.

2. Check electrical connection.

   Visually check the condition of the **AdBlue®** tank level and temperature sensor **B-F56** connector **X-F56** for dirt and/or corrosion.

   Reconnect the **AdBlue®** tank level and temperature sensor **B-F56** connector **X-F56** and check the mechanical integrity of the connection.

   Check to see that this fault is resolved.

   A. If the fault is resolved, the machine can resume service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

3. Check the correct operation of the **AdBlue®** tank level and temperature sensor **B-F56** following the test procedure indicated ( **AD-BLUE INDICATOR - Test (50.74)**).

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, Replace the sensor **B-F56**.

# 295467 639-31 7F021F - CAN error: passive error on the CAN network node 0

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the CAN Bus. If the Bus Off state occurs on the CAN controller, node 0 reports an error. There are 3 states for the CAN node namely "active error", "passive error" and "busoff". When the CAN controller detects that there are no CAN nodes connected, it goes into the "passive error" state. If the CAN controller detects that a CAN cable has been reconnected or a new node is added, it will return to the "active error" state. If the CAN node is in a short circuit or is producing incorrect information, the state changes to busoff and this fault occurs.

**Cause:**
The ECU **A-F02** has sensed a "Bus Off" state on node 0 of the CAN.

**Possible failure modes:**

1. Fault in the CAN configuration, incorrect phasing.
2. faulty CAN circuit wiring, open circuit, short circuit to ground or short circuit.
3. faulty ECU **A-F02**, terminating resistor or software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. go to**7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the terminating resistor inside the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be **120 Ω**. |

   A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is correct, go to **4**.
4. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

   Disconnect the phase 5 engine wiring from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the ON position, use a multimeter to check the voltage on the phase 5 engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to **5**.

5. Check the CAN circuit of the ECU **A-F02** to check for a short circuit.

   Disconnect the phase 5 engine wiring from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

   A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. If no continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 7F020B 639-11 - CAN error: error on the CAN network node 0

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two distinct CAN networks. The correct configuration and monitoring of the two networks configured with pairs of twisted wires is also a function of the ECU **A-F02**. Node 0 of the CAN BUS is the vehicle interface bus. The ECU **A-F02** supplies a CAN termination resistor for node 0 of the CAN BUS inside the ECU **A-F02**. There are three states for the CAN node: "active error", "passive error" and "bus off". When the CAN control unit detects that there are no CAN nodes connected, switches to "passive error" state. If the CAN control unit detects that a cable is reconnected or a new node is added, returns to "active error" state. If the CAN node is in short circuit or produces only incorrect information, the state switches to "bus off". If the CAN control unit of the ECU **A-F02** detects a "bus off" fault in node 0 of the CAN for more than 2 events, this fault occurs.

**Cause:**
The ECU **A-F02** has sensed a "Bus Off" state on node 0 of the CAN.

**Possible failure modes:**

1. Fault in the CAN configuration, incorrect phasing.
2. faulty CAN circuit wiring, open circuit, short circuit to ground or short circuit.
3. faulty ECU **A-F02**, terminating resistor or software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue with step **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. go to**7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the terminating resistor inside the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to perform the following resistance check on the component side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be **120 Ω**. |

   A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the measured resistance is correct, go to **4**.
4. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the phase 5 engine wiring from the ECU **A-F02** at the connector **X-F02V**.

With the ignition switch in the ON position, use a multimeter to check the voltage on the phase 5 engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

B. In the absence of voltage, go to **5**.

5. Check the CAN circuit of the ECU **A-F02** to check for a short circuit.

   Disconnect the phase 5 engine wiring from the ECU **A-F02** at the connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

   A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**.Locate and repair the shorted conductor.

   B. If no continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 1659-2 7B0602 - Deviation between the measured value and expected value of the engine cooling thermostat

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the circuit of the coolant temperature sensor **B-F21**. If the coolant temperature sensor **B-F21** does not detect the minimum required temperature, this fault occurs.

**Cause:**

The coolant temperature sensor **B-F21** detects that the temperature is too high. This can be caused by:

- environment too cold in the cab heater at full power;
- corroded connectors in the additional resistor wiring;
- engine thermostat blocked in the open position.

**Possible failure modes:**

1. Faulty coolant temperature sensor **B-F21**, internal fault.
2. Faulty signal circuit in the coolant temperature sensor **B-F21**.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Before carrying out the required checks, make sure that the engine is not used in extreme environmental conditions.

   Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,. Go to step **6**.

2. Check the conditions of the coolant temperature sensor **B-F21**.

   Disconnect the engine wiring from the coolant temperature sensor **B-F21** at connector **X-F21**.

   Use a multimeter to measure the resistance of the coolant temperature sensor **B-F21**:

| From | To | Value |
|---|---|---|
| Coolant temperature sensor **X-F21 pin 1** | Coolant temperature sensor **X-F21 pin 2** | There must be a measurable quantity of resistance according to the effective coolant temperature, between **100 – 50,000 Ω**. |

   A. If an appropriate value of resistance is detected, leave the connector disconnected and go to **3**.

   B. If there is infinite resistance, the coolant temperature sensor **B-F21** has failed internally. Replace sensor.

3. Check the circuit of the coolant temperature sensor **B-F21** for an interruption.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02E**.

   With the ignition switch set to OFF, use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | **X-F21 pin 1** | There should be continuity. |

A. If continuity is detected, leave the connectors disconnected and go to **4**.

B. If there is no continuity, it means that there is an open circuit in the engine wiring between the connector **X-F21 pin 1** of the coolant temperature sensor **B-F21** and the connector **X-F02E (Receptacle) pin 100** of the ECU **A-F02**.Locate and repair the conductor interruption.

4. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards another circuit (high voltage source).

   With the ignition switch in the OFF position, use a multimeter to carry out the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | All other pins in connector **X-F02E** | There should be no continuity. |

   A. If there is continuity, there is a short circuit towards another circuit (high voltage source) in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. If no continuity is detected, leave the connectors disconnected and go to **5**.

5. Check the signal circuit of the coolant temperature sensor **B-F21** for a short circuit towards the power supply.

   With the ignition switch set to “ON”, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 100** | Chassis ground | There should be no voltage. |

   A. If there is voltage, there is a short circuit towards power supply in the signal circuit of the coolant temperature sensor **B-F21**.Locate and repair the shorted conductors.

   B. In the absence of voltage, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 5BEAE9 518747-9 - Timeout error of CAN-receive-frame HCU2EDC1 from HCU control unit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the CAN network. If it receives the message HCU2EDC1 (Heater Control Unit 1) from the SCR Heater Control Unit and contains information about the HCU status, power supply or heater status 1 and 3, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a timeout error in the HCU2EDC1 message.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,.Go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the wiring from the ECU **A-F02** at connector **X-F02V_1**.

With the ignition switch in the ON position, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**. Locate and repair the shorted conductor.

B. In the absence of voltage, go to **7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity on the wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**. Locate and repair the shorted conductor.

B. If no continuity is detected, go to **8**.

8. Check the CAN circuit of the ECU **A-F02** for an open circuit.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | To the pin of CAN H of chassis control module control unit | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | To the pin of CAN L of chassis control module control unit | There should be continuity. |

A. If there is no continuity, there is an open circuit on the CAN network of the ECU **A-F02**. Locate and repair the broken conductor.

B. If continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 518748-9 5CEAE9 - Timeout error of CAN-receive-frame HCU2EDC2 from HCU control unit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the CAN network. If it receives the message HCU2EDC2 (Heater Control Unit 2) from the SCR Heater Control Unit and contains information about the HCU status, power supply or heater status 1 and 3, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a timeout error in the HCU2EDC2 message.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN faulty.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active,.Go to **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, go to **4**.
4. Check the ECU **A-F02** grounding.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected on all of the checks, go to **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, go to **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the wiring from the ECU **A-F02** at connector **X-F02V_1**.

With the ignition switch in the ON position, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be a voltage of **0 V**. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be a voltage of **0 V**. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**. Locate and repair the shorted conductor.

B. In the absence of voltage, go to **7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity on the wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Frame ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**. Locate and repair the shorted conductor.

B. If no continuity is detected, go to **8**.

8. Check the CAN circuit of the ECU **A-F02** for an open circuit.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | To the pin of CAN H of chassis control module control unit | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | To the pin of CAN L of chassis control module control unit | There should be continuity. |

A. If there is no continuity, there is an open circuit on the CAN network of the ECU **A-F02**. Locate and repair the broken conductor.

B. If continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the involved wiring to check for any intermittent faults or short circuits in the involved cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 520497-7 31F1E7 - SCR heater relay stuck closed

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the SCR heater relay **A-F45**. If the ECU **A-F02** detects incorrect closure, this fault occurs.

**Cause:**
The ECU **A-F02** has detected incorrect closure of the relay **A-F45**.

**Possible failure modes:**

1. Fault in the SCR heater relay **A-F45**.

**Solution:**

1. Check that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. Go to step **3**.
2. Check the correct operation of the SCR heater relay **A-F45**.

   A. If it is working correctly, check that the software of ECU **A-F02** is correct and update if necessary.

   B. is not operating correctly, replace the SCR heater relay.
3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 32F1E7 520498-7 - SCR heater relay stuck open

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the correct operation of the SCR heater relay **A-F45**. If the ECU **A-F02** detects incorrect opening, this fault occurs.

**Cause:**
The ECU **A-F02** has detected incorrect opening of the relay **A-F45**.

**Possible failure modes:**

1. Fault in the SCR heater relay **A-F45**.

**Solution:**

1. Check that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. Go to step **3**.
2. Check the correct operation of the SCR heater relay **A-F45**.

   A. If it is working correctly, check that the software of ECU **A-F02** is correct and update if necessary.

   B. is not operating correctly, replace the SCR heater relay **A-F45**.
3. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 12F7FF 522002-31 - SCR Monitoring: DEF/AdBlue pressure reduction identified

## Control Module: FPT ECU

***NOTE:*** *No action.*

**Fault Description:**
The minimum UREA pressure reached during the pressure reducing state is monitored. If the pressure is too high, an error is set.

# 295467 520499-5 33F1E5 - SCR relay: open circuit detected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the status of the SCR external relay **K-F247** to check for electrical faults.

**Cause:**
The ECU **A-F02** has detected an open circuit fault in the SCR external relay circuit **K-F247**.

**Possible failure modes:**

1. Faulty SCR relay **K-F247** wiring, open circuit.
2. Internal fault in the SCR relay **K-F247**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **5**.
2. Check the wiring of the SCR external relay **K-F247** to check for an open circuit.

   Check for an open circuit by checking continuity:

| From | To | Value |
|---|---|---|
| **X-F247 pin 85** | **X-F02V (Receptacle) pin 18** | There should be continuity. |
| **X-F247 pin 86** | **F-FU001** | There should be continuity. |
| **X-F247 pin 30** | Battery positive | There should be continuity. |
| **X-F247 pin 87** | **F-FU002** and **F-FU003** | There should be continuity. |

   A. If there is no continuity, this indicates an open circuit in the wiring, Locate and repair the conductor.

   B. If continuity is detected, go to step **3**.
3. Check the correct operation of the SCR external relay **K-F247**.

   A. If the relay is working correctly, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the relay is not working properly, replace the selector switch.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 520499-6 33F1E6 - SCR relay: overtemperature detected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the status of the SCR external relay **K-F247** to check for electrical faults.

**Cause:**
The ECU **A-F02** has detected an over-temperature fault in the SCR external relay circuit **K-F247**, this fault may be due to high battery voltage, excessive temperature inside the ECU, high load or problems with the relay wiring or connector.

**Possible failure modes:**

1. Fault in the battery.
2. Fault in the wiring of the SCR relay **K-F247**, high load.
3. Internal fault in the SCR relay **K-F247**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **5**.
2. Check the correct operation of the battery.

   Use a multimeter to perform the following check:

| From | To | Value |
|---|---|---|
| Battery + | Battery – | it must be **12 V** |

   A. If it is correct, go to step **2**.

   B. If it is not correct,repair or replace the battery.
3. Check the wiring of the SCR external relay **K-F247** .

   Carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F247 pin 85** | **X-F02V (Receptacle) pin 18** | There should be continuity. |
| **X-F247 pin 86** | **F-FU001** | There should be continuity. |
| **X-F247 pin 30** | Battery positive | There should be continuity. |
| **X-F247 pin 87** | **F-FU002** and **F-FU003** | There should be continuity. |

   A. If there is no continuity, this indicates a fault in the wiring, Locate and repair the damaged conductor.

   B. If continuity is detected, go to step **3**.
4. Check the correct operation of the SCR external relay **K-F247**.

   A. If the relay is working correctly, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the relay is not working properly, replace the selector switch.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 520499-3 33F1E3 - SCR relay: short circuit to battery detected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the status of the SCR external relay **K-F247** to check for electrical faults.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the SCR external relay circuit **K-F247**.

**Possible failure modes:**

1. Fault in the wiring of the SCR relay **K-F247**, short circuit to battery.
2. Internal fault in the SCR relay **K-F247**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **5**.
2. Check the wiring of the SCR external relay **K-F247** to check for a short circuit to battery.

   Carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F247 pin 85** | **X-F02V (Receptacle) pin 18** | There should be continuity. |
| **X-F247 pin 86** | **F-FU001** | There should be continuity. |
| **X-F247 pin 30** | Battery positive | There should be continuity. |
| **X-F247 pin 87** | **F-FU002** and **F-FU003** | There should be continuity. |

   A. If there is no continuity, this indicates a fault in the wiring, Locate and repair the damaged conductor.

   B. If continuity is detected, go to step **3**.
3. Check the correct operation of the SCR external relay **K-F247**.

   A. If the relay is working correctly, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the relay is not working properly, replace the selector switch.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 33F1E4 520499-4 - SCR relay: short circuit to ground detected

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the status of the SCR external relay **K-F247** to check for electrical faults.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground in the SCR external relay circuit **K-F247**.

**Possible failure modes:**

1. Fault in the wiring of the SCR relay **K-F247**, short circuit to ground.
2. Internal fault in the SCR relay **K-F247**.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. go to step **5**.
2. Check the wiring of the SCR external relay **K-F247** to check for a short circuit to ground.

   Carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F247 pin 85** | **X-F02V (Receptacle) pin 18** | There should be continuity. |
| **X-F247 pin 86** | **F-FU001** | There should be continuity. |
| **X-F247 pin 30** | Battery positive | There should be continuity. |
| **X-F247 pin 87** | **F-FU002** and **F-FU003** | There should be continuity. |

   A. If there is no continuity, this indicates a fault in the wiring, Locate and repair the damaged conductor.

   B. If continuity is detected, go to step **3**.
3. Check the correct operation of the SCR external relay **K-F247**.

   A. If the relay is working correctly, check the ECU **A-F02** for the appropriate software and update if necessary.

   B. If the relay is not working properly, replace the selector switch.
4. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, then erase the fault code and continue operation.

# 295467 4363-20 0B1114 - SCR Temp Monitoring: downstream temperature above the maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature downstream of the urea catalyst which is connected via hardware to the ECM. The temperature is read by the sensor through the analog-digital converter and if the signal range check is passed, the raw voltage signal is converted into a physical value. The physical value should be in a defined range. If the ECU **A-F02** reports that the downstream temperature exceeds the maximum limit, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a temperature exceeding the maximum limit of the exhaust temperature sensor downstream of the SCR system **B-F39**.

**Possible failure modes:**

1. Fault in the temperature signal of the temperature sensor at the exhaust downstream of the SCR system **B-F39**, short circuit to a high voltage source.
2. Faulty temperature sensor at the exhaust downstream of the SCR system **B-F39**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive, continue to step **6**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR **B-F39** for a short circuit towards another circuit.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 47** | All other pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Receptacle) pin 24** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, this indicates a short circuit towards another circuit of the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR **B-F39**, locate and repair the conductors in a short circuit condition.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.
3. Check the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR **B-F39** for a short circuit towards a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 47** | Chassis ground | There must be no voltage. |

   A. If there is voltage, this indicates a short circuit towards a voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR **B-F39**, locate and repair the conductors in a short circuit condition.

B. If there is no voltage, continue to step **4**.

4. Check the correct operation of the temperature sensor at the exhaust downstream of the DOC **B-F39** following the procedure indicated **TEMPERATURE SENSOR - Test (50.74)**.

   A. If the sensor is okay, continue to step **6**.

   B. If the sensor is not working correctly, continue to step **5**.

5. Replace the temperature sensor at the exhaust downstream of the SCR system **B-F39**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, then erase the fault code and continue operation.

# 295467 4360-20 081114 - SCR Temp Monitoring: upstream temperature above the maximum limit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the temperature upstream of the urea catalyst which is connected via hardware to the ECM. The temperature is read by the sensor through the analog-digital converter and if the signal range check is passed, the raw voltage signal is converted into a physical value. The physical value should be in a defined range. If the ECU **A-F02** reports that the upstream temperature exceeds the maximum limit, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a temperature of the temperature sensor at the exhaust upstream of the SCR system which exceeds the maximum limit **B-F38**.

**Possible failure modes:**

1. Fault in the temperature signal of the temperature sensor at the exhaust upstream of the SCR system **B-F38**, short circuit to a high voltage source.
2. Faulty temperature sensor at the exhaust upstream of the SCR system **B-F38**, internal fault.
3. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the operator screen or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive, continue to step **6**.
2. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38** for a short circuit towards another circuit.

   Disconnect the Stage 5 (S5) engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the key switch in the OFF position, use a multimeter to perform the following continuity checks:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 29** | All other pins in connector **X-F02V** | There should be no continuity. |
| **X-F02V (Receptacle) pin 7** | All other pins in connector **X-F02V** | There should be no continuity. |

   A. If there is continuity, this indicates a short circuit towards another circuit in the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38**, locate and repair the conductors in a short circuit condition.

   B. If no continuity is detected, leave the connector **X-F02V** disconnected and go to step **3**.
3. Check the temperature signal circuit of the temperature sensor at the exhaust upstream of the SCR system **B-F38** for a short circuit towards a voltage source.

   With the key switch in the ON position, use a multimeter to perform the following voltage check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 29** | Chassis ground | There must be no voltage. |

   A. If voltage is detected, this indicates a short circuit towards a voltage source in the temperature signal circuit of the temperature sensor at the exhaust downstream of the SCR system **B-F38**, locate and repair the conductors in a short circuit condition.

B. If there is no voltage, continue to step **4**.

4. Check the correct operation of the temperature sensor at the exhaust upstream of the SCR system **B-F38** following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**).

   A. If the sensor is okay, continue to step **6**.

   B. If the sensor is not working correctly, continue to step **5**.

5. Replace the temperature sensor at the exhaust upstream of the SCR system **B-F38**.

   Use the operator display or the diagnostic instrument to check that this fault has been resolved.

   A. If this fault has been resolved, return the machine to service.

   B. If this fault has not been resolved, check that the software of ECU **A-F02** is correct and update if necessary.

6. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 8AEBE3 519050-3 - Short circuit to battery in high side powerstage of DEF/AdBlue dosing valve actuator

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** monitors the circuit in the high side of the power stage of the **Diesel Exhaust Fluid (DEF)/AdBlue®** dosing valve actuator . If the ECU **A-F02** detects a short circuit to battery in the **AdBlue®** dosing valve circuit , this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit towards the battery power supply in the dosing valve circuit of **AdBlue®**.

**Possible failure modes:**

1. Internal fault of the metering valve of **AdBlue®** .
2. Faulty wiring of the metering valve of **AdBlue®** .
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, pass on to point **6**.
2. Check the metering valve of **AdBlue®** for an internal fault.

   Disconnect the engine wiring from the **AdBlue®** dosing valve.

   Use a multimeter to check the resistance between the pins of the dosing valve

   A. If there is between **11 – 16 Ω** pass on to point **3**.

   B. If the value is not between **11 – 16 Ω** pass on to point **5**.
3. Check the circuit of the dosing valve **AdBlue®** for a short circuit to battery power supply.

   Disconnect the engine wiring from the ECU **A-F02**.

   The key must be in the OFF position.

   Use a multimeter to check the continuity to check for a short circuit between the pins of the valve.

   A. If there is no continuity, locate and repair the shorted conductor.

   B. If continuity is detected, leave the connector disconnected and continue to Step **4**.
4. Check the correct operation of the metering valve of **AdBlue®** , following the procedure indicated **AD-BLUE SYSTEM - Test (50.74)**

   A. If the valve is working correctly, pass on to point **5**.

   B. If the valve is not working correctly, replace the metering valve of **AdBlue®** .
5. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings,then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 785-31 11031F - Fault in the DEF/AdBlue return pipe heater power stage

## Control Module: FPT ECU

***NOTE:*** *No action.*

**Fault Description:**
The control of the urea backflow line heater is monitored by the hardware for electrical faults. If a fault is detected in the power stage of the DEF/AdBlue return duct heater, this fault occurs.

**Solution:**

1. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

# 295467 13F7FF 522003-31 - Fault in the DEF/AdBlue pressure line heater power stage

## Control Module: FPT ECU

***NOTE:*** *No action.*

**Fault Description:**
The power stage of the urea pressure line heater is monitored by the hardware for electrical faults.

# 295467 32492-31 EC7E1F - Fault in the DEF/AdBlue heater module power stage

## Control Module: FPT ECU

***NOTE:*** *No action.*

**Fault Description:**
The control of the supply module heater is monitored by the hardware for error management.

# 295467 7EECE5 519294-5 - Fault in the DEF/AdBlue heater module;: open circuit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** checks the correct operation of the urea pipes heating contactor which controls the return flow pipe heater of the DEF/AdBlue® supply module and the delivery duct heater of the DEF/AdBlue® supply module . If the ECU **A-F02** detects an open circuit in the shared circuit of the delivery pipe heater of the DEF/AdBlue® supply module and the return flow pipe heater of the DEF/AdBlue® supply module, this fault is generated.

**Cause:**
The ECU **A-F02** has detected an open circuit in the circuit of the delivery pipe heater of the DEF/AdBlue® supply module and the return flow pipe heater of the DEF/AdBlue® supply module.

**Possible failure modes:**

1. Fault in the wiring of the delivery pipe heater of the DEF/AdBlue® supply module and the return flow pipe heater of the DEF/AdBlue® supply module , open circuit.
2. Fault in the urea pipes heating contactor , internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**.
2. Check the circuit wiring, vehicle wiring harness, to check for an open circuit condition.

   Disconnect the vehicle wiring from the urea pipe heating contactor.

   Disconnect the vehicle wiring from the ECU **A-F02**.

   Disconnect the vehicle wiring from the heater of the DEF/AdBlue® supply module delivery flow pipe.

   Disconnect the vehicle wiring from the heater of the DEF/AdBlue® supply module return flow pipe.

   Use a multimeter to check for continuity on the vehicle harness side:

   A. If continuity is detected,continue to step **5**.

   B. If there is no continuity,locate and repair the broken wiring.
3. Check the correct operation of the urea pipes heating contactor following the test procedure indicated ( **RELAY' - Test (76.63)**).

   A. If the unit is working correctly, contact the Technical Help Desk.

   B. If the unit is not working correctly, continue to step **3**.
4. Replace the urea pipes heating contactor .

   Then check to see that this fault is resolved.

   A. If the fault is resolved, the machine can resume service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 7EECE3 519294-3 - Fault in the DEF/AdBlue heater module;: short-circuit to battery

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** checks the correct operation of the urea pipes heating contactor which controls and monitors the resistors. If the ECU **A-F02** detects a short to high voltage source in the circuit of the resistors, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to a high voltage source in the circuit of the resistors.

**Possible failure modes:**

1. Fault in the wiring of the resistors in a short circuit to voltage source.
2. Fault in the urea pipes heating contactor , internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**.
2. Check the vehicle wiring harness circuit wiring for a short to voltage condition.

   Disconnect the vehicle wiring from the urea pipe heating contactor.

   With the ignition switch in the ON position, use a multimeter to check for voltage on the vehicle wiring side:

   A. If there is no voltage, continue to step **5**.

   B. If voltage is detected, Use the appropriate service manual, if necessary, to locate and repair the damaged conductors.
3. Check the correct operation of the urea pipes heating contactor following the test procedure indicated ( **RELAY' - Test (76.63)**).

   A. If the unit is working correctly, contact the Technical Help Desk.

   B. If the unit is not working correctly, continue to step **3**.
4. Replace the urea pipes heating contactor .

   Then check to see that this fault is resolved.

   A. If the fault is resolved, the machine can resume service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 7EECE4 519294-4 - Fault in the DEF/AdBlue heater module;: short circuit to ground

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** checks the correct operation of the urea pipes heating contactor which controls and monitors the resistors. If the ECU **A-F02** detects a short circuit to ground in the circuit of the resistors, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground in the resistors.

**Possible failure modes:**

1. Fault in the wiring of the resistors in a short circuit to ground condition.
2. Fault in the urea pipes heating contactor , internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to step **4**.
2. Check the vehicle wiring harness circuit wiring for a short to voltage condition.

   Disconnect the vehicle wiring from the urea pipe heating contactor.

   With the ignition switch in the ON position, use a multimeter to check the continuity on the wiring side.

   A. If there is no continuity, continue to step **5**.

   B. If continuity is detected, Use the appropriate service manual, if necessary, to locate and repair the damaged conductors.
3. Check the correct operation of the urea pipes heating contactor following the test procedure indicated ( **RELAY' - Test (76.63)**).

   A. If the unit is working correctly, contact the Technical Help Desk.

   B. If the unit is not working correctly, continue to step **3**.
4. Replace the urea pipes heating contactor .

   Then check to see that this fault is resolved.

   A. If the fault is resolved, the machine can resume service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.
5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 97EBE6 519063-6 - Error in the high side powerstage of the DEF/AdBlue pump: overtemperature

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** checks the correct operation of the high side of the power stage of the DEF/AdBlue pump **M-F42A**. If the ECU **A-F02** detects an overtemperature in the high side of the power stage of the DEF/AdBlue pump **M-F42A**, this fault is generated.

**Cause:**
The ECU **A-F02** has detected an overtemperature in the high side of the power stage of the DEF/AdBlue pump **M-F42A**.

**Possible failure modes:**

1. Fault in the wiring of the high side of the power stage of the DEF/AdBlue pump **M-F42**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.

2. Check the battery voltage.

   Engine running.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Battery terminal (+) | Battery terminal (-) | The value should be approximately **12 V** |

   A. If the voltage is not approximately **12 V**, Repair or replace as required

   B. If the value is approximately **12 V**, pass on to point **3**.

3. Check the wiring of the pump **M-F42A**.

   With the key in the OFF position, use the a multimeter to perform the following continuity check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F42A pin 2** | **X-F02E (Receptacle) pin 10** | There should be continuity. |
| **X-F42A pin 3** | **X-F247 pin 87** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V (Receptacle) pin 2** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V (Receptacle) pin 4** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V (Receptacle) pin 6** | There should be continuity. |

   A. If there is no continuity, this indicates an open circuit in the pump **M-F42A** if necessary, use the appropriate service manual to locate and repair the shorted conductor.

   B. If continuity is detected, pass on to point **4**.

4. Check the wiring of the pump **M-F42A** to check for a short circuit to ground.

The key must be in the OFF position.

Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F42A pin 2** | **X-F42A pin 4** | There should be no continuity. |
| **X-F42A pin 3** | **X-F42A pin 4** | There should be no continuity. |

A. If there is continuity, this indicates a short circuit to ground in the pump wiring **M-F42A**,Locate and repair the damaged conductor.

B. If there is no continuity, pass on to point **5**.

5. Check the connector for a short circuit to ground condition.

The key must be in the OFF position.

Disconnect the connectors **X-F02E**, **X-F02V** and **X-F247**

Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 10** | **X-F02V (Receptacle) pin 2** | There should be no continuity. |
| **X-F247 pin 87** | **X-F02V (Receptacle) pin 2** | There should be no continuity. |
| **X-F02E (Receptacle) pin 10** | **X-F02V (Receptacle) pin 4** | There should be no continuity. |
| **X-F247 pin 87** | **X-F02V (Receptacle) pin 4** | There should be no continuity. |
| **X-F02E (Receptacle) pin 10** | **X-F02V (Receptacle) pin 6** | There should be no continuity. |
| **X-F247 pin 87** | **X-F02V (Receptacle) pin 6** | There should be no continuity. |

A. If there is continuity, this indicates a short circuit to ground in the pump control circuit **M-F42A**,Locate and repair the damaged conductor.

B. If there is no continuity, pass on to point **6**.

6. Check the wiring of the pump **M-F42A** to check for a short circuit to ground.

The key must be in the OFF position.

Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F42A pin 2** | **X-F42A pin 3** | There should be no continuity. |
| **X-F42A pin 4** | **X-F42A pin 3** | There should be no continuity. |

A. If there is continuity, this indicates a short circuit to battery in the pump wiring **M-F42A**,Locate and repair the damaged conductor.

B. If there is no continuity, pass on to point **7**.

7. Check the connector for a short circuit to battery condition.

The key must be in the OFF position.

Disconnect the connectors **X-F02E**, **X-F02V** and **X-F247**

Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 10** | **X-F247 pin 87** | There should be no continuity. |
| **X-F02V (Receptacle) pin 2** | **X-F247 pin 87** | There should be no continuity. |
| **X-F02V (Receptacle) pin 4** | **X-F247 pin 87** | There should be no continuity. |
| **X-F02V (Receptacle) pin 6** | **X-F247 pin 87** | There should be no continuity. |

A. If there is continuity, this indicates a short circuit to battery in the pump control circuit **M-F42A**,Locate and repair the damaged conductor.

B. If there is no continuity, pass on to point **8**.

8. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**).

   A. If the module is working correctly, pass on to point **9** .

   B. If the module is not working correctly, replace the pump module **M-F42A** and go to step **9**.

9. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

10. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 522006-31 16F7FF - Error in the DEF/AdBlue pump: overtemperature

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** checks the correct operation of the high side of the power stage of the DEF/AdBlue pump **M-F42A**. If the ECU **A-F02** detects an overtemperature in the high side of the power stage of the DEF/AdBlue pump **M-F42A**, this fault is generated.

**Cause:**
The ECU **A-F02** has detected an overtemperature in the power stage of the DEF/AdBlue pump **M-F42A**.

**Possible failure modes:**

1. Fault in the wiring of the power stage of the DEF/AdBlue pump **M-F42A**.
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **6**.

2. Check the battery voltage.

   Engine running.

   Use a multimeter to carry out the following voltage check:

| From | To | Value |
|---|---|---|
| Battery terminal (+) | Battery terminal (-) | The value should be approximately **12 V** |

   A. If the voltage is not approximately **12 V**, Repair or replace as required

   B. If the value is approximately **12 V**, pass on to point **3**.

3. Check the wiring of the pump **M-F42A**.

   With the key in the OFF position, use the a multimeter to perform the following continuity check on the engine wiring harness side:

| From | To | Value |
|---|---|---|
| **X-F42A pin 2** | **X-F02E (Receptacle) pin 10** | There should be continuity. |
| **X-F42A pin 3** | **X-F247 pin 87** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V (Receptacle) pin 2** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V (Receptacle) pin 4** | There should be continuity. |
| **X-F42A pin 4** | **X-F02V (Receptacle) pin 6** | There should be continuity. |

   A. If there is no continuity, this indicates an open circuit in the pump **M-F42A** if necessary, use the appropriate service manual to locate and repair the shorted conductor.

   B. If continuity is detected, pass on to point **4**.

4. Check the wiring of the pump **M-F42A** to check for a short circuit to ground.

The key must be in the OFF position.

Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F42A pin 2** | **X-F42A pin 4** | There should be no continuity. |
| **X-F42A pin 3** | **X-F42A pin 4** | There should be no continuity. |

A. If there is continuity, this indicates a short circuit to ground in the pump wiring **M-F42A**,Locate and repair the damaged conductor.

B. If there is no continuity, pass on to point **5**.

5. Check the connector for a short circuit to ground condition.

The key must be in the OFF position.

Disconnect the connectors **X-F02E**, **X-F02V** and **X-F247**

Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 10** | **X-F02V (Receptacle) pin 2** | There should be no continuity. |
| **X-F247 pin 87** | **X-F02V (Receptacle) pin 2** | There should be no continuity. |
| **X-F02E (Receptacle) pin 10** | **X-F02V (Receptacle) pin 4** | There should be no continuity. |
| **X-F247 pin 87** | **X-F02V (Receptacle) pin 4** | There should be no continuity. |
| **X-F02E (Receptacle) pin 10** | **X-F02V (Receptacle) pin 6** | There should be no continuity. |
| **X-F247 pin 87** | **X-F02V (Receptacle) pin 6** | There should be no continuity. |

A. If there is continuity, this indicates a short circuit to ground in the pump control circuit **M-F42A**,Locate and repair the damaged conductor.

B. If there is no continuity, pass on to point **6**.

6. Check the wiring of the pump **M-F42A** to check for a short circuit to ground.

The key must be in the OFF position.

Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F42A pin 2** | **X-F42A pin 3** | There should be no continuity. |
| **X-F42A pin 4** | **X-F42A pin 3** | There should be no continuity. |

A. If there is continuity, this indicates a short circuit to battery in the pump wiring **M-F42A**,Locate and repair the damaged conductor.

B. If there is no continuity, pass on to point **7**.

7. Check the connector for a short circuit to battery condition.

The key must be in the OFF position.

Disconnect the connectors **X-F02E**, **X-F02V** and **X-F247**

Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F02E (Receptacle) pin 10** | **X-F247 pin 87** | There should be no continuity. |
| **X-F02V (Receptacle) pin 2** | **X-F247 pin 87** | There should be no continuity. |
| **X-F02V (Receptacle) pin 4** | **X-F247 pin 87** | There should be no continuity. |
| **X-F02V (Receptacle) pin 6** | **X-F247 pin 87** | There should be no continuity. |

A. If there is continuity, this indicates a short circuit to battery in the pump control circuit **M-F42A**,Locate and repair the damaged conductor.

B. If there is no continuity, pass on to point **8**.

8. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**).

   A. If the module is working correctly, pass on to point **9**.

   B. If the module is not working correctly, replace the pump module **M-F42A** and go to step **9**.

9. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

10. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

    A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

    B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 8205-3 0D2003 - DEF/AdBlue heater module: overvoltage Error

## Control Module: FPT ECU

***NOTE:*** *No action.*

**Fault Description:**
The pressure line and supply module heaters are operated by the HCU (Heater Control Unit). The HCU is communicating with the ECU via CAN, providing the requested information for diagnostics, implementation status and request for the activation command from the ECU.

# 295467 0D2006 8205-6 - DEF/AdBlue heater module: overtemperature error

## Control Module: FPT ECU

***NOTE:*** *No action.*

**Fault Description:**
The pressure line and supply module heaters are operated by the HCU (Heater Control Unit). The HCU is communicating with the ECU via CAN, providing the requested information for diagnostics, implementation status and request for the activation command from the ECU.

# 295467 8205-4 0D2004 - DEF/AdBlue heater module: voltage too low

## Control Module: FPT ECU

***NOTE:*** *No action.*

**Fault Description:**
The pressure line and supply module heaters are operated by the HCU (Heater Control Unit). The HCU is communicating with the ECU via CAN, providing the requested information for diagnostics, implementation status and request for the activation command from the ECU.

# 295467 97EBE3 519063-3 - Error in the high side powerstage of the DEF/AdBlue pump: short-circuit to battery

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** checks the correct operation of the high side of the power stage of the DEF/AdBlue pump **M-F42A**. If the ECU **A-F02** detects a short circuit to battery in the high side of the power stage of the DEF/AdBlue pump **M-F42A**, this fault is generated.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the high side of the power stage of the DEF/AdBlue pump **M-F42A**.

**Possible failure modes:**

1. Fault in the wiring of the high side of the power stage of the DEF/AdBlue pump **M-F42A**, short circuit to battery.
2. Fault in the wiring of the high side of the power stage of the DEF/AdBlue pump **M-F42A**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check the correct operation of the main contactor **K-F245**.

   Use the diagnostic tool to check the status of this fault.

   A. If it is working correctly, pass on to point **3**.

   B. If it is not working correctly, replace the selector switch.
3. Check the correct operation of the SCR contactor **K-F247**.

   Use the diagnostic tool to check the status of this fault.

   A. If it is working correctly, pass on to point **4**.

   B. If it is not working correctly, replace the SCR contactor **K-F247**.
4. Check the power supply circuit for a short circuit towards a voltage source between the **M-F42A** pump module and the vehicle side control unit.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F42A (Plug) pin 2** | Battery positive | There should be no continuity. |

   A. If continuity is present, locate and repair the shorted conductor.

   B. If there is no continuity, pass on to point **5**.
5. Check the correct operation of the SCR pump module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**).

A. If the module is working correctly, contact the Technical Help Desk.

B. If the module is not working correctly, replace the pump module and go to step **6**.

6. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 522007-31 17F7FF - Error in the DEF/AdBlue pump: short-circuit to battery

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** checks the correct operation of the DEF/AdBlue pump **M-F42A**. If the ECU **A-F02** detects a short circuit to battery in the DEF/AdBlue pump **M-F42A**, this fault is generated.

**Cause:**
The ECU **A-F02** has detected a short circuit to battery in the DEF/AdBlue pump **M-F42A**.

**Possible failure modes:**

1. Fault in the wiring of the DEF/AdBlue pump **M-F42A**, short circuit to battery.
2. Fault in the wiring of the DEF/AdBlue pump **M-F42A**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **5**.
2. Check the power supply circuit for a short circuit towards a voltage source between the **M-F42A** pump module and the vehicle side control unit.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F42A (Plug) pin 2** | Battery positive | There should be no continuity. |

   A. If continuity is present, locate and repair the shorted conductor.

   B. If there is no continuity, pass on to point **3**.
3. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**).

   A. If the module is working correctly, contact the Technical Help Desk.

   B. If the module is not working correctly, replace the pump module and go to step **4**.
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 522005-31 15F7FF - Error in the high side powerstage of the DEF/AdBlue pump: open circuit

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** checks the correct operation of the high side of the power stage of the DEF/AdBlue pump **M-F42A**. If the ECU **A-F02** detects an open temperature in the high side of the power stage of the DEF/AdBlue pump **M-F42A**, this fault is generated.

**Cause:**
The ECU **A-F02** has detected an open circuit in the high side of the power stage of the DEF/AdBlue pump **M-F42A**.

**Possible failure modes:**

1. Fault in the wiring of the high side of the power stage of the DEF/AdBlue pump **M-F42A**, open circuit.
2. Fault in the wiring of the high side of the power stage of the DEF/AdBlue pump **M-F42A**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **7**.
2. Check the correct operation of the main contactor **K-F245**.

   Use the diagnostic tool to check the status of this fault.

   A. If it is working correctly, pass on to point **3**.

   B. If it is not working correctly, replace the selector switch.
3. Check the correct operation of the SCR contactor **K-F247**.

   Use the diagnostic tool to check the status of this fault.

   A. If it is working correctly, pass on to point **4**.

   B. If it is not working correctly, replace the selector switch.
4. Check the power supply circuit for an open circuit between the pump module **M-F42** and the vehicle side control unit.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F42A (Plug) pin 2** | **X-F02E (Plug) pin 10** | There should be continuity. |

   A. If there is no continuity, Locate and repair the broken conductor.

   B. If continuity is present, pass on to point **5**.
5. Check the correct operation of the SCR pump module **M-F42A** following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**).

A. If the module is working correctly, contact the Technical Help Desk.

B. If the module is not working correctly, pass on to point **6**.

6. Replace the pump module **M-F42A**.

   Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

   Then check to see that this fault is resolved.

   A. If the fault is resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

7. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 18F7FF 522008-31 - Error in the DEF/AdBlue pump: short circuit to ground

## Control Module: FPT ECU

**Fault Description:**
The Engine Control Unit (ECU) **A-F02** checks the correct operation of the DEF/AdBlue pump **M-F42A**. If the ECU **A-F02** detects a short circuit to ground in the DEF/AdBlue pump **M-F42A**, this fault is generated.

**Cause:**
The ECU **A-F02** has detected a short circuit to ground in the DEF/AdBlue pump **M-F42A**.

**Possible failure modes:**

1. Fault in the wiring of the DEF/AdBlue pump **M-F42A**, short circuit to ground.
2. Fault in the wiring of the DEF/AdBlue pump **M-F42A**, internal fault.
3. Faulty ECU **A-F02**, software.

**Solution:**

1. Check if the fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, pass on to point **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Go to step **5**.
2. Check the supply circuit for a short circuit to ground condition between the pump module **M-F42A** and the vehicle side control unit.

   Set the ignition switch to ON.

   Use a multimeter to carry out the following continuity check:

| From | To | Value |
|---|---|---|
| **X-F42A (Plug) pin 3** | Chassis ground | There should be no continuity. |

   A. If continuity is present, locate and repair the shorted conductor.

   B. If there is no continuity, pass on to point **3**.
3. Check the correct operation of the SCR pump module following the test procedure indicated ( **AD-BLUE SYSTEM - Test (50.74)**).

   A. If the module is working correctly, contact the Technical Help Desk.

   B. If the module is not working correctly, replace the pump module and go to step **4**.
4. Carry out the **Diesel Exhaust Fluid (DEF)/AdBlue®** system test.

   Use the diagnostic instrument to carry out the Urea Dosing System test (UDST) **AD-BLUE SYSTEM - Test (50.74)** and follow the on-screen instructions.

   Use the UDST Trouble Shooting Guideline as required, to identify and resolve the problem.

   Perform the Engine Restart Counter Reset/Unlock inducement configuration with the diagnostic tool before returning the machine to service.

   Carry out the SCR fault verification.

Then check to see that this fault is resolved.

A. If the fault is resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

5. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If no damage is detected, only normal readings will appear on the screen delete the fault code.

# 295467 0D200E 8205-14 - DEF/AdBlue heater module: voltage loss

## Control Module: FPT ECU

***NOTE:*** *No action.*

**Fault Description:**
The pressure line and supply module heaters are operated by the HCU (Heater Control Unit). The HCU is communicating with the ECU via CAN, providing the requested information for diagnostics, implementation status and request for the activation command from the ECU.

# 295467 0D201F 8205-31 - DEF/AdBlue heater module: error in non volatile memory

## Control Module: FPT ECU

***NOTE:*** *No action.*

**Fault Description:**
The pressure line and supply module heaters are operated by the HCU (Heater Control Unit) **A-F45**. The HCU **A-F45** is communicating with the ECU **A-F02** via CAN, providing the requested information for diagnostics, implementation status and request for the activation command from the ECU. **A-F02**

**Cause:**
Error in the non volatile memory of the HCU (Heater Control Unit) **A-F45**

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN fault.
2. Fault in the power supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short circuit, short circuit to ground, or short circuit towards a high voltage source.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify that the fault code is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, continue to step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.Continue to step **9**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, continue to step **3**.
3. Check the power supply voltage of the ECU **A-F02**.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 1** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 3** | chassis ground | It must be **12.0 V**. |
| **X-F02V (Receptacle) pin 5** | chassis ground | It must be **12.0 V**. |

   A. If there is no voltage in one or more checks, Identify and restore power supply to ECU **A-F02**.

   B. If voltage is present in all the checks, continue to step **4**.
4. Check the ECU **A-F02**grounding.

   Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 2** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 4** | Chassis ground | There should be continuity. |
| **X-F02V (Receptacle) pin 6** | Chassis ground | There should be continuity. |

A. If no continuity is detected in one or more checks, identify and restore the ground circuit to the ECU **A-F02**.

B. If continuity is detected in all the checks, continue to step **5**.

5. Check the terminating resistor inside the ECU **A-F02**.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to perform the following resistance check:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | The resistance should be **120 Ω**. |

A. If the measured resistance is incorrect, there is a fault inside the ECU **A-F02**. Check the ECU **A-F02** for the appropriate software and update if necessary.

B. If the measured resistance is correct, continue to step **6**.

6. Check the CAN circuit of the ECU **A-F02** for a short circuit towards a high voltage source.

Disconnect the wiring from the ECU **A-F02** at connector **X-F02V_1**.

With the ignition switch in the ON position, use a multimeter to check the voltage:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Chassis ground | There should be **0 V**voltage. |
| **X-F02V (Receptacle) pin 14** | Chassis ground | There should be **0 V**voltage. |

A. If the value is greater than **0 V**, there is a short circuit towards a high voltage source in the CAN circuit of the ECU **A-F02**. Locate and repair the shorted conductor.

B. If there is no voltage, continue to step **7**.

7. Check the CAN circuit of the ECU **A-F02** to check for a short circuit to ground.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity on the wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | Chassis ground | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | **X-F02V** all other pins | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | **X-F02V** all other pins | There should be no continuity. |

A. If there is continuity, there is a short circuit to ground in the CAN circuit of the ECU **A-F02**. Locate and repair the shorted conductor.

B. If no continuity is detected, continue to step **8**.

8. Check the CAN circuit of the ECU **A-F02** for an open circuit.

Disconnect the wiring harness from the ECU **A-F02** at connector **X-F02V**.

With the ignition switch in the OFF position, use a multimeter to check the continuity:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | To the pin of CAN H of chassis control module control unit | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | To the pin of CAN L of chassis control module control unit | There should be continuity. |

A. If there is no continuity, there is an open circuit on the CAN network of the ECU **A-F02**. Locate and repair the broken conductor.

B. If continuity is detected, check the ECU **A-F02** for the appropriate software and update if necessary.

9. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If there is no damage and the display indicates normal values, delete the fault code.

# 295467 1A151F AE0010 6677-31 174-16 1A15-1F - Fuel temperature has exceeded a maximum limit

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the fuel temperature sensor **B-F04**. If the ECU **A-F02** detects a too high fuel temperature, this fault occurs.

**Cause:**
The ECU **A-F02** has detected a too high oil temperature.

**Possible failure modes:**

1. High ambient temperature.
2. Faulty fuel temperature sensor **B-F04**, internal failure.
3. Faulty fuel temperature sensor **B-F04**, hardware.
4. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the operator display or the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active, go to **6**.
2. Determine the effective fuel temperature.

   Use a thermometer or a thermal gun, as close as possible to the fuel temperature sensor **B-F04**, to measure the fuel temperature.

   A. If the measured temperature is less than **84.96 °C** (**193.9 °F**), go to **3**.

   B. If the measured temperature is greater than **84.96 °C** (**193.9 °F**), locate and resolve any ambient conditions or operational factors of the engine, such as improper use. Resolve any physical conditions that cause engine overheating.
3. Check the conditions of the fuel temperature sensor **B-F04**.

   Disconnect the engine wiring from the fuel temperature sensor **B-F04** at connector **X-F04**.

   Use a multimeter to measure the resistance of the fuel temperature sensor **B-F04**:

| From | To | Value |
|---|---|---|
| **X-F04 (Plug) pin 1** | **X-F04 (Plug) pin 2** | There should be a value greater than **250 Ω**. |

   A. If the measured resistance is lower than **250 Ω**, the fuel temperature sensor **B-F04** has failed internally. Replace sensor.

   B. If the measured resistance is greater than **250 Ω**, leave the fuel temperature sensor connector **B-F04** disconnected and go to **4**.
4. Check the integrity of the fuel temperature sensor **B-F04**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V_2**.

Inspect the wiring and relative connectors checking for damaged, bent, or displaced pins, corroded terminals, or open or stripped wires. Make sure that the connectors are fully inserted.

A. If a fault is found during the inspection, repair or replace as required.

B. If no failures are found during the inspection, leave the connector **X-F04** disconnected and go to **5**.

5. Replace the fuel temperature sensor **B-F04**.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault has been resolved, return the machine to service.

   B. If the fault has not been resolved, check the ECU **A-F02** for the appropriate software and update if necessary.

6. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 870E10 3719-16 - DPF system: particulate filter clogged

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the integrity of the particulate filter. In order to determine the integrity of the particulate filter, the pressure drop measured on the empty filter (low soot) in stationary conditions is compared with the reference values determined on a new undamaged DPF. An error is detected if the maximum differential pressure value saved at stationary state is lower than a threshold that depends on the flow of the volume.

**Cause:**
The particulate filter is clogged

**Possible failure modes:**

1. Faulty particulate filter, failed or disassembled
2. Faulty ECU **A-F02**, software.

**Solution:**

1. Verify fault is present and active.

   Use the diagnostic tool to check the status of this fault.

   A. If the fault is present and active, go to **2**.

   B. If the fault is no longer present or active, the fault may be intermittent and not currently active. go to step **4**.
2. Check if the filter is clogged.

   A. If it is clogged. clean it carefully.

   B. If it is not clogged, go to **3**.
3. Check that the particulate filter is operating correctly.

   A. If a fault is present,replace the filter.

   B. If a fault is not present,check the ECU **A-F02** for the appropriate software and re-flash if necessary.
4. Visually inspect the wiring and the relevant connectors to check for any pins which may be damaged or bent or may have moved, check for corroded terminals or broken conductors. Check that the connectors are fully inserted. Bend the relevant wiring to identify any short circuits or intermittent interruptions. Operate the vehicle and check the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, delete the fault code.

# 295467 85EBE2 519045-2 - Downstream NOx Sensor - Not Ready in Time or possible poisoned sensor (NOx or Lambda signals)

## Control Module: FPT ECU

**Fault Description:**
The $NO_X$ sensor downstream of the Selective Catalyst Reduction system (SCR) **B-F39** sends information on its error status and the results of the self-diagnostics procedure to the engine control unit (ECU) **A-F02**, through the CAN. If the $NO_X$ sensor downstream of the SCR system **B-F39** sends non-plausible Lambda or $NO_X$ signals, this fault occurs.

**Cause:**
The $NO_X$ sensor downstream of the SCR system **B-F39** has reported via CAN to the ECU **A-F02** that the Lambda or $NO_X$ signal is not plausible.

**Possible failure modes:**

1. Fault in the $NO_X$ sensor downstream of the SCR **B-F39**, hardware or firmware.

**Solution:**

1. Check for related faults.

   Use the diagnostic instrument to check for related faults.

   A. If there are related faults, go to step **5**.

   B. If there are no related faults, ignore this fault.
2. Check that the $NO_X$ sensor downstream of the SCR system **B-F39** is operating correctly, following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, repair it or replace as required.

# 295467 900C02 3216-2 - Upstream NOx Sensor - Not Ready in Time or possible poisoned sensor (NOx or Lambda signals)

## Control Module: FPT ECU

**Fault Description:**
The $NO_X$ sensor upstream of the diesel oxidation catalyst (DOC) **B-F67** sends information on its error status and results of the self-diagnostics procedure to the engine control unit (ECU) **A-F02**, through the CAN. If the $NO_X$ sensor upstream of the DOC **B-F67** sends non-plausible Lambda or $NO_X$ signals, this fault occurs.

**Cause:**
The $NO_X$ sensor upstream of the DOC **B-F67** has reported, via CAN, to the ECU **A-F02** that the Lambda or $NO_X$ signal is not plausible.

**Possible failure modes:**

1. Faulty DOC upstream $NO_X$ sensor **B-F67**, hardware or firmware.

**Solution:**

1. Check for related faults.

   Use the diagnostic instrument to check for related faults.

   A. If there are related faults, go to step **5**.

   B. If there are no related faults, ignore this fault.
2. Check that the $NO_X$ sensor downstream of the SCR system **B-F39** is operating correctly, following the test procedure indicated ( **TEMPERATURE SENSOR - Test (50.74)**)

   A. If the sensor is okay, contact the Technical Help Desk.

   B. If the sensor is not working correctly, repair it or replace as required.

# 295467 520380-31 BCF0FF - CAN error: overload error of MCAN buffer

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two separate CAN (Controller Area Network). The correct configuration and monitoring of the two networks configured with pairs of twisted wired is also a function of the ECU **A-F02**. Node 1 of the CAN bus is the main vehicle interface bus. The ECU **A-F02** supplies a termination resistor for node 1 of the CAN bus inside the ECU. If the ECU **A-F02** detects excessive message traffic on the CAN Bus with the vehicle, this error occurs.

**Cause:**
The ECU **A-F02** has detected excessive message traffic on the vehicular CAN network, a control unit continuously sends messages with error.

**Possible failure modes:**

1. Fault in the vehicle system, associated CAN fault on a vehicle control unit.
2. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. Go to step **7**.
2. Check for other vehicle CAN faults.

   Use the diagnostic instrument to determine if CAN network faults exist related to the vehicle.

   A. If other vehicle CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other vehicle CAN faults do not exist, go to step **5**.
3. Check the CAN circuit of the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | All other pins **X-F02V** | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | All other pins **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**. Locate and repair the conductor with a short circuit condition.

   B. If no continuity is detected, go to step **6**.
4. Check the ECU CAN circuit **A-F02** for an open circuit condition.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H terminal | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L terminal | There should be continuity. |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**. Locate and repair the broken conductor.

B. If continuity is detected, check that the software of ECU **A-F02** is correct and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 520381-31 BDF0FF - CAN error: overload error of MCANR buffer

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** can connect and ensure communication between two separate CAN (Controller Area Network). The correct configuration and monitoring of the two networks configured with pairs of twisted wired is also a function of the ECU **A-F02**. Node 1 of the CAN bus is the main vehicle interface bus. The ECU **A-F02** supplies a termination resistor for node 1 of the CAN bus inside the ECU. If the ECU **A-F02** detects excessive message traffic on the engine CAN Bus, this error occurs.

**Cause:**
The ECU **A-F02** has detected excessive message traffic on the engine CAN network.

**Possible failure modes:**

1. Engine side CAN fault.
2. Fault in the ECU **A-F02**, software.

**Solution:**

1. Check that the fault code is present and active.

   Use the diagnostic instrument to check the status of this fault.

   A. If the fault is present and active, go to step **2**.

   B. If the fault is no longer present or is inactive, it may be intermittent and currently inactive. Go to step **7**.
2. Check for other faults in the engine CAN network.

   Use the diagnostic instrument to determine whether faults are detected in the engine CAN network.

   A. If other engine CAN faults do exist, resolve the vehicle CAN faults, then check to see that this fault is also resolved.

   B. If other engine CAN faults do not exist, go to step **5**.
3. Check the CAN circuit of the ECU **A-F02**.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | **X-F02V (Receptacle) pin 14** | There should be no continuity. |
| **X-F02V (Receptacle) pin 13** | All other pins **X-F02V** | There should be no continuity. |
| **X-F02V (Receptacle) pin 14** | All other pins **X-F02V** | There should be no continuity. |

   A. If there is continuity, there is a short circuit condition in the CAN circuit of the ECU **A-F02**. Locate and repair the conductor with a short circuit condition.

   B. If no continuity is detected, go to step **6**.
4. Check the ECU CAN circuit **A-F02** for an open circuit condition.

   Disconnect the engine wiring from the ECU **A-F02** at connector **X-F02V**.

   With the ignition switch in the OFF position, use a multimeter to check for continuity of the engine wiring side:

| From | To | Value |
|---|---|---|
| **X-F02V (Receptacle) pin 13** | Vehicle CAN H terminal | There should be continuity. |
| **X-F02V (Receptacle) pin 14** | Vehicle CAN L terminal | There should be continuity. |

A. If there is no continuity, there is an interruption in the CAN circuit of the ECU **A-F02**. Locate and repair the broken conductor.

B. If continuity is detected, check that the software of ECU **A-F02** is correct and update if necessary.

5. Visually check the wiring and main connectors looking for any faults, bent or incorrectly positioned pins, corroded terminals, or broken wires. Make sure that the connectors are fully mounted. Bend the affected wiring to check for any intermittent faults or short circuits in the cables. Operate the machine and observe the display.

   A. If damage is detected or values other than normal are shown on the display, repair the damage detected during the inspection or identify and repair the condition causing the display of values other than normal and check that the error has been corrected.

   B. If no damage is found and the display shows normal values, delete the fault code.

# 295467 BF1311 5055-17 - Oil viscosity below the minimum threshold

## Control Module: FPT ECU

**Fault Description:**
The engine control unit (ECU) **A-F02** monitors the viscosity of the engine oil. The error arises when the viscosity of the oil is lower than a first predetermined threshold.

**Cause:**
The engine control unit (ECU) **A-F02** detects a consumption of engine oil due to a degradation of the oil.

**Possible failure modes:**

1. Engine oil degraded

**Solution:**

1. Check the viscosity of the engine oil.
   A. If the oil viscosity level is too low, change the engine oil.
   B. If the oil viscosity level is correct, use the diagnostic instrument to check for any software updates in the engine control unit (ECU), **A-F02** then update as required.

# 295467 5055-18 BF1312 - Oil viscosity above second threshold

## Control Module: FPT ECU

***NOTE:*** *If the oil filter or the engine oil is changed, carry out the Replacement of the Engine Oil/Filter - Reset Change Reminder with the diagnostic tool before you return the machine to service.*

**Fault Description:**
The ECU **A-F02** monitors the viscosity of the engine oil. If the ECU **A-F02** determines that the engine oil has not been changed after the second level indication on the instrument panel, this fault occurs. The only corrective action is to change the engine oil.

# 295467 5A150F 5466-15 - DPF system: particulate filter overload

## Control Module: FPT ECU

**Fault Description:**
When filter regeneration is insufficient due to low exhaust temperatures over an extended period of time (running the engine at idle speed or at low load for an extended period of time) or in the presence of a damaged diesel oxidation catalyst (DOC) (does not produce fuel gas), the filter flow resistance may increase above critical values.
The engine control unit (ECU) **A-F02** monitors if the soot load level is high or the pressure differential in the diesel particulate filter (DPF) is higher than the limits defined by the ECU **A-F02** based on the exhaust flow. In this case, the filter is overloaded (flow resistance is too high) and this fault occurs.
Check the correct operation of the DPF delta pressure sensor **B-F34** and perform manual catalyst management (MCM) (where applicable) with possible forced heat treatment at the Selective Catalytic Reduction on Filter (RCSsF) inlet or clean the filter.

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