Workshop Manual

Group 30 Electrical system

TAD580-583VE, TAD880-884VE
TAD1180-1184VE, TAD1380-1384VE
TWD1683VE/GE

Table of Content

00-0 General

General Information

The product designation and the serial number and specification are shown on the engine decal or type plate. This information must be included in all correspondence concerning the product.

Volvo Penta is constantly developing its products. All information in this Manual is based on product data that was available at the time the Manual was published.

The working methods described in this manual are based on a workshop scenario where the product is mounted in a work fixture. Maintenance work is often carried out in situ, in which case - if nothing else is indicated - using the same working methods as the workshop.

The service manual describes work operations carried out with the aid of Volvo Penta Special Tools, where such have been developed. Volvo Penta Special Tools are designed to ensure the safest and most rational working methods possible.

In some cases local safety regulations and user instructions may be applicable regarding the use of tools and chemicals mentioned in the service manual. These rules must always be observed, so there are no special instructions about this in the workshop manual.

Above all, when working on fuel systems, hydraulic systems, lubrication systems, turbochargers, inlet systems, bearings and seals, it is of the utmost importance that dirt and foreign objects are kept away, as malfunctions or shortened service intervals may otherwise result.

Replacement parts

Volvo Penta Original Replacement Parts meet national safety requirements. No damage of any kind caused by the use of replacement parts not approved by Volvo Penta will be compensated by any warranty undertaking.

About this Workshop manual

Certified engines

When performing service and repairs on emission certified engines, it is important to be aware of the following:

Certification means that an engine type has been checked and approved by the relevant authority. The engine manufacturer guarantees that all engines of the same type are manufactured to correspond to the certified engine.
This places special demands on service and repair work, namely:

- Maintenance and service intervals recommended by Volvo Penta must be complied with.

- Only replacement parts approved by Volvo Penta may be used.

- All fuel injection service must always be carried out by an authorised Volvo Penta workshop.

- The engine must not be converted or modified, except with accessories and service kits which Volvo Penta has approved for the engine.

- No changes to the exhaust pipe and engine air inlet duct installations may be made.

- No warranty seals (where present on the product) may be broken by unauthorized persons.

IMPORTANT!

Neglected or poorly-performed maintenance or service and the use of replacement parts not approved by Volvo Penta, will mean that AB Volvo Penta no longer guarantees that the engine conforms to the certified model.

Volvo Penta accepts no responsibility for damage or costs arising as a result of failure to follow the above mentioned standards.

Colours used in images

Most images include a highlighted component which is secured by a screw or similar as part of a (light gray) engine transmission.

NOTICE! Because the images in the maintenance literature are used for different engine variants, certain details may vary compared to the actual model concerned. The essential information is always correct, however.
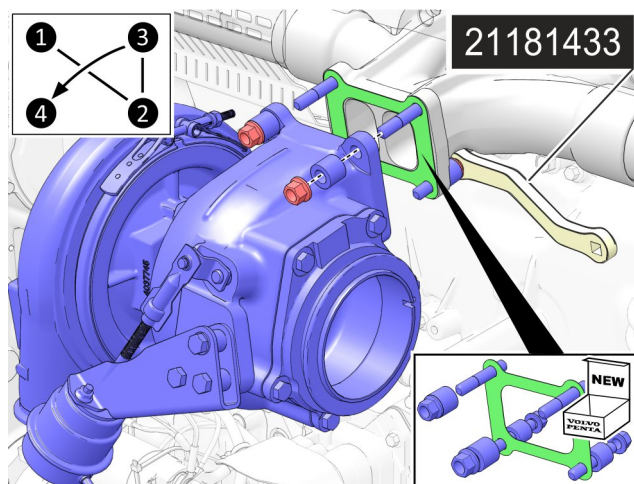
P0030543

1   Component emphasized (blue)

2   Attachment fasteners (red)

3   Chassis (light grey)

4   Background (white)

5   Special tool (yellow)

6   Seals (green)
    (as from June 2018)

Other types of symbols used in the images are divided into the following categories:

- Safety
- Important
- Cleanliness
- Position
- Movement
- Measured value
- Tools
- Chemicals
- Sealant
- Units

Safety information

Read the safety information below carefully before you start repair or service work.

This symbol is used on the product to let you know that this concerns safety information. Always read such information very carefully.

Warnings take the following priority:

⚠ **DANGER!**

Indicates a dangerous situation which, if not avoided, will lead to death or serious injury.

⚠ **WARNING!**

Indicates a dangerous situation which, if not avoided, could lead to death or serious personal injury.

⚠ **CAUTION!**

Indicates a dangerous situation which, if not avoided, will lead to minor or significant injury.

IMPORTANT:

Is used to make you aware of something that may cause minor injury or a minor malfunction to the product or property.

NOTICE! Is used to make you aware of important information that will facilitate the work or operation in progress.

This symbol is used on certain functions to indicate the following:

Performance of this operation requires prior theoretical and/or instructor-led training. Contact your local training organization for further information.

This symbol informs you that supplemental information needs to be read. And where necessary information can be found.

This symbol means **Dangerous electrical voltage / General electrical danger**.

This symbol is used when a VODIA computer is needed, either for troubleshooting, testing or programming.

This symbol is used for facilitation tips when repairing.

A compilation of safety precautions that must be taken and risks which you must be aware of is presented in the following pages.

⚠ Immobilize the engine by turning off the power supply with the main switch(es) and lock it (them) in the off position before work is begun. Place a warning notice at the main switch.

⚠ All maintenance and service must be carried out on when the engine is stopped. Approaching a running engine is a safety risk.

⚠ Beware of hot surfaces and hot liquids in pipes and hoses on an engine that is running or has just been switched off.

⚠ Make sure that all warning and information decals on the product are always visible. Replace decals that have been damaged or painted over.

⚠ Avoid getting oil on the skin! Use protective gloves and avoid oil-soaked clothes and rags.

⚠ Switch off the engine and disconnect the power at the main switches before starting work on the electrical system.

⚠ Always wear protective goggles if there is a risk of splinters, sparks and splashes from acid or other chemicals.

⚠ Never use start gas or similar products as a starting aid.

⚠ Never allow open flames or electrical sparks in the vicinity of fuel. Always ensure that there are fire extinguishers close at hand in the operating area.

⚠ Batteries must never be exposed to open flames or electrical sparks.

⚠ Avoid opening the coolant filler cap when the engine is hot. Steam or hot coolant may spray out and with a resultant system pressure loss.

⚠ Never start the engine without the air filter in place. The rotating compressor turbine in the turbocharger can cause severe injury. Install all protective covers before starting the engine.

⚠ When operating in a confined space, exhaust pipe fumes and crankcase gases must be led away from the engine compartment or workshop area. Ensure good ventilation.

⚠ Only make connection adjustments with the engine switched off.

⚠ Never start the engine with the valve cover removed. There is a risk of personal injury.

⚠ Stop the engine before working on the cooling system. Marine engines: Close the sea cock/cooling water inlet valve before starting work on the cooling system.

⚠ Check that rags soaked in oil or fuel and used fuel and oil filters are stored safely. Oil-soaked rags may ignite spontaneously in certain conditions.

⚠ Never work alone when dismantling heavy components, even if you use lifting equipment.

⚠ Take extreme care when searching for fuel system leaks and testing fuel injector nozzles. Wear safety goggles.

⚠ Never use a high-pressure washer to clean the engine. Pay attention to the following when using a high-pressure washer on components other than the actual engine: Never aim the water jet at seals, rubber hoses or electrical components.

⚠ Always wear protective goggles when charging or handling the batteries. Rinse immediately with plenty of water and soap if battery electrolyte comes into contact with unprotected skin.
If you get battery acid in your eyes, flush at once with a generous amount of water, and get medical assistance at once.

⚠ The engine must not be operated in areas where there are explosive materials or gases.

⚠ Only use fuels and lubricating oils as recommended by Volvo Penta.

03-3 Specifications, Electrical

Engine Protection Map
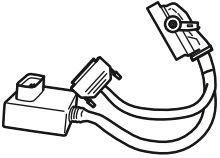
All versions of Engine Protection Maps, are to be found at the Volvo Penta Sales Support Tool, Technical data for concerned engine type.
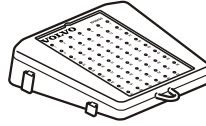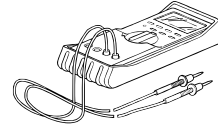
08-2 Special Service Tools

The following special tools are used when working on the engine. The tools can be ordered from AB Volvo Penta by specifying the number indicated.

9990014 Break-out cable

9998699 Break-out box

88890074 Multimeter

30-0 General

Checking the charging system

Tools:
88890074 Multimeter

Fault tracing charging system

Battery check

1 Check that all connectors at the battery are correctly assembled.

2 Check the condition of the cables to the battery.Look for oxidation.

3 Check the water level in the battery.

4 Check, if possible, the specific gravity of all cells.

when no charge

1 Check the alternator belt tension.

2 Check that all connectors at the alternator and at the battery are correctly assembled.

3 Check the condition of all cables in the charging system.

4 Regulator fault. Replace alternator.

when undercharge

1 Check the alternator belt tension.

2 Check that all connectors at the alternator and at the battery are correctly assembled.

3 Check the condition of all cables in the charging system.

4 Regulator fault. Replace alternator.

when overcharge

1 Probably regulator fault. Replace alternator.

Generally about alternators:

The voltage output from an alternator must be limited to prevent the elecrolyte in the battery to evaporate. The alternator output is regulated (limited) by the voltage regulator in the alternator. The maximum current that the alternator can deliver at regulated voltage output depends on the alternator revolution. When the engine is started an excitation current is needed to "wake up" the alternator.

NOTICE! It is the consumers (batteries included) which decides the output current from the alternator.

Measurements

1 Engine off.

2 Use 88890074 Multimeter to do a voltage measurement over the battery. The nominal voltage over a full loaded battery is approx. 25.4 V.

3 Engine on. Run at 1500 rpm.

4 Use 88890074 Multimeter to do a voltage measurement over the battery and also over the alternator. The nominal charging voltage over the battery should be approx. 27.8-28.6 V.

Service regeneration needed when replacing EMS

Diesel particulate filter (DPF) service regeneration needs to be performed when replacing a locked or defect EMS.

Reason:
The soot load level in the DPF is estimated by EMS and is stored in the memory at key off to be read at next driving cycle.

The stored data is very important as it is used to start the soot regeneration and keep the DPF clean. If the EMS is locked, broken or replaced after an engine replacement, the stored data will be lost in the new EMS and the soot level estimation is reset to zero while the real soot level in the DPF still can be high.

In order to reset the real soot level in the DPF, it is necessary to start a parked regeneration. If the regeneration is not done, there is a serious risk of damaging the DPF.

Regeneration is not needed when reprogramming current software or updating software on the EMS, only when the EMS is replaced.
Run a parked regeneration to reset the soot level in the new EMS after:

- Engine replacement

- Locked EMS replacement

- Defect EMS replacement

Important information
Reprogramming EMS (only valid for TAD168x VE)
The electric pump in the CAC system will automatically be activated during EMS programming. If there is no water available in the CAC system the electric pump can be damaged. To protect the pump from damages it must be disconnected.

P0032734

47712292 04-2022 © AB VOLVO PENTA
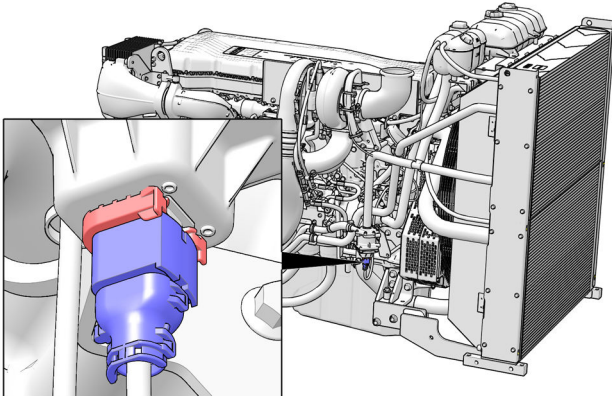
VODIA test routines

Relative compression test

There is a possibility to do a "Cylinder compression" test by using Vodia. Important to know is that this is a relative compression test and cannot give any information about the absolute, actual, compression status of the engine, only an indication of the relative compression status between the cylinders.

The test must be run several times to give any valid information. Always look for tendencies between all runs. If cranking a cold engine the piston rings will not perform at their best the first runs and the result can be very poor. It can be a huge difference at later runs.

The test result is presented in form of percentage values per cylinder where the cylinder with 100% is considered to have the best "compression" in relation to the other cylinders. A cylinder value above 40% is considered to be ok. If a cylinder value is lower than 40% during all runs the reason for that needs to be investigated.

Injector click test

Warning: This test may cause injection of fuel into the cylinders when the engine is not running. Start the engine and run it for 2 minutes after every 3rd consecutive execution of this test.

The click test verifies that all the electrical parts, wiring, coils, of the injectors are OK. Use the test after repair or replacement of an injector or the wiring harness.

EATS, Urea Adaption Reset

The purpose of urea adaptation function is to:

- Inject the optimal amount of urea and minimize effect of disturbances.
- Keep track of long term Specific NOx level to trig Urea Quality evaluation, regeneration or Selective Catalytic Reduction (SCR) Closed Loop Diagnosis.

Resets the urea adaptation function. This must be done when the Urea Injector, the Urea Dosing System (UDS) or the NOx Sensor are replaced.

There is also the need to reset this function when there is a leakage or crystal build up as the urea adaptation function can start deviating and take a long time to correct itself.

EATS Reset

Reset the exhaust aftertreatment system after a complete replacement.

If the Diesel Particulate Filter (DPF) was not replaced with the rest of the exhaust aftertreatment system, a DPF regeneration needs to be performed.

F2 Pump Shut Off Test

The purpose of this test is to support the fault tracing of the F2 fuel pumps.

One or several pumps can be shut off on request by user. The test doesn´t return a evaluation result. The evaluation is done by the user. The test is manually stopped by the user.

To keep the same rail pressure, the user will notice that the pumping demand for the remaining pumps will increase. If there is a problem with any of the pumping injectors an engine knocking noise could appear. By shutting off one injector at a time the injector that is causing the engine knocking noise can be detected.

Exhaust Flap Smart Actuator, Mode Diagnostic Test (EPG)

Tests the EPG actuator by requesting a wiping test, step test or self calibration. A Mode (Wiping test, Step Response test or Self Calibration) is given through the routine option and this one is compared with the one given by the actuator. If the mode given is achieved by the actuator in a maximum time, a positive feedback OK, will be sent by the routine.

The test will be evaluated to: OK, Not Reliable or Not Tested.
If the evaluation is Not Reliable it means that the mode request didn´t end within the maximum time permitted. This can be caused by that the EPG actuator is faulty, the exhaust flap obstructed, the EPG actuator linkage obstructed.

Exhaust Flap Smart Actuator, Position, Diagnostic Test (EPG)

Tests the EPG actuator by requesting a position. A position is given through the routine option and is compared with the position given by the actuator. If the requested position is achieved by the actuator within the maximum time, a positive feedback will be sent by the routine.

The test will be evaluated to: OK, Not Reliable or Not Tested.
If the evaluation is Not Reliable it means that the mode request didn´t end within the maximum time permitted. This can be caused by that the EPG actuator is faulty, the exhaust flap obstructed, the EPG actuator linkage obstructed.

Exhaust After Treatment System Cleaning

This routine is used when there is a need to perform a regeneration i.e heat up the EATS to high temperature.
There are 2 options:

Crystal Removal

DPF Regeneration

All options will force the exhaust temperature to rise by closing the EPG, closing the EGR, increase engine speed, activate VCB, etc.

Note! The routine will run for an hour.
Since the system is heated to a very high temperature during a long period of time, make sure that the application is parked outdoors where there are no combustible materials.

DPF Reset

This routine resets modeled soot, ash, hydrocarbon and sulfur levels in DPF.

This request is only to be used when the diesel particulate filter has been cleaned according to the service interval or has been replaced with a new.

SCR NOx Conversion

The NOx sensor and SCR NOx conversion test routine (only to be used if engine is permitted to run at 1900rpm) is taking control of demanded engine out NOx, EATS heating, engine speed and urea dosing in a sequence of different levels that provides a diagnostic self test result on the main functionality of the EATS system. By a number of predefined steps, phases, it evaluates the NOx sensors' capability of, and accuracy in, reading high and low NOx levels, and that correct conversion efficiency is achieved while dosing urea.

DTC interpretation

Type of DTC:

- P = Powertrain

- U = Network

The last two digits of the DTC states the failure type.

The most common failure types are:

00   No Sub Type Information
01   General Electrical Failure
11   Circuit Short To Ground
12   Circuit Short To Battery
13   Circuit Open
16   Circuit Voltage Below Threshold
17   Circuit Voltage Above Threshold
64   Signal Plausibility Failure
86   Signal Invalid
88   Bus Off

30-2 Fault Tracing

Fault Codes

P001676

Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	
SPN [FMI]:	636 [7]
Node:	EMS
FTB Name:	Wrong Mounting Position
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	• Possible engine derate. • High fuel consumption
Failure Event:	Phase error
Possible Root Cause:	• The camshaft is one or more cogs wrong in the transmission. • Damaged gearwheel.
Corrective Action:	1 Check mounting of flywheel, camshaft and timing chain/belt. 2 Check the correlation between the camshaft signal and the crankshaft signal. Use an oscilloscope.

P004A11

Turbocharger/Supercharger Boost Control "B"	
SPN [FMI]:	520566 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	The supercharger is not engaged which results in less performance during acceleration and when heavily loaded
Failure Event:	Voltage at B2 < than normal.
Possible Root Cause:	• SC: B2, GND • Faulty clutch solenoid
Corrective Action:	1 Check all cables and connections between the supercharger and the EMS. 2 Check the function of the supercharger clutch solenoid.

P004A12

Turbocharger/Supercharger Boost Control "B"	
SPN [FMI]:	520566 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	The supercharger is always engaged which may result in supercharger damage.
Failure Event:	Voltage at B2 > than normal.
Possible Root Cause:	• SC: B2, VBat • Faulty clutch solenoid
Corrective Action:	1 Check all cables and connections between the supercharger and the EMS. 2 Check the function of the supercharger clutch solenoid.

P004A13

Turbocharger/Supercharger Boost Control "B"	
SPN [FMI]:	520566 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	The supercharger is not engaged which results in less performance during acceleration and when heavily loaded. Derate according to the engine protection map.
Failure Event:	Voltage at B2 is outside normal range.
Possible Root Cause:	• OC: B2 • Faulty clutch solenoid
Corrective Action:	1 Check all cables and connections between the supercharger and the EMS. 2 Check the function of the supercharger clutch solenoid.

P006964

Manifold Absolute Pressure - Barometric Pressure Correlation	
SPN [FMI]:	102 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	30 seconds
DTC Monitor Test Conditions:	Ignition on, engine not running
Functional Behaviour Description:	Engine might not run properly, with either low performance or high soot
Failure Event:	• Boost pressure compared to reference pressure below -15kPa • Boost pressure compared to reference pressure above 15kPa
Possible Root Cause:	Sensor failure on either Boost Pressure Sensor or Ambient Pressure Sensor
Corrective Action:	1 Replace Boost Pressure Sensor 2 If still error, check values from Ambient Pressure Sensor. If Ambient Pressure sensor shows not expected values, replace sensor (complete ECU).

P008700

Fuel Rail/System Pressure - Too Low Bank 1	
SPN [FMI]:	157 [1]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
Functional Behaviour Description:	Engine might shutdown/Engine cranks but does not start.
Failure Event:	The rail pressure < 25MPa for 2 seconds.
Possible Root Cause:	• Closed fuel inlet valve. • Low fuel level. • Blocked fuel filters. • Deformed/restrickted fuel hoses/fuel pipes. • Leakage in the fuel system. • Air in the fuel system. Air leakage in the low pressure system. • Faulty rail pressure sensor. • Faulty ePRV. • Faulty Fuel quantity regulator (SCV, Suction Control Valve) • Faulty injectors, leakage in combustion chamber.
Corrective Action:	1 Check that the fuel inlet valve is open and that the fuel lines are correctly connected. Check fuel level. Do a visual check of the fuel system for squeezed hoses/pipes and for leakage. Change the fuel filters. Bleed the fuel system. 2 Run the engine from a separate stand-alone fuel tank. Since the high pressure pump is sucking the fuel from the tank, a search must be made for air entry between the high pressure pump and the tank. Check for air leakage. 3 Check all cables and connectors between the rail pressure sensor and the EMS. Logg the rail pressure by using Vodia or by performing a voltage measurement. P(norm at idle speed)=30-40 MPa, P(start) approximately 20-30MPa. If the engine can be started, notice at what rail pressure the fault code is set. If the engine can't be started, notice the rail pressure during cranking. 4 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope. 5 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. Check the Fuel quantity regulator signal using oscilloscope.

P008800

Fuel Rail/System Pressure - Too High Bank 1	
SPN [FMI]:	157 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	The rail pressure is critically high more than 2 seconds
Possible Root Cause:	• The Fuel quantity regulator is stucked open, fuel is leaking pass the Fuel quantity regulator. The reason can be a mechanical fault or an electrical fault. Fuel quantity regulator is closed at OC. • The ePRV is stucked close and the fuel pressure can't be released. The ePRV is closed at OC. • Faulty rail pressure sensor.
Corrective Action:	1 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. Check the Fuel quantity regulator signal using oscilloscope. 2 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope. 3 Check all cables and connectors between the rail pressure sensor and the EMS. Logg the rail pressure by using Vodia or by performing a voltage measurement.

P008A00

Low Pressure Fuel System Pressure - Too Low	
SPN [FMI]:	94 [18]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	• Engine is difficult to start or does not start. • Engine performance affected.
DTC Monitor Detection Time:	5 seconds
Failure Event:	Fuel pressure is lower than expected.
Possible Root Cause:	• Closed fuel cock. • Low fuel level. • Blocked fuel fine filter/pre fuel filter. • Leakage in the fuel system. • Fuel tank ventilation is clogged or closed. • Air in the fuel system. Air leakage in the low pressure system. • Faulty fuel pressure sensor. • Blocked strainer/filter in high pressure pump inlet (from pre fuel filter).
Corrective Action:	1 Open fuel cock. Check fuel level, hoses and fuel filter for leakage. Check that the fuel hoses are not blocked or squeezed. Change all fuel filters. Bleed the fuel system. 2 Verify good tank ventilation function. 3 Run the engine from a separate stand-alone fuel tank. Since the high pressure pump is sucking the fuel from the tank, a search must be made for air entry between the high pressure pump and the tank. Check for air leakage. 4 Check the fuel pressure sensor by control measuring the fuel pressure. Please refer to the workshop manual Grp 21-26.

P008B00

Low Pressure Fuel System Pressure - Too High	
System:	Fuel System
SPN [FMI]:	94 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	Engine is difficult to start or does not start. or Engine performance affected.
Failure Event:	Fuel pressure is higher than expected.
Possible Root Cause:	• Blocked fuel fine filter/pre-fuel filter. • Faulty fuel pressure sensor. • Blocked strainer/filter in high-pressure pump inlet (from pre-fuel filter).
Corrective Action:	1 Check/replace fuel filter. 2 Check the fuel pressure sensor by control measuring the fuel pressure. Refer to workshop manual (group 21–26).

P008B97

Low Pressure Fuel System Pressure - Too High	
SPN [FMI]:	94 [0]
Node:	EMS
FTB Name:	Component or System Operation Obstructed or Blocked
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	• Engine is difficult to start or does not start. • Engine performance affected.
Failure Event:	Fuel pressure is higher/lower than expected.
Possible Root Cause:	• Clogged main fuel filter. • Faulty fuel pressure sensor • Blocked strainer/filter in high pressure pump fuel inlet (from main fuel filter).
Corrective Action:	1 Replace the main fuel filter. 2 Check the fuel pressure sensor by control measuring the fuel pressure. Please refer to the workshop manual Grp 21-26.

P009011

Fuel Pressure Regulator 1 Control	
SPN [FMI]:	679 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1 seconds
Functional Behaviour Description:	• Engine might not start • Engine might stop • High fuel consumption • High fuel temperature
Failure Event:	Current at A12/A16 is outside expected range
Possible Root Cause:	• SC: A12/A16, GND • Faulty Fuel quantity regulator (SCV, Suction Control Valve)
Corrective Action:	1 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. Check the Fuel quantity regulator signal using oscilloscope.

P009012

Fuel Pressure Regulator 1 Control	
SPN [FMI]:	679 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1 seconds
Functional Behaviour Description:	• Engine might not start • Engine might stop • High fuel consumption • High fuel temperature
Failure Event:	Current at A12/A16 rises too fast
Possible Root Cause:	• SC: A16, A12 • Faulty Fuel quantity regulator (SCV, Suction Control Valve)
Corrective Action:	1 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. Check the Fuel quantity regulator signal using oscilloscope.

P009013

Fuel Pressure Regulator 1 Control	
SPN [FMI]:	679 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1 seconds
Functional Behaviour Description:	• Engine might not start • Engine might stop • High fuel consumption • High fuel temperature
Failure Event:	Current at A12/A16 rises too slow
Possible Root Cause:	• OC: A12/A16 • Faulty Fuel quantity regulator (SCV, Suction Control Valve)
Corrective Action:	1 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. Check the Fuel quantity regulator signal using oscilloscope.

P009400

Fuel System Leak Detected - Small Leak	
SPN [FMI]:	1239 [14]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1 seconds
Functional Behaviour Description:	None
Failure Event:	During the engine shutdown sequence the rail pressure is monitored by the EMS. If there is an unexpected fuel pressure drop in the rail during an evaluation period the DTC is set.
Possible Root Cause:	• Leakage in the high pressure system • Faulty ePRV. (open/partially opened) • Faulty rail pressure sensor
Corrective Action:	1 Check the high pressure system for leakage. 2 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope. Check the fuel return from the ePRV. 3 Check all cables and connectors between the rail pressure sensor and the EMS. Logg the rail pressure by using Vodia or by performing a voltage measurement.

P009B11

Fuel Pressure Relief Control	
SPN [FMI]:	520244 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1 second
Functional Behaviour Description:	• Remaining pressure in fuel rail after engine stop • Engine might not start • Engine might stop
Failure Event:	Current at A28/A62 is outside expected range
Possible Root Cause:	• SC: A28/A62, GND • Faulty ePRV
Corrective Action:	1 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope.

P009B12

Fuel Pressure Relief Control	
SPN [FMI]:	520244 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1 second
Functional Behaviour Description:	• Remaining pressure in fuel rail after engine stop • Engine might not start • Engine might stop
Failure Event:	Current at A28/A62 rises too fast
Possible Root Cause:	• SC: A28/A62, Vbat • Faulty ePRV
Corrective Action:	1 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope.

P009B13

Fuel Pressure Relief Control	
SPN [FMI]:	520244 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1 second
Functional Behaviour Description:	• Remaining pressure in fuel rail after engine stop • Engine might not start • Engine might stop
Failure Event:	Current is outside expected range. **NOTICE!** Risk for high fuel pressure after engine shutdown. Please refer to the workshop manual Grp 21-26.
Possible Root Cause:	• OC: A28/A62 • Faulty ePRV
Corrective Action:	1　Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope.

P009B73

Fuel Pressure Relief Control	
SPN [FMI]:	520244 [7]
Node:	EMS
FTB Name:	Actuator Stuck Closed
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
DTC Monitor Test Conditions:	Engine running
Functional Behaviour Description:	Engine derate
Failure Event:	No rail pressure drop during ePRV activation. **NOTICE!** Risk for high fuel pressure after engine shutdown. Refer to workshop manual Grp 21–26.
Possible Root Cause:	Faulty ePRV
Corrective Action:	1 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope.

P00C600

Fuel Rail Pressure Too Low - Engine Cranking Bank 1	
SPN [FMI]:	157 [14]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	8 seconds
Functional Behaviour Description:	Engine cranks but does not start.
Failure Event:	Rail pressure increase unsufficient during cranking.
Possible Root Cause:	• Closed fuel cock. • Low fuel level. • Blocked fuel filter. • Leakage in the fuel system. • Air in the fuel system. Air leakage in the low pressure system. • Faulty rail pressure sensor. • Faulty/stucked open ePRV. • Faulty/stucked closed Fuel quantity regulator (SCV, Suction Control Valve). • Blocked strainder/filter in high pressure pump tank inlet. • Blocked strainer/filter in high pressure pump fuel inlet (from fuel filter) • Faulty injectors, leakage in combustion chamber.
Corrective Action:	1 Check that the fuel inlet valve is open and that the fuel lines are correctly connected. Check fuel level. Do a visual check of the fuel system for squeezed hoses/pipes and for leakage. Change the fuel filters. Bleed the fuel system. 2 Run the engine from a separate stand-alone fuel tank. Since the high pressure pump is sucking the fuel from the tank, a search must be made for air entry between the high pressure pump and the tank. Check for air leakage. 3 Check all cables and connectors between the rail pressure sensor and the EMS. Logg the rail pressure by using Vodia or by performing a voltage measurement. P(norm at idle speed)=30-40 MPa, P(start) approximately 20-30 MPa. If the engine can be started, notice at what rail pressure the fault code is set. If the engine can't be started, notice the rail pressure during cranking. 4 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope. Check the fuel return from the ePRV. 5 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. Check the Fuel quantity regulator signal using oscilloscope

P00D911

Ambient Air Temperature Sensor "B"	
SPN [FMI]:	172 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	15 seconds
Functional Behaviour Description:	Engine might be hard to start in cold climate
Failure Event:	U at B31 < 0.06V
Possible Root Cause:	• SC: B31, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor

P00D913

Ambient Air Temperature Sensor "B"	
SPN [FMI]:	172 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	15 seconds
Functional Behaviour Description:	Engine might be hard to start in cold climate
Failure Event:	U at B31 > 4.89V
Possible Root Cause:	• OC: B31 • SC: B31, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket B31 in the EMS connector. 3 Check the sensor.

P010512

Manifold Absolute Pressure/Barometric Pressure Sensor	
SPN [FMI]:	102 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	U at A22 > 4,85V
Possible Root Cause:	• OC: A11 • SC: A22, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket A11 in the EMS connector. 3 Check the sensor.

P010513

Manifold Absolute Pressure/Barometric Pressure Sensor	
SPN [FMI]:	102 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	U at A22 < 0,15V
Possible Root Cause:	• OC: A22 • OC: 5+ • SC: A22, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket A22 in the EMS connector. 3 Check the sensor.

P010562

Manifold Absolute Pressure/Barometric Pressure Sensor	
SPN [FMI]:	102 [7]
Node:	EMS
FTB Name:	Signal Compare Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	60 seconds steady at low load and 60 seconds steady at high load.
DTC Monitor Test Conditions:	Run warm engine normally at different loads. More steady state driving than transient.
Functional Behaviour Description:	• Engine might not run properly, with either low performance or high soot.
Failure Event:	Boost Pressure signal from sensor is stuck at a value.
Possible Root Cause:	Sensor Failure or Sensor not in correct position.
Corrective Action:	1 Replace Boost Pressure Sensor or check the mounting for correct position.

P011011

Intake Air Temperature Sensor 1 Bank 1	
SPN [FMI]:	105 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at A47 < 0,15V
Possible Root Cause:	• SC: A47, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P011013

Intake Air Temperature Sensor 1 Bank 1	
SPN [FMI]:	105 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at A47 > 4,91V
Possible Root Cause:	• OC: A47/ A11 • SC: A47, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket A47/A11 in the EMS connector. 3 Check the sensor.

P011511

Engine Coolant Temperature Sensor 1	
SPN [FMI]:	110 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	• Engine is difficult to start • Idle run regulation is detoriated
Failure Event:	U at B27 < 0,15V
Possible Root Cause:	• SC: B27, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P011513

Engine Coolant Temperature Sensor 1	
SPN [FMI]:	110 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	• Engine is difficult to start • Idle run regulation is detoriated
Failure Event:	U at B27 > 4,91V
Possible Root Cause:	• OC: B27 • SC: B27, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket B27 in the EMS connector. 3 Check the sensor.

P01152A

Engine Coolant Temperature Sensor 1	
SPN [FMI]:	110 [10]
Node:	EMS
FTB Name:	Signal Stuck In Range
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	120 seconds
DTC Monitor Test Conditions:	Coolant Temperature at engine start below 60 and Barometric Pressure between 83 and 120 and Engine running and Engine considered to be fully warmed up
Functional Behaviour Description:	• Engine cooling fan does not shut off. • Engine does not reach normal operating temperature. • Engine cooling fan inoperative. • Engine overheating.
Failure Event:	Difference during Precrank between Engine Coolant Temperature and mean value of (EGR Temperature, Compressor Temperature, Boost Temperature, CAC outlet temp) when above 100 degrees.
Possible Root Cause:	Sensor Failure on Coolant temperature sensor
Corrective Action:	1 Replace Coolant temp sensor

P012082

Throttle/Pedal Position Sensor "A"	
SPN [FMI]:	91 [9]
Node:	EMS
FTB Name:	Alive / Sequence Counter Incorrect / Not Updated
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	Limited engine speed
Failure Event:	The EMS is not receiving a valid pedal signal.
Corrective Action:	1 Check for a concurrent set DTC about pedal issues. 2 Check all cables and connectors between the pedal, DCU and the EMS. 3 Check that the pedal installation and set up is done according to the installation manual.

P012083

Throttle/Pedal Position Sensor "A"	
SPN [FMI]:	91 [19]
Node:	EMS
FTB Name:	Value of Signal Protection Calculation Incorrect
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	Limited engine speed
Failure Event:	The EMS is not receiving a valid pedal signal
Corrective Action:	1 Check for a concurrent set DTC about pedal issues.
	2 Check all cables and connectors between the pedal, DCU and the EMS.
	3 Check that the pedal installation and set up is done according to the installation manual.

P012085

Throttle/Pedal Position Sensor "A"	
SPN [FMI]:	91 [0]
Node:	EMS
FTB Name:	Signal Above Allowable Range
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	Limited engine speed
Failure Event:	Faulty pedal position signal. Pedal position input value > 100%
Possible Root Cause:	• Faulty pedal installation or set up. • Faulty pedal potentiometer.
Corrective Action:	1 Check that the pedal installation and set up is done according to the installation manual. 2 Check the pedal potentiometer output range. 0.2V < Approved range < 4.8V

P012800

Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature)	
SPN [FMI]:	1659 [12]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	Engine does not reach normal operating temperature
Failure Event:	The average coolant temperature below excpected temperature (typically 71° C)
Possible Root Cause:	• Faulty thermostat • Faulty coolant temperature sensor.
Corrective Action:	1 Replace thermostat 2 Replace the sensor.

P016800

Fuel temperature too high.	
SPN [FMI]:	3468 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	300 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Fuel temperature is above the set value of the engine protection parameter.
Possible Root Cause:	• Low fuel level. (high fuel flow) • Excessive heat transfer to fuel tank, sensor or fuel pipe • Faulty sensor • Leaking ePRV (high fuel flow)
Corrective Action:	1 Check the fuel level/fill the tank up with fuel. **NOTICE!** High temperature caused by fast return flow of fuel to the tank is reduced if there is a lot of fuel in the tank. 2 Check the installation of the fuel tank and fuel pipes. See if something is radiating heat against the fuel system. 3 Check the fuel temperature sensor. 4 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope. Check the fuel return from the ePRV.

P016E00

Closed Loop Fuel Pressure Control At Limit - Pressure Too High	
SPN [FMI]:	520245 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Average rail pressure deviation above 10 MPa for 10 seconds
Possible Root Cause:	• Faulty rail pressure sensor • Faulty/stuck/not opening ePRV • Faulty/leaking Fuel quantity regulator (SCV, Suction Control Valve) • Wrongly mounted high pressure pump. If the pump been dismounted/exchanged the pump alignment against the flywheel position is wrong.
Corrective Action:	1 Check all cables and connectors between the rail pressure sensor and the EMS. Logg the rail pressure by using Vodia or by performing a voltage measurement. P(norm at idle speed)=30-40 MPa. Notice at what rail pressure the fault code is set. 2 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope. 3 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. Check the Fuel quantity regulator signal using oscilloscope. 4 If the high pressure pump been dismounted/exchanged check the pump installation according to the workshop manual Grp 21-26.

P016F00

Closed Loop Fuel Pressure Control At Limit - Pressure Too Low	
SPN [FMI]:	520245 [1]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Average rail pressure deviation below 10 MPa for 10 seconds
Possible Root Cause:	• Low fuel level. • Blocked fuel filter • Leakage in the fuel system • Air in the fuel system. Air leakage in the low pressure system. • Faulty rail pressure sensor. • Faulty/leaking ePRV. • Faulty/stucked Fuel quantity regulator (SCV, Suction Control Valve). • Faulty injectors, leakage in combustion chamber.
Corrective Action:	1 Check fuel level, hoses and fuel filter for leakage. Check that the fuel hoses are not blocked or squeezed. Change the fuel filter. Bleed the fuel system. 2 Run the engine from a separate stand-alone fuel tank. Since the high pressure pump is sucking the fuel from the tank, a search must be made for air entry between the high pressure pump and the tank. Check for air leakage. 3 Check all cables and connectors between the rail pressure sensor and the EMS. Logg the rail pressure by using Vodia or by performing a voltage measurement. P(norm at idle speed)=30-40 MPa. Notice at what rail pressure the fault code is set. 4 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope. Check the fuel return from the ePRV. 5 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. Check the Fuel quantity regulator signal using oscilloscope.

P018011

Fuel Temperature Sensor "A" Circuit	
System:	Coolant System
SPN [FMI]:	174 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage at B32 below normal range
Possible Root Cause:	• Faulty wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor

P018012

Fuel Temperature Sensor "A" Circuit	
System:	Coolant System
SPN [FMI]:	174 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage at B32 above normal range.
Possible Root Cause:	• Faulty wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P018013

Fuel Temperature Sensor "A" Circuit	
System:	Coolant System
SPN [FMI]:	174 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage at B32 outside normal range
Possible Root Cause:	• Faulty wiring. • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P018501

Fuel Temperature Sensor "B"	
SPN [FMI]:	3468 [12]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	15 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage at A5/B32 outside normal range
Possible Root Cause:	• Faulty wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P018511

Fuel Temperature Sensor "B"	
SPN [FMI]:	3468 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	15 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage at A5/B32 below normal range
Possible Root Cause:	• Faulty wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P018513

Fuel Temperature Sensor "B"	
SPN [FMI]:	3468 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	15 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage at A5/B32 outside normal range
Possible Root Cause:	• Faulty wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P018564

Fuel Temperature Sensor "B"	
SPN [FMI]:	3468 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	60 seconds
Functional Behaviour Description:	None
Failure Event:	The plausibility diagnostic is raised when there is no correlation between, the fuel temperature, ambient temperature, and coolant temperature.
Possible Root Cause:	• Ambient air temperature sensor not mounted/ambient airtemperature sensor broken. • Coolant temperature sensor not mounted/coolant temperature sensor broken.
Corrective Action:	1 Check all cables and connectors between the sensors and the EMS.

P019001

Fuel Rail Pressure Sensor Bank 1	
SPN [FMI]:	157 [12]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Low power.
Failure Event:	0.80V > U at A5 > 0.15V or 4.85V > U at A19 > 4.68V
Possible Root Cause:	• Unwanted circuit resistance • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P019011

Fuel Rail Pressure Sensor Bank 1	
SPN [FMI]:	157 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	U at A19 < 0.15V
Possible Root Cause:	• SC: A19, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P019013

Fuel Rail Pressure Sensor Bank 1	
SPN [FMI]:	157 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	U at A19 > 4.85V
Possible Root Cause:	• OC: A19 • SC: A19, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket A19 in the EMS connector. 3 Check the sensor.

P01901F

Fuel Rail Pressure Sensor Bank 1	
SPN [FMI]:	157 [10]
Node:	EMS
FTB Name:	Circuit Intermittent
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Significant rail pressure signal transition when none or minor expected.
Possible Root Cause:	• Fault in sensor wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P019064

Fuel Rail Pressure Sensor Bank 1	
SPN [FMI]:	157 [10]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Rail pressure fluctuation less than expected
Possible Root Cause:	• Fault in sensor wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P019511

Engine Oil temperature Sensor "A"	
SPN [FMI]:	175 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at A31 < 0,15V
Possible Root Cause:	• SC: A31, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P019513

Engine Oil temperature Sensor "A"	
SPN [FMI]:	175 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at A31 > 4,85V
Possible Root Cause:	• OC: A31 • SC: A31, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket A31 in the EMS connector. 3 Check the sensor.

P019564

Engine Oil temperature Sensor "A"	
SPN [FMI]:	157 [10]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Rail pressure fluctuation less than expected
Possible Root Cause:	• Fault in sensor wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P01B901

Engine Oil Temperature Sensor "B"	
SPN [FMI]:	1135 [12]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage on A30 Outside plausible range
Possible Root Cause:	• Faulty wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P01B911

Engine Oil Temperature Sensor "B"	
SPN [FMI]:	1135 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage on A30 Below 0.15 V
Possible Root Cause:	• SC: A30, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P01B913

Engine Oil Temperature Sensor "B"	
SPN [FMI]:	1135 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage on A:30 above 4.913330V
Possible Root Cause:	• OC: A30 • SC: A30, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P020111

Cylinder 1 Injector "A"	
SPN [FMI]:	651 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving is outside expected range.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020112

Cylinder 1 Injector "A"	
SPN [FMI]:	651 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to quickly.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020113

Cylinder 1 Injector "A"	
SPN [FMI]:	651 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to slow.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020211

Cylinder 2 Injector "A"	
SPN [FMI]:	652 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving is outside expected range.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020212

Cylinder 2 Injector "A"	
SPN [FMI]:	652 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to quickly.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020213

Cylinder 2 Injector "A"	
SPN [FMI]:	652 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to slow.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020311

Cylinder 3 Injector "A"	
SPN [FMI]:	653 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving is outside expected range.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020312

Cylinder 3 Injector "A"	
SPN [FMI]:	653 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to quickly.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020313

Cylinder 3 Injector "A"	
SPN [FMI]:	653 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to slow.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020411

Cylinder 4 Injector "A"	
SPN [FMI]:	654 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving is outside expected range.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020412

Cylinder 4 Injector "A"	
SPN [FMI]:	654 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to quickly
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020413

Cylinder 4 Injector "A"	
SPN [FMI]:	654 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to slow.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020511

Cylinder 5 Injector "A"	
SPN [FMI]:	655 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving is outside expected range.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020512

Cylinder 5 Injector "A"	
SPN [FMI]:	655 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to quickly.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020513

Cylinder 5 Injector "A"	
SPN [FMI]:	655 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to slow.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020611

Cylinder 6 Injector "A"	
SPN [FMI]:	656 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving is outside expected range.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020612

Cylinder 6 Injector "A"	
SPN [FMI]:	656 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to quickly.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P020613

Cylinder 6 Injector "A"	
SPN [FMI]:	656 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0.5 seconds
Functional Behaviour Description:	• Derate according to the engine protection map. • Uneven running. Run on three to five cylinders.
Failure Event:	Current driving the injector rises to slow.
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check all cables and connectors between the injector and the EMS. 2 Check the injector.

P021700

Engine Coolant Over Temperature Condition	
SPN [FMI]:	110 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Engine is derated if the engine protection parameter is activated.
Failure Event:	Coolant water temperature exceeds the set value of the engine protection parameter.
Possible Root Cause:	• Coolant level too low. • Radiator fan system not function properly. • Dust or dirt on the outside of the radiator. • Drive belt is not properly adjusted. • There is air in the coolant water system. • Faulty thermostat. • Faulty temperature sensor. • Faulty coolant pressure cap. • Clogged cooling system. • Worn coolant pump.
Corrective Action:	1 Check the coolant level. If low coolant level check the coolant water system for leakage by a pressure test. 2 Check the function of the radiator fan system. 3 Check the outside of radiator for dust and dirt. 4 Check the drive belt adjustment. 5 Run VODIA routine "Coolant Pump High/Low Speed Test". Check if there are any coolant temperature changes when running the pump at different speeds. If not check the coolant water circuit: - Bleed the coolant water system.. - Replace the coolant water thermostat. - Check the coolant temperature sensor. - Replace the coolant pressure cap. - Clean the cooling system. 6 Replace the coolant pump.

P021900

Engine Overspeed Condition	
SPN [FMI]:	190 [0]
DTC node:	EMS
Failure type:	No Sub Type Information
DTC description:	Engine overspeed detected.
Monitoring condition:	Monitoring engine speed.
Fault indication:	Yellow alarm status
DTC stored:	Yes
Replacement value:	None
Symptom:	Engine speed limited
DTC conditions:	• Engine is / was overspeeding • Overspeed limit = Maximum permitted engine speed + (deepends of engine model, typical 4–10%)
Probable cause:	Vehicle is rolling downhill, of a ramp or similar forcing the engine to speed above maximum permitted engine speed.
Action:	1 Check the vehicle driving cycle to see if any situation could trigger engine overspeed condition. 2 If the engine is situated at high altitude the EMS ambient pressure sensor could be wrong. Log the Barometric Pressure, P1E1S, using Vodia.

P023400

Turbocharger/Supercharger Overboost Condition	
SPN [FMI]:	1127 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	60 seconds
DTC Monitor Test Conditions:	Run engine normally at different loads. More steady state driving than transient.
Functional Behaviour Description:	Engine damage could occur earlier than expected.
Failure Event:	Boost Pressure has at some point been higher than expected.
Possible Root Cause:	• Wastegate not function correctly.
Corrective Action:	1 Check wastegate for proper function. Both mechanically and electrically.

P023A07

Charge Air Cooler Coolant Pump "A" Control	
SPN [FMI]:	520998 [7]
Node:	EMS
FTB Name:	Mechanical Failures
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	-
Functional Behaviour Description:	No cooling of the charge air High air inlet manifold temperature Possible derate
Failure Event:	Pump motor overloaded
Possible Root Cause:	• Blocked charge air cooling circuit • Pump rotor stuck
Corrective Action:	1 Run VODIA routine "Charge Air Cooler Coolant Pump Test". Check if there are any air inlet manifold temperature changes when running the pump at different speeds If not: Check the charge air cooling circuit for blocked pipes/hoses. 2 Replace the pump.

P023A16

Charge Air Cooler Coolant Pump "A" Control	
SPN [FMI]:	520998 [4]
Node:	EMS
FTB Name:	Circuit Voltage Below Threshold
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	No cooling of the charge air High air inlet manifold temperature Possible derate
Failure Event:	Pump motor supply voltage too low
Possible Root Cause:	• Pump motor supply voltage is too low
Corrective Action:	1 Verify that the engine supply voltage is within specified range 2 Check the wiring harness and connectors

P023A1C

Charge Air Cooler Coolant Pump "A" Control	
SPN [FMI]:	520998 [13]
Node:	EMS
FTB Name:	Circuit Voltage Out of Range
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	No cooling of the charge air High air inlet manifold temperature Possible derate
Failure Event:	Pump motor voltage out of range
Possible Root Cause:	• Pump motor supply voltage below 15 V • Pump motor supply voltage above 59 V
Corrective Action:	1 Verify that the pump motor supply voltage is within specified range 2 Check the wiring harness and connectors

P023A85

Charge Air Cooler Coolant Pump "A" Control	
SPN [FMI]:	520998 [15]
Node:	EMS
FTB Name:	Signal Above Allowable Range
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	No cooling of the charge air High air inlet manifold temperature Possible derate
Failure Event:	Pump internal temperature above 130 °C
Possible Root Cause:	• High charge air cooling circuit temperature • High ambient temperature • Internal pump problem
Corrective Action:	1 Reduce load to let the system cool down 2 Check cooling circuit for blocked pipes/hoses 3 Clean the system 4 Replace the pump

P023A96

Charge Air Cooler Coolant Pump "A" Control	
SPN [FMI]:	520998 [15]
Node:	EMS
FTB Name:	Component Internal Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	No cooling of the charge air High air inlet manifold temperature Possible derate
Failure Event:	Internal pump fault
Possible Root Cause:	• Internal pump fault
Corrective Action:	1 Replace the Pump

P023A98

Charge Air Cooler Coolant Pump "A" Control	
SPN [FMI]:	520998 [0]
Node:	EMS
FTB Name:	Component or System Over Temperature
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	No cooling of the charge air High air inlet manifold temperature Possible derate
Failure Event:	Pump internal temperature above 142 °C
Possible Root Cause:	• High charge air cooling circuit temperature • High ambient temperature • Internal pump problem
Corrective Action:	1 Reduce load to let the system cool down 2 Check cooling circuit for blocked pipes/hoses 3 Clean the system 4 Replace the pump

P024311

Turbocharger/Supercharger Wastegate Solenoid "A"	
SPN [FMI]:	1188 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Low power
Failure Event:	U at B38 < 1/3 Vbat (tier4, D8 marine)
Possible Root Cause:	• SC: B38, GND
Corrective Action:	1 Check all cables and connectors between the wastegate solenoid and the EMS.

P024312

Turbocharger/Supercharger Wastegate Solenoid "A"	
SPN [FMI]:	1188 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Low power
Failure Event:	I at B38 > 2.2A
Possible Root Cause:	• SC: B38, Vbat • Faulty wastegate solenoid
Corrective Action:	1 Check all cables and connectors between the wastegate solenoid and the EMS. 2 Check the wastegate solenoid.

P024313

Turbocharger/Supercharger Wastegate Solenoid "A"	
SPN [FMI]:	1188 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Low power
Failure Event:	2/3 Vbat > U at B38 > 1/3 Vbat
Possible Root Cause:	• OC: B38 • Unwanted circuit resistance • Faulty wastegate solenoid
Corrective Action:	1 Check all cables and connectors between the wastegate solenoid and the EMS. 2 Check the contact pressure at the wastegate connector and in socket B38 in the EMS connector. 3 Check the wastegate solenoid.

P025112

Injection Pump Fuel Metering Control "A" (Cam/Rotor/Injector)	
SPN [FMI]:	651 [2]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current reaches 16 A before (time) 35 µs OR Measured Low current does not reach 6.6 A within (time) 150 µs
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:59 A:24

P025114

Injection Pump Fuel Metering Control "A" (Cam/Rotor/Injector)	
SPN [FMI]:	651 [1]
Node:	EMS
FTB Name:	Circuit Short To Ground or Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current does not reach 16 A within (time) 300 µs
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:59 A:24

P025612

Injection Pump Fuel Metering Control B	
SPN [FMI]:	652 [2]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current reaches 16 A before (time) 35 µs OR Measured Low current does not reach 6.6 A within (time) 150 µs
Possible Root Cause:	• Faulty wiring. • Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:59 A:16

P025614

Injection Pump Fuel Metering Control B	
SPN [FMI]:	652 [1]
Node:	EMS
FTB Name:	Circuit Short To Ground or Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current does not reach 16 A within (time) 300 µs
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:59 A:16

P025692

Injection Pump Fuel Metering Control B	
SPN [FMI]:	652 [18]
Node:	EMS
FTB Name:	Performance or Incorrect Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Loss of high fuel pressure pumping capacity
Possible Root Cause:	• Faulty high fuel pressure pump • Faulty cam profile
Corrective Action:	1 Check the high fuel pressure pump 2 Check if rotated cam profile

P029800

Engine Oil Over Temperature	
SPN [FMI]:	175 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Engine is derated if the engine protection parameter is activated.
Failure Event:	Engine oil temperature exceeds the set value of the engine protection parameter.
Possible Root Cause:	• Low oil level • High engine temperature — Low coolant level — Radiator fan system not function properly • Faulty sensor • Clogged oil cooler • Faulty oil cooler by-pass valve
Corrective Action:	1 Check the oil level in the engine. Check that no leakage occurs. 2 Check the engine coolant temperature. — Check the coolant level. — Check function of the radiator fan system 3 Check the sensor. 4 Clean the oil cooler system. 5 Replace the oil cooler by-pass valve.

P029900

Turbocharger/Supercharger Underboost	
SPN [FMI]:	1127 [18]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	60 seconds
DTC Monitor Test Conditions:	Run engine normally at different loads. More steady state driving than transient.
Functional Behaviour Description:	Extreme soot buildup in DPF and poor performance of engine.
Failure Event:	Boost Pressure has at some point been lower than expected.
Possible Root Cause:	• Air leakage in boost pipes from turbocharger to intake manifold. • Turbocharger damaged. • Wastegate not functioning correctly.
Corrective Action:	1 Check all boost pressure air pipes from turbocharger to intake manifold, and intercooler for air leaks or blocks. 2 Check wastegate functionality. Both mechanically and electrically. 3 Check EGR valve for proper function, and that it is closed at higher loads. 4 Check turbocharger for damage or dirt buildup.

P02E011

Diesel Intake Air Flow Control	
SPN [FMI]:	3464 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Throttle set in default position (fully open).
Failure Event:	I at B1/B5 higher than normal
Possible Root Cause:	• SC: B1/B5, GND • Faulty throttle actuator motor
Corrective Action:	1 Check all cables and connectors between the throttle actuator and the EMS. 2 Check the throttle actuator motor.

P02E012

Diesel Intake Air Flow Control	
SPN [FMI]:	3464 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Throttle set in default position (fully open).
Failure Event:	U at B1/B5 higher than normal
Possible Root Cause:	• SC: B1/B5, Vbat • SC: B1, B5 • Faulty throttle actuator motor
Corrective Action:	1 Check all cables and connectors between the throttle actuator and the EMS. 2 Check the throttle actuator motor.

P02E013

Diesel Intake Air Flow Control	
SPN [FMI]:	3464 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Throttle set in default position (fully open).
Failure Event:	I at B1/B5 lower than normal
Possible Root Cause:	• OC: B1/B5 • Faulty throttle actuator motor
Corrective Action:	1 Check all cables and connectors between the throttle actuator and the EMS. 2 Check the contact pressure in the throttle actuator connector and in socket B1/B5 in the EMS connector. 3 Check the throttle actuator motor.

P02E07C

Diesel Intake Air Flow Control	
SPN [FMI]:	3464 [10]
Node:	EMS
FTB Name:	Slow Response
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	3 seconds
Functional Behaviour Description:	Poor engine control
Failure Event:	A throttle actuator valve position sensor check performed at key on, and a throttle actuator valve calibration procedure is executed at key off. The current limitation is activated if the valve is too hard to move.
Possible Root Cause:	• Contaminated throttle actuator valve • Stucked or obstructed throttle actuator valve • Faulty throttle actuator valve • Faulty throttle actuator valve position sensor
Corrective Action:	1 Clean the throttle actuator valve. 2 Check that the throttle actuator valve is not stucked or obstructed. Check that the start-up test of the throttle actuator valve, open/close, is performed as normal at key on. The throttle actuator valve movement shall be smooth during the start-up test. 3 Check the throttle actuator valve position sensor.
Info:	When root cause is fixed do as follow to clear the DTC: 1 Start the engine and run it at a speed above idle speed. 2 Turn ignition off. 3 Wait until the system shuts down.

P02E09B

Diesel Intake Air Flow Control	
SPN [FMI]:	3464 [12]
Node:	EMS
FTB Name:	High/Excessive Flow
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
Functional Behaviour Description:	Reduced capability to heat the exhaust gases.
Failure Event:	Demanded throttle position deviates from current throttle position.
Possible Root Cause:	Contaminated throttle actuator valve
Corrective Action:	1 Clean the throttle actuator valve. 2 Check that the throttle actuator valve is not stucked or obstructed. Check that the start-up test of the throttle actuator valve, open/close, is performed as normal at key on. The throttle actuator valve movement shall be smooth during the start-up test. 3 Check the throttle actuator valve position sensor.
Info:	When root cause is fixed do as follow to clear the DTC: 1 Start the engine and run it at a speed above idle speed. 2 Turn ignition off. 3 Wait until the system shuts down.

P02E09C

Diesel Intake Air Flow Control	
SPN [FMI]:	3464 [7]
Node:	EMS
FTB Name:	Low/Insufficient Flow
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
Functional Behaviour Description:	None
Failure Event:	Demanded throttle position deviates from current throttle position.
Possible Root Cause:	Contaminated throttle actuator valve
Corrective Action:	1 Clean the throttle actuator valve. 2 Check that the throttle actuator valve is not stucked or obstructed. Check that the start-up test of the throttle actuator valve, open/close, is performed as normal at key on. The throttle actuator valve movement shall be smooth during the start-up test. 3 Check the throttle actuator valve position sensor.
Info:	When root cause is fixed do as follow to clear the DTC: 1 Start the engine and run it at a speed above idle speed. 2 Turn ignition off. 3 Wait until the system shuts down.

P02E601

Diesel Intake Air Flow Position Sensor	
SPN [FMI]:	51 [12]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	None
Failure Event:	0.25V > U at B24 > 0.15V or 4.85V > U at B24 > 4.76V
Possible Root Cause:	• Unwanted circuit resistance • Faulty throttle actuator valve position sensor
Corrective Action:	1 Check all cables and connectors between the throttle actuator and the EMS. 2 Check the throttle actuator valve position sensor.

P02E612

Diesel Intake Air Flow Position Sensor	
SPN [FMI]:	51 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	Idle mode
Failure Event:	U at B24 > 4.85V
Possible Root Cause:	• OC: B18 • SC: B24, 5+ • SC: B24, B1/B5
Corrective Action:	1 Check all cables and connectors between the throttle actuator and the EMS. 2 Check the throttle actuator valve position sensor.

P02E613

Diesel Intake Air Flow Position Sensor	
SPN [FMI]:	51 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	Idle mode
Failure Event:	U at B24 < 0.15V
Possible Root Cause:	• OC: B24 • OC: B17 • SC: B24, GND • SC: B17, B18 • Faulty throttle actuator valve position sensor
Corrective Action:	1 Check all cables and connectors between the throttle actuator and the EMS. 2 Check the contact pressure in the throttle actuator connector and in socket B24, B17 in the EMS connector. 3 Check the throttle actuator valve position sensor.

P02E697

Diesel Intake Air Flow Position Sensor	
SPN [FMI]:	51 [13]
Node:	EMS
FTB Name:	Component or System Operation Obstructed or Blocked
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	• Idle mode • Engine can not/hard to start
Failure Event:	Throttle actuator valve position below target position when fully closed or throttle actuator valve position above target position when fully opened.
Possible Root Cause:	• Stucked or obstructed throttle actuator valve • Faulty throttle actuator valve • Faulty throttle actuator valve position sensor
Corrective Action:	1 Check that the throttle actuator valve is not stucked or obstructed. Check that the start-up test of the throttle actuator valve, open/close, is performed as normal at key on. The throttle actuator valve movement shall be smooth during the start-up test. 2 Check the throttle actuator valve position sensor.
Info:	When root cause is fixed do as follow to clear the DTC: 1 Turn ignition on. Throttle calibration is performed. 2 Turn ignition off. 3 Wait until the system shuts down.

P02E699

Diesel Intake Air Flow Position Sensor	
SPN [FMI]:	51 [7]
Node:	EMS
FTB Name:	Exceeded Learning Limit
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	• Idle mode • Engine cannot/hard to start
Failure Event:	Throttle actuator valve calibration not finished within maximum time limit. A position sensor check performed at key on, and a throttle actuator valve calibration procedure is executed at key off.
Possible Root Cause:	Faulty/sticky throttle actuator valve.
Corrective Action:	1 Check that the throttle actuator valve is not stucked or obstructed. Check that the start-up test of the throttle actuator valve, open/close, is performed as normal at key on. The throttle actuator valve movement shall be smooth during the start-up test. 2 Check the throttle actuator valve position sensor.
	When root cause is fixed do as follow to clear the DTC: 1 Turn ignition on. Throttle calibration is performed. 2 Turn ignition off. 3 Wait until the system shuts down.

P03351F

Crankshaft Position Sensor "A"	
SPN [FMI]:	637 [2]
Node:	EMS
FTB Name:	Circuit Intermittent
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	• Engine is difficult to start • Loss of torque • The engine will operate unevenly with increased fuel consumption as a consequence.
Failure Event:	Incorrect/weak/intermittent crank speed signal
Possible Root Cause:	• SC: A37, A38 • Polarity fault, the cables to the sensor is shifted
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the crankshaft position sensor signal. Use an oscilloscope. 3 Check the sensor.

P033531

Crankshaft Position Sensor "A"	
SPN [FMI]:	637 [9]
Node:	EMS
FTB Name:	No signal
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	• Engine is difficult to start • Loss of torque • The engine will operate unevenly with increased fuel consumption as a consequence.
Failure Event:	No crankshaft position signal when expected or permanent loss of sensor signal.
Possible Root Cause:	• OC: A37/A38 • SC: A37/A38, Vbat • SC: A37/A38, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure in the sensor connector and in socket A37/A38 in the EMS connector. 3 Check the crankshaft position sensor signal. Use an oscilloscope. 4 Check the sensor.

P033538

Crankshaft Position Sensor "A"	
SPN [FMI]:	637 [8]
Node:	EMS
FTB Name:	Signal Frequency Incorrect
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	• Engine is difficult to start • Loss of torque • The engine will operate unevenly with increased fuel consumption as a consequence.
Failure Event:	Too many crank signal pulses detected inbetween cam signal pulses
Possible Root Cause:	• Incorrectly mounted sensor • Faulty sensor
Corrective Action:	1 Check the installation of the sensor. Please refer to the workshop manual Grp 21–26. 2 Clean the sensor. 3 Check the crankshaft position sensor signal. Use an oscilloscope.

P034031

Camshaft Position Sensor "A" Bank 1 or Single Sensor	
SPN [FMI]:	636 [9]
Node:	EMS
FTB Name:	No signal
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Engine is difficult to start
Failure Event:	No camshaft position signal when expected or permanent loss of sensor signal
Possible Root Cause:	• OC: A45/A46 • SC: A45, A46 • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure in the sensor connector and in socket A45/A46 in the EMS connector. 3 Check the camshaft position sensor signal. Use an oscilloscope. 4 Check the sensor.

P034038

Camshaft Position Sensor "A" Bank 1 or Single Sensor	
SPN [FMI]:	636 [8]
Node:	EMS
FTB Name:	Signal Frequency Incorrect
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Engine is difficult to start
Failure Event:	No camshaft position signal when expected or permanent loss of sensor signal.
Possible Root Cause:	• Incorrectly mounted sensor • OC: A45/A46 • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure in the sensor connector and in socket A45 and A46 in the EMS connector. 3 Check the installation of the sensor. Please refer to the workshop manual Grp 21-26. 4 Check the camshaft position sensor signal. Use an oscilloscope.

P04009C

Exhaust Gas Recirculation "A" Flow	
SPN [FMI]:	2659 [18]
Node:	EMS
FTB Name:	Low/Insufficient Flow
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 minutes
DTC Monitor Test Conditions:	1 Run engine at EATS-temperature (Exhaustgas temp. sensor #3) from 220°C to 300°C and in steady-state (No quick changes in engine speed and torque) for close to 3min. 2 Run engine on idle.
Functional Behaviour Description:	Nox conversion warning and inducement system activated, leading to engine derate.
Failure Event:	The difference in boost temperature between open and closed EGR valve is too low. Normally EGR increases boost temperature significantly. If this does not happen, the EGR flow is regarded as too low.
Possible Root Cause:	• EGR Valve might be stuck in closed position or the EGR circuit might be blocked. • EGR circuit might be blocked
Corrective Action:	1 Check if EGR valve/actuator is stucked in position. (closed EGR = low boost temp, open EGR = high boost temp) If necessary clean the EGR valve/actuator, see grp 21–26 WSM. 2 Check EGR gas piping for blocks or cracks. If no fault can be found, check that boost temp sensor increases when EGR valve opens. (This normally happens at low load and idle)

P040311

EGR "A" Control	
System:	EGR system
SPN [FMI]:	2791 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	• Emissions affected • Possible derate
Failure Event:	Current at A20/A24 outside normal range
Possible Root Cause:	• SC: A20/A24, GND
Corrective Action:	1 Check all cables and connectors between the actuator and the EMS. 2 Check the actuator.

P040312

EGR "A" Control	
SPN [FMI]:	2791 [6]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	• Emissions affected • Possible derate
Failure Event:	Current at A20/A24 outside normal range
Possible Root Cause:	• SC: A20/A24, Vbat
Corrective Action:	1 Check all cables and connectors between the actuator and the EMS 2 Check the actuator.

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P040313

EGR "A" Control	
SPN [FMI]:	2791 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	• Emissions affected • Possible derate
Failure Event:	Current at A20/A24 outside normal range
Possible Root Cause:	• SC: A20/A24, Vbat • OC: A20/A24
Corrective Action:	1 Check all cables and connectors between the actuator and the EMS. 2 Check the actuator.

P040397

EGR "A" Control	
SPN [FMI]:	2791 [7]
Node:	EMS
FTB Name:	Component or System Operation Obstructed or Blocked
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1 second
DTC Monitor Test Conditions:	None
Functional Behaviour Description:	Low power.
Failure Event:	The EMS monitoring of the EGR functionality shows a deviation.
Possible Root Cause:	• EGR valve stucked closed • EGR system might be blocked/restricted
Corrective Action:	1 Clean the EGR valve. Please refer to the workshop manual Grp 21-26. 2 Check EGR system for restrictions. If no fault can be found, check that boost temp sensor increases when EGR valve opens. (This normally happens at low load and idle)

P047001

Exhaust Pressure Sensor "A"	
SPN [FMI]:	131 [12]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	0.21V > U at B12 > 0.15V or 4.85V > U at B12 > 4.79V
Possible Root Cause:	• Unwanted circuit resistance • Faulty exhaust pressure sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P047012

Exhaust Pressure Sensor "A"	
SPN [FMI]:	131 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	Auxiliary brakes, low performance (reduced engine braking)
Failure Event:	U at B12 > 4.85V
Possible Root Cause:	• SC: B12, Vbat • Faulty exhaust pressure sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P047013

Exhaust Pressure Sensor "A"	
SPN [FMI]:	131 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	Auxiliary brakes, low performance (reduced engine braking)
Failure Event:	U at B12 < 0.15V
Possible Root Cause:	• OC: B12 • Faulty exhaust pressure sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket B12 in the EMS connector. 3 Check the sensor.

P047064

Exhaust Pressure Sensor "A"	
SPN [FMI]:	131 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	60 seconds
DTC Monitor Test Conditions:	Run DPF regeneration cycle for checking too low values. Run Engine at idle for checking too high values.
Functional Behaviour Description:	DPF regeneration and engine brake will not work properly.
Failure Event:	Exhaust pressure signal shows too high or too low values.
Possible Root Cause:	Pressure pipes to sensor might be blocked by soot or ice. Also it is possible that EPG has some fault so that exhaust pressure is not rising as expected when using engine brake or at DPF regeneration cycle.
Corrective Action:	1 Check pressure pipes to sensor for blocks or damage 2 Check the sensor

P047501

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	1074 [12]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	Electronic Throttle Controller Electrical Error
Possible Root Cause:	• Wiring fault • Internal EPG fault
Corrective Action:	1 Check all connectors and wiring between the EMS and the EPG 2 Replace EPG

P047507

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	1074 [7]
Node:	EMS
FTB Name:	Mechanical Failures
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	Internal EPG fault
Possible Root Cause:	• Internal EPG fault
Corrective Action:	1 Replace EPG

P047519

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	1074 [19]
Node:	EMS
FTB Name:	Circuit Current Above Threshold
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	Learning Timout, Impossible to switch in the learning mode
Possible Root Cause:	• Internal EPG fault
Corrective Action:	1 Replace EPG

P047541

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	1074 [14]
Node:	EMS
FTB Name:	General Checksum Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	EEPROM read failure
Possible Root Cause:	• Internal EPG fault
Corrective Action:	1 Replace EPG

P047554

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	1074 [13]
Node:	EMS
FTB Name:	Missing Calibration
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	Self-calibration error
Possible Root Cause:	• Blocked EPG linkage • Blocked actuator
Corrective Action:	1 Secure that the valve linkage is not blocked. 2 Run any of the eEPG test routines in VODIA. Visually check that the EPG can be completely opened and closed. 3 Replace EPG.

P047571

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	1074 [31]
Node:	EMS
FTB Name:	Actuator Stuck
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance More frequent particulate filter regenerations
Failure Event:	EPG wiping sequence failed
Possible Root Cause:	• Blocked EPG linkage • Blocked actuator
Corrective Action:	1 Secure that the valve linkage is not blocked. 2 Run any of the eEPG test routines in VODIA. Visually check that the EPG can be completely opened and closed. 3 Replace EPG.

P047572

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	131 [7]
Node:	EMS
FTB Name:	Actuator Stuck Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance. More frequent particulate filter regenerations.
Failure Event:	Difference between Sensed Exhaust Manifold Pressure and Modeled Exhaust Manifold Pressure.
Possible Root Cause:	• Fautly exhaust pressure sensor.
Corrective Action:	1 Replace the exhaust pressure sensor.

P047577

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	1074 [11]
Node:	EMS
FTB Name:	Commanded Position Not Reachable
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	Position deviation, Position deviation of more than 15 steps for more than 2s.
Possible Root Cause:	• Blocked EPG linkage • Blocked actuator
Corrective Action:	1 Secure that the valve linkage is not blocked. 2 Run any of the eEPG test routines in VODIA. Visually check that the EPG can be completely opened and closed. 3 Replace EPG.

P047588

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	1074 [10]
Node:	EMS
FTB Name:	Bus Off
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	EPG Communication fault
Possible Root Cause:	• CAN bus error due to harness/connector fault
Corrective Action:	1 Power off/on the system 2 Check harness and connector

P047597

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	1074 [20]
Node:	EMS
FTB Name:	Component or System Operation Obstructed or Blocked
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	None
Failure Event:	Step response test error
Possible Root Cause:	• Blocked EPG linkage • Blocked actuator
Corrective Action:	1 Secure that the valve linkage is not blocked. 2 Run any of the eEPG test routines in VODIA. Visually check that the EPG can be completely opened and closed. 3 Replace EPG.

P047598

Exhaust Pressure Control Valve "A"	
SPN [FMI]:	5627 [0]
Node:	EMS
FTB Name:	Component or System Over Temperature
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	EPG Temperature above 150 ˚C
Possible Root Cause:	• Coolant circuit blocked or not connected
Corrective Action:	1 Check EPG cooling circuit

P047599

Exhaust Pressure Control Valve "A"	
System:	Exhaust System
SPN [FMI]:	1074 [16]
Node:	EMS
FTB Name:	Exceeded Learning Limit
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	EPG End point learning fault
Possible Root Cause:	• Blocked actuator • Linkage broken
Corrective Action:	1 Secure that the valve linkage is not blocked. 2 Run any of the eEPG test routines in VODIA. Visually check that the EPG can be completely opened and closed. 3 Replace EPG.

P047600

Exhaust Pressure Control Valve "A" Range/Performance	
System:	Exhaust System
SPN [FMI]:	1074 [18]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	EPG End point learning fault
Possible Root Cause:	• Blocked actuator • Linkage broken
Corrective Action:	1 Secure that the valve linkage is not blocked. 2 Run any of the eEPG test routines in VODIA. Visually check that the EPG can be completely opened and closed. 3 Replace EPG.

P047700

Exhaust Pressure Control Valve "A" Low	
System:	Exhaust System
SPN [FMI]:	1074 [4]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	None
Failure Event:	EPG Voltage above 33V
Possible Root Cause:	• High system voltage
Corrective Action:	1 Check system voltage

P047800

Exhaust Pressure Control Valve "A" High	
System:	Exhaust System
SPN [FMI]:	1074 [3]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	None
Failure Event:	EPG Voltage below 7V
Possible Root Cause:	• Low system voltage
Corrective Action:	1 Check alternator 2 Check battery 3 Check harness and connectors

P048011

Fan 1 Control Circuit	
SPN [FMI]:	647 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	• Engine may be overheated • Fan always deactivated or always activated if fault is intermittent
Failure Event:	U at B49 < 1/3Vbat
Possible Root Cause:	• SC: B49, GND
Corrective Action:	1 Check all cables and connectors between the fan and the EMS.

P048012

Fan 1 Control Circuit	
SPN [FMI]:	647 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Fan runs at full speed
Failure Event:	I at B49 > 5.5A
Possible Root Cause:	• SC: B49, Vbat
Corrective Action:	1 Check all cables and connectors between the fan and the EMS.

Fan 1 Control Circuit

SPN [FMI]: 647 [3]

P048013

Fan 1 Control Circuit	
SPN [FMI]:	647 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Fan runs at full speed.
Failure Event:	2/3 Vbat > U at B49 > 1/3 Vbat
Possible Root Cause:	• OC: B49 • Faulty fan clutch solenoid
Corrective Action:	1 Check all cables and connectors between the fan and the EMS. 2 Check the contact pressure at the fan clutch connector and in socket B49 in the EMS connector. 3 Check the fan clutch solenoid.

P048B01

Exhaust Pressure Control Valve "A" Position Sensor/Switch Circuit	
SPN [FMI]:	5625 [12]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Particulate filter regeneration not possible
Failure Event:	Position (Hall) Sensor error
Possible Root Cause:	• Internal EPG fault
Corrective Action:	1 Replace EPG

P052012

Engine Oil Pressure Sensor/Switch "A"	
SPN [FMI]:	100 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at B11 > 4,85V
Possible Root Cause:	• OC: Sensor GND • SC: B11, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P052013

Engine Oil Pressure Sensor/Switch "A"	
SPN [FMI]:	100 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at B11 < 0,15V
Possible Root Cause:	• OC: B11/5+ • SC: B11, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket B11 in the EMS connector. 3 Check the sensor.

P052400

Engine Oil Pressure Too Low	
SPN [FMI]:	100 [1]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Engine shuts off unexpectedly - Only at low speed
Failure Event:	The engine oil pressure is below the set value of the engine protection parameter.
Possible Root Cause:	• Low oil level • Clogged oil filter • Faulty sensor • Faulty oil pressure reduction valve • Worn oil pump
Corrective Action:	1 Check the oil level in the engine. Check that no leakage occurs. 2 Replace the engine oil and the oil filter. 3 Check function of the sensor by control measuring the engine oil pressure. Please refer to the workshop manual Grp 21-26. 4 Replace the reduction valve. Please refer to the workshop manual Grp 21-26. 5 Replace the oil pump. Please refer to the workshop manual Grp 21-26.

P052612

Fan Speed Sensor Circuit	
SPN [FMI]:	1639 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
Functional Behaviour Description:	Engine cooling fan does not shut off.
Failure Event:	Malfunctioning fan speed sensor.
Possible Root Cause:	• Fan speed is measured by a Hall effect sensor that is connected to A35. This DTC indicates detected fan speed when there should not be an activated fan.
Corrective Action:	1 Check all cables and connectors between the fan and the EMS.

P054001

Intake Air Heater "A" Control	
SPN [FMI]:	729 [12]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	Engine hard to start in cold conditions
Failure Event:	U at B7 deviates from expected value, should be approximately Vbat
Possible Root Cause:	• OC/SC: B7 • Unwanted circuit resistance • OC: Heating element
Corrective Action:	1 Check all cables and connectors between the heating element and the EMS. 2 Check the heating element. 3 Check the contact pressure in socket B7 in the EMS connector.

P054013

Intake Air Heater "A" Control	
SPN [FMI]:	729 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	Engine might be hard to start in cold climate.
Failure Event:	U at B7 deviates from expected value, should be approximately Vbat. when heating relay is activated.
Possible Root Cause:	• OC: B7 • OC: Heating element
Corrective Action:	1 Check all cables and connectors between the heating element and the EMS. 2 Check the heating element. 3 Check the contact pressure in socket B7 in the EMS connector.

P05407E

Intake Air Heater "A" Control	
SPN [FMI]:	729 [6]
Node:	EMS
FTB Name:	Actuator Stuck On
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Preheat element always active CAUTION! Preheat element overheat
Failure Event:	Preheat element stuck active
Possible Root Cause:	• Faulty preheat relay, stucked closed • SC: B7, Vbat
Corrective Action:	1 Check all cables and connectors between the preheat relay connector and the EMS. 2 Check all cables and connectors between the heating element and the EMS. 3 Replace the preheat relay.

P05407F

Intake Air Heater "A" Control	
SPN [FMI]:	729 [7]
Node:	EMS
FTB Name:	Actuator Stuck Off
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
Functional Behaviour Description:	Engine might be hard to start in cold climate.
Failure Event:	Preheat element not activated when there is a activation request.
Possible Root Cause:	• SC: B7, GND • Faulty preheat relay, stucked open • Faulty preheat relay circuit
Corrective Action:	1 Check all cables and connectors between the preheat relay connector and the EMS. 2 Check all cables and connectors between the heating element and the EMS. 3 Replace the preheat relay.

P054464

Exhaust Gas Temperature Sensor Bank 1 Sensor 1	
SPN [FMI]:	3241 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	120 seconds
DTC Monitor Test Conditions:	High EATS-temperature (Exhaustgas temp. sensor #3) >260°C and engine running in steady-state (No quick changes in engine speed and torque) for > 2min.
Functional Behaviour Description:	Warning system activated
Failure Event:	Exhaust temperature sensor #1 (closest to engine) shows too low values compared to normal engine exhaust temperatures at the current engine load.
Possible Root Cause:	• Exhaust temp sensor 1 is faulty, not properly fastened or hangs outside the exhaust flow.
Corrective Action:	1 Check that the senor is mounted correctly in the exhaust stream.
	2 Check the sensor.

P055A01

Engine Oil Pressure Sensor/Switch "B"	
System:	Oil system
SPN [FMI]:	4811 [12]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage on B:19 above 4.787598V and Voltage on B:19 below 4.852295V OR Voltage on B:19 above 0.147705V and Voltage on B:19 below 0.212402V
Possible Root Cause:	• Faulty wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P055A12

Engine Oil Pressure Sensor/Switch "B"	
System:	Oil system
SPN [FMI]:	4811 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage on B:19 above 4.85 V
Possible Root Cause:	• Faulty wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensors and the EMS. 2 Check the sensor

P055A13

Engine Oil Pressure Sensor/Switch "B"	
System:	Oil system
SPN [FMI]:	4811 [3]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage on B:19 below 0.148 V
Possible Root Cause:	• Faulty wiring • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensors and the EMS. 2 Check the sensor

P056084

System Voltage Unstable	
SPN [FMI]:	158 [1]
Node:	EMS
FTB Name:	Signal Below Allowable Range
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	60 seconds
Functional Behaviour Description:	None
Failure Event:	The supply voltage is below 25.5V for 60 seconds.
Possible Root Cause:	• Alternator belt • Flat / poor batteries • Fault in cables or connectors for battery / alternator • Faulty alternator
Corrective Action:	1 Check the charger system. Refer to "Checking the charger system". 2 Check both the negative and the positive cables and connectors between the batteries and the EMS. Clean the connection points. 3 Check that there is no unwanted voltage drop between the batteries and the EMS or the alternator.

P056085

System Voltage Unstable	
SPN [FMI]:	158 [0]
Node:	EMS
FTB Name:	Signal Above Allowable Range
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	60 seconds
Functional Behaviour Description:	None
Failure Event:	Too high supply voltage
Possible Root Cause:	• Overcharging alternator.
Corrective Action:	1 Check the charger system. Refer to "Checking the charger system.

P05611F

System Voltage Unstable	
SPN [FMI]:	158 [2]
Node:	EMS
FTB Name:	Circuit Intermittent
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1 second
Functional Behaviour Description:	None
Failure Event:	Internittent supply voltage
Possible Root Cause:	• Main switch switched off before performing system power down • Loose/dirty connections at the batteries. • Faulty/intermittent main switch • Faulty main relay
Corrective Action:	1 Perform proper system shutdown procedure. 2 Check both the negative and the positive cables and connectors between the batteries and the EMS. Clean the connection points. 3 Check that there is no unwanted voltage drop between the batteries and the EMS or the alternator. 4 Check the main switch.

P05C212

Engine Coolant Pressure Sensor	
SPN [FMI]:	20 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at A54 > 4,85V
Possible Root Cause:	• OC: Sensor GND • SC: A54, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P05C213

Engine Coolant Pressure Sensor	
SPN [FMI]:	20 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at A54 < 0,15V
Possible Root Cause:	• OC: A54/5+ • SC: A54, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket A54 in the EMS connector. 3 Check the sensor.

P060741

Control Module Performance	
SPN [FMI]:	628 [2]
Node:	EMS
FTB Name:	General Checksum Failure
Lamp Status:	None
Functional Behaviour Description:	Engine can not be started
Failure Event:	Software checksum error
Corrective Action:	1 Reprogram the EMS

P061511

Starter Relay	
SPN [FMI]:	677 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Start motor does not engage.
Failure Event:	U at B37/B29 < 1/3 Vbat
Possible Root Cause:	• SC: B37/B29, GND
Corrective Action:	1 Check the starter relay.
	2 Check all cables and connectors between the starter relay and the EMS.

P061512

Starter Relay	
SPN [FMI]:	677 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Start motor does not engage.
Failure Event:	I at B37/B29 > 5.5A
Possible Root Cause:	• SC: B37/B29,Vbat
Corrective Action:	1 Check the starter relay. 2 Check all cables and connectors between the starter relay and the EMS.

P061513

Starter Relay	
SPN [FMI]:	677 [5]
Node:	EMS
FTB Name:	Open Circuit
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Start motor does not engage.
Failure Event:	2/3 Vbat > U at B37/B29 > 1/3 Vbat
Possible Root Cause:	• Faulty starter relay • OC: B37/B29
Corrective Action:	1 Check the starter relay. 2 Check all cables and connectors between the starter relay and the EMS.

P061519

Starter Relay	
SPN [FMI]:	677 [6]
Node:	EMS
FTB Name:	Circuit Current Above Threshold
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Start motor does not engage.
Failure Event:	I at B37/B29 is higher than normal
Possible Root Cause:	• SC: B37, B29
Corrective Action:	1 Check the starter relay. 2 Check all cables and connectors between the starter relay and the EMS.

P062011

Generator Control	
SPN [FMI]:	3353 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Alternator will not charge the battery
Failure Event:	Voltage at A10 below normal range
Possible Root Cause:	• Harness, actuator or connector is short circuited to ground voltage
Corrective Action:	1 Check all cables and connectors between the alternator and the EMS

P062012

Generator Control	
SPN [FMI]:	3353 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Cold start might be affected
Failure Event:	Voltage at A10 above normal range
Possible Root Cause:	• Harness, actuator or connector is short circuited to battery voltage
Corrective Action:	1 Check all cables and connectors between the alternator and the EMS

P06279C

Fuel Pump "A" Control	
SPN [FMI]:	1347 [7]
Node:	EMS
FTB Name:	Low/Insufficient Flow
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	10 seconds
DTC Monitor Test Conditions:	Run engine normally at different loads. More steady state driving than transient.
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Loss of high pressure pump capacity detected due to rail pressure deviation according to expected mapped rail pressure.
Possible Root Cause:	• Other fuel system related DTC • Faulty high pressure pump
Corrective Action:	1 Check if concurrent set fuel system DTC is the root cause. 2 Check the high pressure pump.

P068573

ECM/PCM Power Relay Control	
SPN [FMI]:	1485 [7]
Node:	EMS
FTB Name:	Actuator Stuck Closed
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	Deactivation failure, Engine management system and Battery drainage.
Failure Event:	Main relay stucked
Possible Root Cause:	• Stuck/broken ignition switch • Faulty installation, back feeding power to ignition. • Faulty installation, back feeding power to system. • Stuck/broken main relay.
Corrective Action:	1 Replace the main relay.

P06B016

Sensor Power Supply "A"	
SPN [FMI]:	3509 [4]
Node:	EMS
FTB Name:	Circuit Voltage Below Threshold
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	Incorrect sensor readings. Sensors connected to A7 might set a DTC.
Failure Event:	U at A7 < 4.5V
Possible Root Cause:	• SC: A7, GND
Corrective Action:	1 Check all wiring to pin A7 at the EMS.

P06B017

Sensor Power Supply "A"	
SPN [FMI]:	3509 [3]
Node:	EMS
FTB Name:	Circuit Voltage Above Threshold
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	Incorrect sensor readings. Sensors connected to A7 might set a DTC.
Failure Event:	U at A7 > 5.5V
Possible Root Cause:	• SC: A7, higher voltage
Corrective Action:	1 Check all wiring to pin A7 at the EMS

P06B316

Sensor Power Supply "B"	
SPN [FMI]:	3510 [4]
Node:	EMS
FTB Name:	Circuit Voltage Below Threshold
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	Incorrect sensor readings. Sensors connected to B17 might set a DTC.
Failure Event:	U at B17 < 4.5V
Possible Root Cause:	• SC: B17, GND
Corrective Action:	1 Check all wiring to pin B17 at the EMS

P06B317

Sensor Power Supply "B"	
SPN [FMI]:	3510 [3]
Node:	EMS
FTB Name:	Circuit Voltage Above Threshold
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	Incorrect sensor readings. Sensors connected to B17 might set a DTC.
Failure Event:	U at B17 > 5.5V
Possible Root Cause:	• SC: B17, higher voltage than +5 V
Corrective Action:	1 Check all wiring to pin B17 at the EMS

P06E616

Sensor Power Supply "C"	
SPN [FMI]:	3511 [4]
Node:	EMS
FTB Name:	Circuit Voltage Below Threshold
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	None Engine Cooling fan inoperative
Failure Event:	U at A1 < 4.5V
Possible Root Cause:	• SC: A1, lower voltage
Corrective Action:	1 Check all wiring to pin A1 at the EMS

P06E617

Sensor Power Supply "C"	
SPN [FMI]:	3511 [3]
Node:	EMS
FTB Name:	Circuit Voltage Above Threshold
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	None or Engine Cooling fan inoperative
Failure Event:	U at A1 > 5.5V
Possible Root Cause:	• SC: A1, higher voltage
Corrective Action:	1 Check all wiring to pin A1 at the EMS

P100111

Engine Stop Switch	
SPN [FMI]:	970 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Engine stops or can not be started
Failure Event:	U at A27 lower than normal
Possible Root Cause:	• SC: A27, GND
Corrective Action:	1 Check all wiring to pin A27 at the EMS

P100112

Engine Stop Switch	
SPN [FMI]:	970 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Engine stops or can not be started
Failure Event:	U at A27 higher than normal
Corrective Action:	1 Check all wiring to pin A27 at the EMS

P100113

Engine Stop Switch	
SPN [FMI]:	970 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Engine stops or can not be started
Failure Event:	U at A27 lower than normal
Possible Root Cause:	• OC: A27
Corrective Action:	1 Check all wiring to pin A27 at the EMS

P100192

Engine Stop Switch	
SPN [FMI]:	970 [11]
Node:	EMS
FTB Name:	Performance or Incorrect Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
Failure Event:	Engine stop switch has been activated during engine running. Engine is requested to shutdown and can not be restarted before stopswitch is released and Key off-key on has been performed.
Possible Root Cause:	• Stop switch been activated
Corrective Action:	1 Check what triggered the stop input to be activated. 2 Check all wiring to pin A27 at the EMS.

P10019E

Engine Stop Switch	
SPN [FMI]:	970 [14]
Node:	EMS
FTB Name:	Performance or Incorrect Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine stop switch will not work
Failure Event:	Engine stop switch active at power on
Possible Root Cause:	• Engine stop switch activated
Corrective Action:	1 Release engine stop switch
	2 Check wiring harness

P100311

EGR "A" Control / Turbocharger/Supercharger Wastegate Solenoid "A"	
SPN [FMI]:	520690 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	None
Failure Event:	I at B13/B9 is outside expected range
Possible Root Cause:	• SC: B13/B9, GND • Valve/solenoid
Corrective Action:	1 Check all cables and connectors between the valve/solenoid and the EMS. 2 Replace the valve/solenoid.

P100313

EGR "A" Control / Turbocharger/Supercharger Wastegate Solenoid "A"	
SPN [FMI]:	520690 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	None
Failure Event:	I at B13/B9 rises too slow
Possible Root Cause:	• OC: B13/B9 • Valve/solenoid
Corrective Action:	1 Check all cables and connectors between the valve/solenoid and the EMS. 2 Replace the valve/solenoid.

EGR "A" Control / Turbocharger/Supercharger Wastegate Solenoid "A"	
SPN [FMI]:	520690 [5]

P100400

SCR NOx Catalyst Efficiency, Moderately Below Threshold, Bank 1	
SPN [FMI]:	4364 [17]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	240 seconds
DTC Monitor Test Conditions:	High EATS-temperature (Exhaustgas temp. sensor #3) >280°C and engine running in steady-state (No quick changes in engine speed and torque) for > 4min.
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	At conditions where the SCR is in controlled operation, the conversion rate of Nox has fallen below the allowed limit. The EATS system (SCR) is failing to convert Nox to expected levels.
Possible Root Cause:	The EATS system (SCR) is failing to convert Nox to expected levels. Root cause can be one or more of the following: • Urea crystal buildup in front of SCR • The dosing valve/nozzle or hoses are fully or partially blocked • Upstream Nox-sensor is outside normal tolerances • SCR catalyst is damaged and has limited performance Always check with nox conversion test routine (using VODIA) before and after replacing components.
Corrective Action:	1 Check for urea crystal buildup in front of SCR. 2 Check for damage of SCR catalyst internals. 3 Check for blocked urea flow in nozzle/hoses. Use the dosing test in VODIA to check nozzle flow. 4 Check the upstream Nox-sensor. Use the Nox conversion routine in VODIA (only to be used if engine is permitted to run at 1900rpm). If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned. 5 Check the position of SCR Catalyst, so it is not in cool air flow. Always check with nox conversion test routine (using VODIA) before and after replacing components.

P100701

Air Filter Indicator	
SPN [FMI]:	107 [12]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	U at A29 deviates from expected value
Possible Root Cause:	• Faulty switch
Corrective Action:	1 Check all cables and connectors between the switch and the EMS. 2 Check the switch.

P100711

Air Filter Indicator	
SPN [FMI]:	107 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	U at A29 < than normal
Possible Root Cause:	• SC: A29, GND • Faulty switch
Corrective Action:	1 Check all cables and connectors between the switch and the EMS. 2 Check the switch.

P100712

Air Filter Indicator	
SPN [FMI]:	107 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	U at A29 > than normal
Possible Root Cause:	• SC: A29, Vbat • Faulty switch
Corrective Action:	1 Check all cables and connectors between the switch and the EMS. 2 Check the switch.

P100713

Air Filter Indicator	
SPN [FMI]:	107 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	U at A29 deviates from expected value
Possible Root Cause:	• OC: A29 • Faulty switch
Corrective Action:	1 Check all cables and connectors between the switch and the EMS. 2 Check the switch.

P102111

Volvo Compression Brake (VCB) Control Circuit	
SPN [FMI]:	1072 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Volvo compression brake always active
Failure Event:	U at B30 below than normal
Possible Root Cause:	• SC: B30, GND
Corrective Action:	1 Check all cables and connectors between the VCB actuator and the EMS. 2 Check the actuator.

P102112

Volvo Compression Brake (VCB) Control Circuit	
SPN [FMI]:	1072 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Volvo compression brake will not activate
Failure Event:	U at B30 above than normal
Possible Root Cause:	• SC: B30, Vbat
Corrective Action:	1 Check all cables and connectors between the VCB actuator and the EMS. 2 Check the actuator.

P102113

Volvo Compression Brake (VCB) Control Circuit	
SPN [FMI]:	1072 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
Functional Behaviour Description:	Volvo compression brake will not activate
Failure Event:	U at B30 outside normal range
Possible Root Cause:	• OC: B30
Corrective Action:	1 Check all cables and connectors between the VCB actuator and the EMS. 2 Check the actuator.

P102C68

Torque Speed Control1 Received With Errors, Counter or Checksum	
SPN [FMI]:	520691 [14]
Node:	EMS
FTB Name:	Event Information
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	Probably loss of torque/speed request from driver
Failure Event:	TSC1 message faulty
Possible Root Cause:	• TSC1 message sent with faulty counter or checksum
Corrective Action:	1 Check that the installation is according to what is specified in the "Speed Control" section in the "Electrical Interface Specification EMS 2.3" manual. When controlling the speed/torque with the TSC1- message, the counter (SPN 4206) and checksum (SPN 4207) must be used, according to SAE J1939 specifications.

P103B00

Reagent Dosing Valve Inducement	
SPN [FMI]:	5394 [31]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	240 seconds
DTC Monitor Test Conditions:	Run engine at several different speed and loads. EATS-temperature (Exhaustgas temp. sensor #3) > 230°C.
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	The reductant fluid injection nozzle is blocked. This is detected by the reductant fluid pump duty cycle differs from normal behaviour at certain engine loads.
Possible Root Cause:	• The dosing valve/nozzle or hoses are fully or partially blocked
Corrective Action:	1 Check for blocked urea flow in nozzle/hoses. Use the dosing test in VODIA to check nozzle flow.

P103C00

NOx Catalyst Efficiency Inducement, Selective Catalytic Reduction (SCR) Unit	
SPN [FMI]:	4364 [31]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	120 seconds
DTC Monitor Test Conditions:	High EATS-temperature (Exhaustgas temp. sensor #3) >280°C and engine running in steady-state (No quick changes in engine speed and torque) for > 2min.
Functional Behaviour Description:	Inducement leading to engine derate.
Failure Event:	At conditions where the SCR is in controlled operation, the conversion rate of Nox has fallen below the allowed limit.
Possible Root Cause:	The EATS system (SCR) is failing to convert Nox to expected levels. Root cause can be one or more of the following: • Urea crystal buildup in front of SCR. • The dosing valve/nozzle or hoses are fully or partially blocked. • Faulty NOx sensor/poor NOx sensor signal quality, • SCR catalyst is damaged and has limited performance. • SCR Catalyst is cooled down by flowing air during diagnos monitor test and fails to convert enough Nox.
Corrective Action:	Use "Troubleshooting EATS" documentation for additional faulttracing information. It is available in Product Center as a workshop manual. 1 Check for urea crystal buildup in front of SCR. 2 Check for blocked urea flow in nozzle/hoses. Use the dosing test in VODIA to check nozzle flow. 3 Check the NOx sensors. Use the NOx conversion routine in VODIA. If any NOx sensor is replaced run VODIA routine "Urea Adaption Reset". If NOx conversion routine is not available: Perform a VODIA log using the EATS log template in VODIA. Following conditions must be met to ensure correct log data: High EATS-temperature (Exhaustgas temperature) >280°C and engine running in steady-state (No quick changes in engine speed and torque) for > 2min. Use VODIA "Export to Excel" and analyse both NOx sensors signals with each other. During steady state running the signals should be quite stable and smooth. If one signal oscillates much more than the other make sure that the engine torque and speed are stable during the log recording. An oscillating signal could indicate a faulty sensor. If any NOx sensor is replaced run VODIA routine "Urea Adaption Reset". 4 Check the position of SCR Catalyst, so it is not in cool air flow. 5 Check for damage of SCR catalyst internals. Always check with nox conversion test routine (using VODIA) before and after replacing components.

P103C92

NOx Catalyst Efficiency Inducement, Selective Catalytic Reduction (SCR) Unit	
SPN [FMI]:	4364 [1]
Node:	EMS
FTB Name:	Performance or Incorrect Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	120 seconds
DTC Monitor Test Conditions:	High EATS-temperature (Exhaustgas temp. sensor #3) >230°C and engine running in steady-state (No quick changes in engine speed and torque) for > 2min.
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	At conditions where the SCR is in controlled operation, the conversion rate of NOx has fallen below the allowed limit.
Possible Root Cause:	The EATS system (SCR) is failing to convert NOx to expected levels. Root cause can be one or more of the following: • Urea crystal buildup in front of SCR • The dosing valve/nozzle or hoses are fully or partially blocked • Upstream NOx-sensor is outside normal tolerances • SCR Catalyst is cooled down by flowing air during diagnos monitor test and fails to convert enough NOx • SCR catalyst is damaged and has limited performance
Corrective Action:	Use "Troubleshooting EATS" documentation for additional faulttracing information. It is available in Product Center as a workshop manual. 1 Check for urea crystal buildup in front of SCR 2 Check for blocked urea flow in nozzle/hoses. Use the dosing test in VODIA to check nozzle flow. 3 Check the upstream NOx-sensor. Use the NOx conversion routine in VODIA (only to be used if engine is permitted to run at 1900rpm). If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned. 4 Check the position of SCR Catalyst, so it is not in cool air flow. 5 Check for damage of SCR catalyst internals. Always check with NOx conversion test routine (using VODIA) before and after replacing components.

P108600

Oil Level Moderately Low	
SPN [FMI]:	98 [18]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	Engine shuts off unexpectedly - Only at low speed
Failure Event:	Engine oil level is below the set alarm level.
Possible Root Cause:	• Low engine oil level. • Oil leakage.
Corrective Action:	1 Check the oil level in the engine. 2 Check that no oil leakage occurs. 3 Check the oil level sensor.

P109300

Engine Oil Pressure Too Low->Oil Pressure Moderately Low	
SPN [FMI]:	100 [18]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	None
Failure Event:	Engine oil pressure is below the set alarm level.
Possible Root Cause:	• Low oil level • Clogged oil filter • Faulty sensor • Faulty oil pressure reduction valve • Worn oil pump
Corrective Action:	1 Check the oil level in the engine. Check that no leakage occurs. 2 Replace the engine oil and the oil filter. 3 Check function of the sensor by control measuring the engine oil pressure. Please refer to the workshop manual Grp 21-26. 4 Replace the pressure reduction valve. Please refer to the workshop manual Grp 21-26. 5 Replace the oil pump. Please refer to the workshop manual Grp 21-26.

P10C011

Volvo Compression Brake (VCB) Control "2" Circuit	
SPN [FMI]:	1073 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Volvo compression brake always active.
Failure Event:	U at B46 below than normal
Possible Root Cause:	• SC: B46, GND
Corrective Action:	1 Check all cables and connectors between the VCB actuator and the EMS. 2 Check the actuator.

P10C012

Volvo Compression Brake (VCB) Control "2" Circuit	
SPN [FMI]:	1073 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	Volvo compression brake will not activate
Failure Event:	U at B46 above than normal
Possible Root Cause:	• SC: B46, Vbat
Corrective Action:	1 Check all cables and connectors between the VCB actuator and the EMS. 2 Check the actuator.

P10C013

Volvo Compression Brake (VCB) Control "2" Circuit	
SPN [FMI]:	1073 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
Functional Behaviour Description:	Volvo compression brake will not activate
Failure Event:	U at B46 outside normal range
Possible Root Cause:	• OC: B46
Corrective Action:	1 Check all cables and connectors between the VCB actuator and the EMS. 2 Check the actuator.

P10E100

Particulate Filter Differential Pressure Critically High	
SPN [FMI]:	3251 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	5 seconds (1000 seconds +5 seconds after start-up)
DTC Monitor Test Conditions:	Engine running
Functional Behaviour Description:	High soot level indication and request for regeneration
Failure Event:	DPF Differential pressure >30kPa + 3kPa
Possible Root Cause:	• Blocked or clogged DPF. • Blocked or clogged DPF differential sensor • Broken DPF differential sensor
Corrective Action:	1 Inspect DPF if clogged or blocked. If filter replaced, VODIA routine "DPF Reset" must be runned. 2 Check if DPF differenatial sensor is blocked or clogged. Verify sensor installation according to manual to avoid condensed water trapped in sensor pressure pipes. 3 Check sensor electrical connector for fretting or bad connection. Sensor should measure 0 ±0.3kPa when ignition on and engine switched off.

P10E200

Particulate Filter Differential Pressure Moderately High	
SPN [FMI]:	3251 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds (1000 seconds +5 seconds after start-up)
DTC Monitor Test Conditions:	Engine running
Functional Behaviour Description:	Engine derate. High soot level indication and regeneration needed
Failure Event:	DPF Differential pressure >30kPa + 1 kPa
Possible Root Cause:	• Blocked or clogged DPF • Blocked or clogged DPF differential sensor • Broken differential sensor
Corrective Action:	1 Inspect DPF if clogged or blocked. If filter replaced, VODIA routine "DPF Reset" must be runned. 2 Check if DPF differenatial sensor is blocked or clogged. Verify sensor installation according to manual to avoid condensed water trapped in sensor pressure pipes. 3 Check sensor electrical connector for fretting or bad connection. Sensor should measure 0 ±0.3kPa when ignition on and engine switched off.

P10F800

Air Filter Clogged	
SPN [FMI]:	107 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
Functional Behaviour Description:	None
Failure Event:	Too high vaccum between the air filter and the turbo
Possible Root Cause:	• Clogged air filter
Corrective Action:	1 Replace the air filter

P10FE00

Particulate Filter Restriction - Soot Accumulation Moderately High Bank 1	
SPN [FMI]:	3064 [11]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	30 seconds
DTC Monitor Test Conditions:	Engine running
Functional Behaviour Description:	Engine derate. High soot level indication and regeneration needed.
Failure Event:	(SPN 3719) Soot load level indicator ≥80 ≤99
Possible Root Cause:	High ash or soot load. Regeneration not succeded.
Corrective Action:	1 Start service regeneration
	2 Check for high ash load in aftertreatment diesel particulate filter
	3 Check of Clogging of aftertreatment diesel particulate filter
	4 Check for faulty leaking EGR valve
	5 Check for faulty DPF differential pressure sensor

P111600

Manifold Absolute Pressure/Barometric Pressure Moderately Too High	
SPN [FMI]:	102 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	No indication
DTC Monitor Detection Time:	4 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Manifold absolute pressure exceeds the set alarm level.
Possible Root Cause:	• Leakage in the wastegate valve circuit. • The wastegate valve control lever is stucked. • Faulty manifold absolut pressure sensor • The wastegate solenoid valve does not function properly. • Wrong turbo compressor unit according to the engine specification.
Corrective Action:	1 Check all hoses and connections to and from the wastegate solenoid valve. If there is a leakage the wastegate valve will close which will cause the charge pressure to rise. 2 Check the movement of the wastegate valve control lever. 3 Check the manifold absolut pressure sensor. 4 Replace the wastegate solenoid valve. 5 Check that the turbo compressor unit is in according the engine specification.

P111800

Manifold Absolute Pressure Too High	
SPN [FMI]:	102 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	4 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Manifold absolute pressure exceeds the set value of the engine protection parameter.
Possible Root Cause:	• Leakage in the wastegate valve circuit. • The wastegate valve control lever is stucked • Faulty manifold absolut pressure sensor • The wastegate solenoid valve does not function properly. • Wrong turbo compressor unit according to the engine specification.
Corrective Action:	1 Check all hoses and connections to and from the wastegate solenoid valve. If there is a leakage the wastegate valve will close which will cause the charge pressure to rise. 2 Check the movement of the wastegate valve control lever. 3 Check the manifold absolut pressure sensor. 4 Replace the wastegate solenoid valve 5 Check that the turbo compressor unit is in according the engine specification.

P111900

Intake Manifold Temperature Moderately Too High	
SPN [FMI]:	105 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	None
Failure Event:	Intake manifold temperature exceeds the set alarm level.
Possible Root Cause:	• Engine coolant temperature is too high. • Radiator fan system not function properly. • Dust or dirt on the outside of the charge air cooler and the radiator. • Faulty intake manifold temperature sensor.
Corrective Action:	1 Check that the engine coolant temperature is normal. 2 Check function of the radiator fan system. 3 Clean the charge air cooler and the radiator. 4 Check the intake manifold temperature sensor.

P111A00

Intake Manifold Temperature Too High	
SPN [FMI]:	105 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Intake manifold temperature exceeds the set value of the engine protection parameter.
Possible Root Cause:	• Engine coolant temperature is too high. • Radiator fan system not function properly. • Dust or dirt on the outside of the charge air cooler and the radiator. • Faulty intake manifold temperature sensor.
Corrective Action:	1 Check that the engine coolant temperature is normal. 2 Check function of the radiator fan system. 3 Clean the charge air cooler and the radiator. 4 Check the intake manifold temperature sensor.

P111D00

Engine Coolant Level Moderately Low	
SPN [FMI]:	111 [18]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	12 seconds
Functional Behaviour Description:	None
Failure Event:	Engine coolant level is below the set alarm level.
Possible Root Cause:	1 Low coolant level
Corrective Action:	1 Check the coolant level.
	2 Check that no leakage occurs.
	3 Check the wiring to the coolant level switch.
	4 Check the level switch.

P111E00

Engine Coolant Temperature Moderately High	
SPN [FMI]:	110 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	None
Failure Event:	Engine coolant temperature exceeds the set alarm level.
Possible Root Cause:	• Coolant level too low. • Radiator fan system not function properly. • Dust or dirt on the outside of the radiator. • Drive belt is not properly adjusted. • There is air in the coolant water system. • Faulty thermostat. • Faulty temperature sensor. • Faulty coolant pressure cap. • Clogged cooling system. • Worn coolant pump.
Corrective Action:	1 Check the coolant level. If low coolant level check the coolant water system for leakage by a pressure test. 2 Check the function of the radiator fan system. 3 Check the outside of radiator for dust and dirt. 4 Check the drive belt adjustment. 5 Bleed the coolant water system. 6 Check the coolant water thermostat or replace the coolant water thermostat. 7 Check the coolant temperature sensor. 8 Replace the coolant pressure cap. 9 Clean the cooling system. 10 Replace the coolant pump.

P112000

Control Module Internal Temperature "A" Moderately High	
SPN [FMI]:	1136 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	4 seconds
DTC Monitor Test Conditions:	Engine must be running for (30s + 4s)
Functional Behaviour Description:	None
Failure Event:	ECU internal temperature >90° for more than 4s
Possible Root Cause:	• Poor ventilation in engine compartment • In case of remote ECU: Too hot position of ECU location
Corrective Action:	1 Temperature and ventilation insside engine compartment or where the ECU is located

P112500

Engine Oil Temperature Moderately High	
SPN [FMI]:	175 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Engine oil temperature exceeds the set alarm level.
Possible Root Cause:	• Low oil level • High engine temperature — Low coolant level — Radiator fan system not function properly • Faulty sensor • Clogged oil cooler • Faulty oil cooler by-pass valve
Corrective Action:	1 Check the oil level in the engine. Check that no leakage occurs. 2 Check the engine coolant temperature. — Check the coolant level. — Check function of the radiator fan system 3 Check the sensor 4 Clean the oil cooler system. 5 Replace the oil cooler by-pass valve.

P112800

Piston Cooling Oil Pressure Moderately Low	
SPN [FMI]:	4811 [18]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
DTC Monitor Test Conditions:	Engine must be running for (30 seconds + 30 seconds)
Functional Behaviour Description:	None
Failure Event:	Piston Cooling Oil pressure below set point
Possible Root Cause:	• Low oil level • Fuel in oil • Faulty Piston Cooling Jet (PCJ) valve or wiring • Faulty oil temperature sensor or wiring
Corrective Action:	1 Check oil level. 2 Check for fuel in oil. Replace oil and filter if contaminated. 3 Check all cables and connectors between the PCJ and the EMS. 4 Check the PCJ valve. 5 Check all cables and connectors between the oil temperature sensor and the EMS. 6 Check the oil temperature sensor.

P112E00

Exhaust Gas Temperature Moderately High Bank 1	
SPN [FMI]:	173 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Exhaust gas temperature exceeds the set alarm level.
Possible Root Cause:	• Damaged or restrictions in the exhaust system • Too high exhaust back pressure
Corrective Action:	1 Check that the exhaust pipe has not been damaged and that there are no restrictions. 2 Check the sensor. 3 Check the exhaust back pressure.

P113711

Oil Thermostat	
SPN [FMI]:	4813 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	None
Failure Event:	Short circuit to ground
Possible Root Cause:	• SC: B53, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P113712

Oil Thermostat	
SPN [FMI]:	4813 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	None
Failure Event:	Short circuit to battery voltage.
Possible Root Cause:	• SC: B53, Vbat • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor

P113713

Oil Thermostat	
SPN [FMI]:	4813 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	None
Failure Event:	Open Circuit
Possible Root Cause:	• OC: B53 • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P114500

Reductant Level Moderately Low	
SPN [FMI]:	1761 [17]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	40 seconds
DTC Monitor Test Conditions:	Ignition ON and Reductant fluid tank temp > -7°C
Functional Behaviour Description:	Inducement leading to engine derate.
Failure Event:	Reductant fluid level has been below 15% for more than 40s
Possible Root Cause:	• AdBlue/DEF level is low, lower than 15%
Corrective Action:	1 Fill tank with AdBlue/DEF.
	2 Check the level sensor.

P114700

Fuel Rail/System Pressure - Moderately Too High Bank 1	
SPN [FMI]:	157 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	The rail pressure is moderately high during a certain time.
Possible Root Cause:	• Faulty rail pressure sensor • Faulty/stucked ePRV. • Faulty/stucked Fuel quantity regulator (SCV, Suction Control Valve) • Faulty/clogged injectors
Corrective Action:	1 Check all cables and connectors between the rail pressure sensor and the EMS. Logg the rail pressure by using Vodia or by performing a voltage measurement. P(norm at idle speed)=30-40 MPa Notice at what rail pressure the fault code is set 2 Check all wiring and the connectors between the ePRV and the EMS. Check the ePRV signal using oscilloscope. Check that there is a fuel return from the ePRV 3 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. Check the Fuel quantity regulator signal using oscilloscope 4 If the high pressure pump been dismounted/exchanged check the pump installation according to the workshop manual Grp 21-26.

P115100

Aftertreatment System Over Temperature	
SPN [FMI]:	520330 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	40 seconds
DTC Monitor Test Conditions:	Engine running
Functional Behaviour Description:	Engine derate
Failure Event:	Temperature in the aftertreatment system above (5 + 530)
Possible Root Cause:	• Misfire or leaking injectors • Faulty crank or cam sensor • Charge air leakage
Corrective Action:	1 Check fault codes on injectors, rail system or cam/crank sensor. 2 Check for charge air leakage.

P117600

Starter Motor Deactivated - Over Temperature	
SPN [FMI]:	1675 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Starter motor will not activate until it has cooled down
Failure Event:	Starter motor overheat
Possible Root Cause:	• Too long starter activation
Corrective Action:	1 Allow the starter motor to cool down 2 Ensure that the entire preheat time has elapsed before cranking the engine 3 Make sure no other fault codes that might affect engine start are active

P119300

Engine Coolant Pressure - Moderately Low	
SPN [FMI]:	20 [18]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0 seconds
Functional Behaviour Description:	None
Failure Event:	Coolant pressure too low
Possible Root Cause:	• Leakage in the coolant water system • Faulty sensor • Worn coolant circulation pump
Corrective Action:	1 Check that no leakage occurs. Check the coolant level and the quality of the coolant. 2 Check the sensor by control measuring the coolant pressure. 3 Check the coolant circulation pump.

P119400

Engine Coolant Pressure - Too Low	
SPN [FMI]:	20 [1]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	0 seconds
Functional Behaviour Description:	Engine derate
Failure Event:	Coolant pressure too low
Possible Root Cause:	• Leakage in the coolant water system • Faulty sensor • Worn coolant circulation pump
Corrective Action:	1 Check that no leakage occurs. Check the coolant level and the quality of the coolant. 2 Check the sensor by control measuring the coolant pressure. 3 Check the coolant circulation pump.

P119611

Exhaust Gas Temperature Sensor Wet	
SPN [FMI]:	520567 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at B43 < 0,12V
Possible Root Cause:	• SC: B43, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor

P119612

Exhaust Gas Temperature Sensor Wet	
SPN [FMI]:	520567 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at B43 > 4,9V
Possible Root Cause:	• OC: B43 • SC: B43, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket B43 in the EMS connector. 3 Check the sensor.

P119613

Exhaust Gas Temperature Sensor Wet	
SPN [FMI]:	520567 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at B43 > 4,9V
Possible Root Cause:	• OC: B43 • SC: B43, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket B43 in the EMS connector. 3 Check the sensor.

P119700

Exhaust Gas Temperature Sensor Wet - Moderately High	
SPN [FMI]:	520567 [16]
Node:	EMS
FTB Name:	No Subtype Information
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	None
Failure Event:	Exhaust gas temperature is higher than normal.
Corrective Action:	1 Check that the exhaust pipe has not been damaged and that there are no restrictions. 2 Check the sensor 3 Check the exhaust back pressure.

P119800

Exhaust Gas Temperature Sensor Wet - Too High	
SPN [FMI]:	520567 [0]
Node:	EMS
FTB Name:	No Subtype Information
Lamp Status:	Red alarm status
Functional Behaviour Description:	None
Failure Event:	Exhaust gas temperature is too high.
Corrective Action:	1 Check that the exhaust pipe has not been damaged and that there are no restrictions. 2 Check the sensor. 3 Check the exhaust back pressure.

P119D00

Engine Moderately Overspeed Condition	
SPN [FMI]:	190 [16]
Node:	EMS
FTB Name:	No Subtype Information
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	None
Failure Event:	• Engine is / was overspeeding • Overspeed limit = Maximum permitted engine speed + (depends of engine model, typical 4–10%)
Possible Root Cause:	Vehicle is rolling downhill, of a ramp or similar forcing the engine speed above maximum permitted engine speed.
Corrective Action:	1 Check the vehicle driving cycle to see if any situation could trigger engine overspeed conditions. 2 If the engine is situated at high altitude the EMS ambient pressure sensor could be wrong. Log the Barometric Pressure, P1E1S, using Vodia.

P11A411

Exhaust Gas Temperature Sensor Dry	
SPN [FMI]:	520688 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at B44 < 0,12V
Possible Root Cause:	• SC: B44, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor

P11A412

Exhaust Gas Temperature Sensor Dry	
SPN [FMI]:	520688 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at B44 > 4,9V
Possible Root Cause:	• OC: B44 • SC: B44, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket B44 in the EMS connector. 3 Check the sensor.

P11A413

Exhaust Gas Temperature Sensor Dry	
SPN [FMI]:	520688 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at B44 > 4,9V
Possible Root Cause:	• OC: B44 • SC: B44, 5+ • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the contact pressure at the sensor connector and in socket B44 in the EMS connector. 3 Check the sensor.

P11A500

Exhaust Gas Temperature Sensor Dry, Moderately High	
SPN [FMI]:	520688 [16]
Node:	EMS
FTB Name:	No Subtype Information
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	None
Failure Event:	Exhaust gas temperature is higher than normal.
Corrective Action:	1 Check that the exhaust pipe has not been damaged and that there are no restrictions. 2 Check the sensor. 3 Check the exhaust back pressure.

P11A600

Exhaust Gas Temperature Sensor Dry, Too High	
SPN [FMI]:	520688 [0]
Node:	EMS
FTB Name:	No Subtype Information
Lamp Status:	Red alarm status
Functional Behaviour Description:	None
Failure Event:	Exhaust gas temperature is too high.
Corrective Action:	1 Check that the exhaust pipe has not been damaged and that there are no restrictions..
	2 Check the sensor.
	3 Check the exhaust back pressure.

P200E00

Catalyst System Over Temperature Bank 1	
SPN [FMI]:	5018 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	300s
DTC Monitor Test Conditions:	Exhaust temperature >440ºC for more than 300s combined with sulphur load >1.
Functional Behaviour Description:	Engine derated to keep exhaust temperature <440ºC. Request for parked sulphur regeneration.
Failure Event:	Exhaust temperature >440ºC for more than 300s combined with EATS sulphur load >1.
Possible Root Cause:	• High EATS sulphur load combined with high exhaust temperature
Corrective Action:	1 Perform parked sulphur regeneration.

P203164

Exhaust Gas Temperature Sensor Bank 1 Sensor 2	
SPN [FMI]:	3249 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	60 seconds
DTC Monitor Test Conditions:	EATS-temperature (Exhaustgas temp. sensor #3) > 200°C and engine running in steady-state (No quick changes in engine speed and torque) for > 1min.
Functional Behaviour Description:	Warning system activated
Failure Event:	Exhaust temperature sensor 2 shows abnormal values compared to Exhaust temperature sensor 1 and 3 at conditions where they should be close together.
Possible Root Cause:	• Sensor not installed/mounted correctly in the exhaust pipe • Faulty sensor
Corrective Action:	1 Exhaust temp sensor 2 for malfunction or wrong position (away from exhaust flow)

P203A64

Reductant Level Sensor "A"	
SPN [FMI]:	1761 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
DTC Monitor Test Conditions:	Run the engine normally with EATS-temperature (Exhaust temp. sensor #3) > 260°C for as long as needed to consume at least 7L of reductant fluid, without refilling the reductant tank.
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	The reductand level sensor does not show values that corresponds to the amount of urea consumed in EATS. The reductant fluid level sensor is regarded as faulty.
Possible Root Cause:	• The reductant fluid level sensor might be stuck or faulty. (The level in the tank does not vary while the engine consumes urea.)
Corrective Action:	1 Is reductant fluid tank level decreasing when engine consumes reductant fluid? Has small refills of tank occured? 2 Check complete reductant fluid system for correct behaviour.

P203A86

Reductant Level Sensor "A"	
SPN [FMI]:	1761 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	20 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate.
Failure Event:	The reductant fluid level sensor fails the reach good signal quality status while the reductant fluid quality sensor works ok. The reductant fluid level sensor is regarded as faulty.
Possible Root Cause:	• A corresponding fault code is set in ACM.
Corrective Action:	1 A corresponding fault code is set in ACM. 2 Replace sensor if no other fault is found.

P203A92

Reductant Level Sensor "A"	
SPN [FMI]:	1761 [7]
Node:	EMS
FTB Name:	Performance or Incorrect Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	Both reductant fluid quality and level sensors has failed to reach good signal quality status within reasonable time. The sensors are regarded as removed.
Possible Root Cause:	• Either the quality-level sensor is faulty, or the wiring harness or connectors might be damaged. • Check ACM faultcodes.
Corrective Action:	1 Either the UQLS is faulty, or the wiring harness or connectors might be damaged. Check ACM faultcodes.

P203F00

Reductant Level Too Low	
SPN [FMI]:	1761 [18]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	20 seconds
DTC Monitor Test Conditions:	Ignition ON and Reductant fluid tank temp > -7°C
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	Reductant fluid level has been below 0.1% for more than 40s
Possible Root Cause:	• AdBlue/DEF level is too low.
Corrective Action:	1 Fill tank with AdBlue/DEF.
	2 Check tank level sensor mounting and function. Also check for crystal builup in or around sensor.

P206A64

Reductant Quality	
SPN [FMI]:	3364 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	240 seconds
DTC Monitor Test Conditions:	High EATS-temperature (Exhaust temp. sensor #3) >280°C and engine running in steady-state (No quick changes in engine speed and torque) for > 4min.
Functional Behaviour Description:	Inducement leading to engine derate.
Failure Event:	Measured reductant fluid concentration is below 20% and at the same time the conversion ratio of NOx in the SCR is above 80%. This is a non realistic situation, therefore the reductant fluid quality sensor is regarded as faulty. The time required to perform the NOx conversion evaluation depends on driving/operation condition. The evaluation is using the enable conditions of the SCR performance monitor.
Possible Root Cause:	• Faulty reductant fluid quality sensor • Faulty downstream nox sensor is faulty
Corrective Action:	1 Check reductant fluid quality and condition. 2 Check reductant fluid quality sensor for faults. 3 Look for crystallisation or clogging. 4 If no fault is found, replace downstream nox sensor. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P206A86

Reductant Quality	
SPN [FMI]:	3364 [31]
Node:	EMS
FTB Name:	Signal Invalid
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	240 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	The reductant fluid quality sensor fails the reach good signal quality status while the reductant fluid level sensor works ok. The reductant fluid quality sensor is regarded as faulty.
Possible Root Cause:	• Internal error of reductant fluid quality sensor
Corrective Action:	1 A corresponding fault code is set in ACM 2 Replace sensor if no other fault is found.

P207F9A

Reductant Quality	
SPN [FMI]:	3364 [17]
Node:	EMS
FTB Name:	Component or System Operating Conditions
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	30 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	Estimated reductant concentration below 26%. (The evaluation of reductant concentration requires some time to set or reset the fault code due to signal filter constant. Normally within an hour depending on application)
Possible Root Cause:	• Faulty Adblue/DEF quality or concentration • Faulty QLT sensor
Corrective Action:	1 Check the Adblue/DEF quality or concentration. Compare to QLT sensor value. Replace sensor if necessary. 2 Check for crystal buildup around QLT sensor.

P20F493

AdBlue Consumption Too Low	
SPN [FMI]:	3522 [31]
Node:	EMS
FTB Name:	No Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	60 seconds
DTC Monitor Test Conditions:	EATS-temperature (exhaust temp. sensor #3) > 200°C and engine running in steady-state (No quick changes in engine speed and torque) for > 1min.
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	When both Exhaust temperature sensor #2 and #3 has a signal plausability or electrical failure, as a consequence the injected amount of reductant fluid into the EATS system can be faulty. The reductant fluid injection system is regarded as faulty.
Possible Root Cause:	• Exhaust temperature sensor #2 and #3 has errors
Corrective Action:	1 Check both exhaust sensor #2 (before DPF) and #3 (before SCR) are faulty or out of exhaust flow. Check for mounting and position. If no fault can be found, replace both sensors.

P214A00

SCR NOx catalyst inlet temperature too high	
SPN [FMI]:	3245 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1s
DTC Monitor Test Conditions:	Exhaust temperature sensor #3 must be without fault
Functional Behaviour Description:	None
Failure Event:	Temperature pre SCR >550°C for >1s.
Possible Root Cause:	A issue is creating higher exhaust temperature than expected after the DPF/pre-SCR: • Charge air leakage • Faulty exhaust temperature sensor #3 or sensor wiring • Leaking fuel injector
Corrective Action:	1 Check all cables and connectors between the exhaust temperature sensor #3 and the EMS. 2 Check for charge air leakage. Check all hoses and connections to and from the wastegate solenoid valve. 3 Check for leaking fuel injector.

P220012

NOx Sensor Bank 1 Sensor 1	
SPN [FMI]:	3216 [3]
Node:	EMS
FTB Name:	Continous electrical monitoring
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	180 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	Internal short circuit in the sensor or short circuit between the sensor element and the sensor control unit Error byte received from upstream NOx sensor. Sensor is evaluated as not reliable.
Possible Root Cause:	• Upstream NOx Sensor Short Circuit (Internal sensor fault)
Corrective Action:	1 Replace the upstream NOx sensor. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P220013

NOx Sensor Bank 1 Sensor 1	
SPN [FMI]:	3216 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	180 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	Internal open circuit in the sensor or open circuit between the sensor element and the sensor control unit Error byte received from upstream NOx sensor. Sensor is evaluated as not reliable.
Possible Root Cause:	• Upstream NOx Sensor Short Circuit (Internal sensor fault)
Corrective Action:	1 Check sensor supply voltage. 2 Replace upstream NOx sensor. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P22001C

NOx Sensor Bank 1 Sensor 1	
SPN [FMI]:	3216 [14]
Node:	EMS
FTB Name:	Circuit Voltage Out of Range
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	180 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	(Internal Supply Voltage signal containing status and error byte received from Upstream NOx sensor evaluated as NOT_RELIABLE)
Possible Root Cause:	• Faulty Upstream Nox Sensor Supply. (Internal sensor fault)
Corrective Action:	1 Check sensor supply voltage 2 Replace upstream NOx sensor. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P220064

NOx Sensor Bank 1 Sensor 1	
SPN [FMI]:	3216 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	240 seconds
DTC Monitor Test Conditions:	High EATS-temperature (exhaust temp. sensor #3) >260°C and engine running in steady-state (No quick changes in engine speed and torque) for > 4min.
Functional Behaviour Description:	Inducement leading to engine derate.
Failure Event:	The Upstream NOx Difference (upstream NOx sensor measured NOx flow – modeled NOx flow) is compared to a low and high fault threshold map (NOx flow threshold as a function of modeled NOx flow). The difference must be below Low Limit or above High Limit repeatedly 6 times. Evaluation time for each repeated evaluation is 3s. All evaluations needs to be faulty to set this fault.
Possible Root Cause:	• Faulty upstream NOx sensor. Signal value too low or high.
Corrective Action:	1 Upstream NOx sensor slow or no reaction. Check position and mounting of NOx sensor. Run Nox Conversion test routine using VODIA and check sensor signal from upstream nox sensor (only to be used if engine is permitted to run at 1900rpm). If test fails in sensor evaluation, replace the sensor and rerun the test. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P220093

NOx Sensor Bank 1 Sensor 1	
SPN [FMI]:	3216 [13]
Node:	EMS
FTB Name:	No Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	240 seconds
DTC Monitor Test Conditions:	High EATS-temperature (exhaust temp. sensor #3) >260°C and engine running in steady-state (No quick changes in engine speed and torque) for > 4min.
Functional Behaviour Description:	Inducement leading to engine derate.
Failure Event:	Faulty internal start up behaviour of the pre-Nox sensor. Error byte received from upstream NOx sensor. Sensor is evaluated as not reliable.
Possible Root Cause:	• Faulty upstream NOx sensor. Incorrect Start up behaviour. Might also be caused by damaged wiring harness or connectors.
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS.
	2 Run Nox Conversion test routine using VODIA (only to be used if engine is permitted to run at 1900rpm). If test fails in sensor evaluation, replace the sensor and re-run the test. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P220511

NOx Sensor Gas Outlet Open Circuit	
System:	NOx Sensors
SPN [FMI]:	520837 [4]
DTC node:	EMS
Failure type:	Circuit Short To Ground
DTC description:	Faulty sensor
Monitoring condition:	Running conditions
Fault indication:	Yellow alarm status
DTL:	10 seconds
DTC stored:	Yes
Replacement value:	None
Symptom:	None
DTC conditions:	Temperature Of Heater Element in NOxSensor Upstream not reached and Internal Short Circuit Low signal from Upstream NOx sensor is equal to "Short Wire Detected".
Probable cause:	• Upstream NOx Sensor Heater Element Short Circuit Low (Internal sensor fault)
Action:	1 Replace the Upstream NOx Sensor. After NOx sensor replacement run VODIA routine "Urea Adaption Reset".

P220512

NOx Sensor Gas Outlet Open Circuit	
System:	NOx sensors
SPN [FMI]:	520837 [3]
DTC node:	EMS
Failure type:	Circuit Short To Battery
DTC description:	Faulty sensor
Monitoring condition:	Running conditions
Fault indication:	Yellow alarm status
DTL:	10 seconds
DTC stored:	Yes
Replacement value:	None
Symptom:	None
DTC conditions:	Internal Nox Heater Short Circuit High signal containing status and error byte received from Upstream NOx sensor evaluated as NOT_RELIABLE
Probable cause:	• Upstream NOx Sensor Heater Element Short Circuit (Internal sensor fault)
Action:	1 Replace the Upstream NOx Sensor. After NOx sensor replacement run VODIA routine "Urea Adaption Reset"

P220513

NOx Sensor Gas Outlet Open Circuit	
System:	NOx Sensors
SPN [FMI]:	520837 [5]
DTC node:	EMS
Failure type:	Circuit Open
DTC description:	Faulty sensor
Monitoring condition:	Running conditions
Fault indication:	Yellow alarm status
DTL:	10 seconds
DTC stored:	Yes
Replacement value:	None
Symptom:	None
DTC conditions:	Temperature Of Heater Element in NOxSensor Upstream not reached and Internal Open Circuit signal from Upstream NOx sensor is equal to "Open Wire Detected"
Probable cause:	• Upstream NOx Sensor Heater Element Open Circuit (Internal sensor fault)
Action:	1 Replace the Upstream NOx Sensor. After NOx sensor replacement run VODIA routine "Urea Adaption Reset".

P220801

NOx Sensor Heater Sense Circuit, Bank 1 Sensor 1	
System:	NOx sensors
SPN [FMI]:	520837 [12]
DTC node:	EMS
Failure type:	General Electrical Failure
DTC description:	Faulty sensor
Monitoring condition:	Running conditions
Fault indication:	Yellow alarm status
DTL:	10 seconds
DTC stored:	Yes
Replacement value:	None
Symptom:	None
DTC conditions:	Internal Nox Heater General Electric signal containing status and error byte received from Upstream NOx sensor evaluated as NOT_RELIABLE"
Probable cause:	• Internal sensor fault
Action:	1 Replace the Upstream NOx Sensor. After NOx sensor replacement run VODIA routine "Urea Adaption Reset"

P222612

Barometric Pressure Sensor "A" Circuit	
SPN [FMI]:	108 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	15 seconds
Functional Behaviour Description:	Internal failure in the EMS
Failure Event:	• Faulty barometric sensor
Corrective Action:	1 Replace EMS

P222613

Barometric Pressure Sensor "A" Circuit	
SPN [FMI]:	108 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	15 seconds
Functional Behaviour Description:	Internal failure in the EMS
Failure Event:	• Faulty barometric sensor
Corrective Action:	1 Replace EMS

P222664

Barometric Pressure Sensor "A" Circuit	
SPN [FMI]:	108 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	15 seconds
Functional Behaviour Description:	Engine might not run properly, with either low performance or high soot
Failure Event:	Ambient pressure compared to reference pressure below -15kPa OR Ambient pressure compared to reference pressure above 15kPa
Possible Root Cause:	Sensor failure on either Boost Pressure Sensor or Ambient Pressure Sensor
Corrective Action:	1 Replace Boost Pressure Sensor 2 Check values from Ambient Pressure Sensor. If Ambient Pressure sensor shows not expected values, replace sensor. (complete ECU).

P225D00

NOx Sensor Performance - Signal Stuck Low Bank 1 Sensor 1	
SPN [FMI]:	3216 [11]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	180 seconds
DTC Monitor Test Conditions:	Engine running with EATS-temperature (exhaust temp. sensor #3) > 200°C for 3 min.
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	The upstream NOx sensor considered removed from the exhaust system when the sensor measure too high lambda value.
Possible Root Cause:	• Exhaust system leakage • NOx sensor removed from exhaust flow • Faulty NOx sensor
Corrective Action:	1 Check that the upstream NOx sensor is clean and coorectly installed. 2 Check the cables and the connectors between the upstream NOx sensor, NOx sensor board and connection harness. 3 Check that the upstream NOx sensor is placed in the exhaust flow. 4 Check the exhaust system for leakage. 5 Run Nox Conversion test routine using VODIA (only to be used if engine is permitted to run at 1900rpm). If test fails in sensor evaluation, replace the sensor and re-run the test. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P225F00

NOx Sensor Performance - Signal Stuck Low Bank 1 Sensor 2	
SPN [FMI]:	3226 [7]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	180 seconds
DTC Monitor Test Conditions:	Engine running with EATS-temperature (exhaust temp. sensor #3) > 200°C for 3 min.
Functional Behaviour Description:	Inducement leading to engine derate.
Failure Event:	The post-NOx sensor considered removed from the exhaust system when the sensor measure too high lambda value.
Possible Root Cause:	• Exhaust system leakage • NOx sensor removed from exhaust flow • Air intake leakage • Faulty NOx sensor
Corrective Action:	1 Check that the upstream NOx sensor is clean and coorectly installed 2 Check the cables and the connectors between the upstream NOx sensor, NOx sensor board and connection harness 3 Check that the upstream NOx sensor is placed in the exhaust flow 4 Check the exhaust system for leakage 5 Check the air intake for leakage 6 Run Nox Conversion test routine using VODIA (only to be used if engine is permitted to run at 1900rpm). If test fails in sensor evaluation, replace the sensor and re-run the test. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P226411

Water In Fuel Sensor	
SPN [FMI]:	97 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	U at B8 < 0.21V
Possible Root Cause:	• SC: B8, GND
Corrective Action:	1 Check all cables and connections between the sensor and the EMS.

P226985

Water In Fuel Indicator	
SPN [FMI]:	97 [0]
Node:	EMS
FTB Name:	Signal Above Allowable Range
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	None
Failure Event:	• Water in fuel detected.
Corrective Action:	1 Empty the water trap.

P228D72

Fuel Pressure Regulator 1 Exceeded Control Limits - Pressure Too High	
SPN [FMI]:	679 [7]
Node:	EMS
FTB Name:	Actuator Stuck Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
DTC Monitor Test Conditions:	Run engine normally at different loads. More steady state driving than transient.
Functional Behaviour Description:	Low power.
Failure Event:	The inlet metering valve is monitored for being stuck open by observing a significant rail fuel pressure increase during evaluation period.
Possible Root Cause:	• Fuel quantity regulator (SCV, Suction Control Valve) open, partly opened or out of caracteristic. • Faulty rail pressure sensor.
Corrective Action:	1 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. If ok: Replace SCV. 2 Check all cables and connectors between the rail pressure sensor and the EMS. If ok: Replace the sensor.

P228E00

Fuel Pressure Regulator 1 Exceeded Learning Limits - Too Low	
SPN [FMI]:	520245 [18]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
DTC Monitor Test Conditions:	Run engine normally at different loads. More steady state driving than transient.
Functional Behaviour Description:	Engine derate
Failure Event:	Fuel pump is delivering a higher pressure than requested.
Possible Root Cause:	• Faulty/stuck closed ePRV • Fuel quantity regulator (SCV, Suction Control Valve) open, partly open or out of caracteristic. • Faulty rail pressure sensor. • Wrongly mounted high pressure pump. If the pump been dismounted/exchanged the pump alignment against the flywheel position is wrong.
Corrective Action:	1 Check all wiring and the connectors between the ePRV and the EMS. If ok: Replace ePRV 2 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. If ok: Replace SCV. 3 Check all cables and connectors between the rail pressure sensor and the EMS. If ok: Replace the sensor 4 If the high pressure pump been dismounted/exchanged check the pump installation according to the workshop manual.

P228F00

Fuel Pressure Regulator 1 Exceeded Learning Limits - Too High	
SPN [FMI]:	520245 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
DTC Monitor Test Conditions:	Run engine normally at different loads. More steady state driving than transient.
Functional Behaviour Description:	Engine derate
Failure Event:	Fuel pump can not deliver the demanded pressure.
Possible Root Cause:	• Leakage in the low pressure system. • Leakage in the high pressure system. • Faulty/stucked open ePRV. • Fuel quantity regulator (SCV, Suction Control Valve) closed, partly closed or out of caracteristic. • Faulty rail pressure sensor. • Wrongly mounted high pressure pump. If the pump been dismounted/exchanged the pump alignment against the flywheel position is wrong.
Corrective Action:	1 Check for leakage in the fuel system. 2 Check all wiring and the connectors between the ePRV and the EMS. If ok: Replace ePRV 3 Check all wiring and the connectors between the Fuel quantity regulator and the EMS. If ok: Replace SCV 4 Check all cables and connectors between the rail pressure sensor and the EMS. If ok: Replace the sensor 5 If the high pressure pump been dismounted/exchanged check the pump installation according to the workshop manual.

P229E12

NOx Sensor Bank 1 Sensor 2	
SPN [FMI]:	3226 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	180 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	Internal short circuit in the sensor or short circuit between the sensor element and the sensor control unit Error byte received from downstream/post-NOx sensor Sensor is evaluated as not reliable.
Possible Root Cause:	• Downstream NOx Sensor Short Circuit (Internal sensor fault)
Corrective Action:	1 Replace the downstream NOx sensor. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P229E13

NOx Sensor Bank 1 Sensor 2	
SPN [FMI]:	3226 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	180 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	Internal open circuit in the sensor or open circuit between the sensor element and the sensor control unit Error byte received from downstream/ post-NOx sensor Sensor is evaluated as not reliable.
Possible Root Cause:	• Downstream NOx Sensor Short Circuit (Internal sensor fault)
Corrective Action:	1 Replace the downstream NOx sensor. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P229E1C

NOx Sensor Bank 1 Sensor 2	
SPN [FMI]:	3226 [14]
Node:	EMS
FTB Name:	Circuit Voltage Out of Range
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	180 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	(Internal Supply Voltage signal containing status and error byte received from Downstream NOx sensor evaluated as NOT_RELIABLE)
Possible Root Cause:	• Faulty Downstream Nox Sensor Supply. (Internal sensor fault)
Corrective Action:	1 Check sensor supply voltage 2 Replace downstream NOx sensor If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P229E64

NOx Sensor Bank 1 Sensor 2	
SPN [FMI]:	3226 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	600 seconds
DTC Monitor Test Conditions:	High EATS-temperature (exhaust temp. sensor #3) >260°C and engine running in repeated torque transients (Engine load going fast from low to high)
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	The downstream NOx sensor shall normally respond to fast power increases. If it does not respond correctly 5 times in a row, the reductant fluid flow is temporary turned off. The test is then repeated. If the sensor still not responds correctly, the sensor value is considered stuck.
Possible Root Cause:	• Sensor positioned out of exhaust flow • Internal sensor error
Corrective Action:	1 Check position and mounting of downstream NOx sensor 2 Run NOx Conversion test routine using VODIA (only to be used if engine is permitted to run at 1900rpm). If test fails in sensor evaluation, replace the sensor and re-run the test. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P229E93

NOx Sensor Bank 1 Sensor 2	
SPN [FMI]:	3226 [13]
Node:	EMS
FTB Name:	No Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	300 seconds
DTC Monitor Test Conditions:	High EATS-temperature (exhaust temp. sensor #3) >260°C and engine running in steady-state (No quick changes in engine speed and torque) for > 4min.
Functional Behaviour Description:	Inducement leading to engine derate.
Failure Event:	(Internal status and error byte recieved from Downstream NOx sensor not evaluated as GOOD within a reasonable time)
Possible Root Cause:	• Faulty downstream NOx sensor. Incorrect start up behaviour. Might also be caused by damaged wiring harness or connectors.
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS.
	2 Run NOx Conversion test routine using VODIA (only to be used if engine is permitted to run at 1900rpm). If test fails in sensor evaluation replace the sensor and re-run the test. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P22A311

NOx Sensor Heater Control Bank 1 Sensor 2	
System:	NOx Sensors
SPN [FMI]:	520838 [4]
DTC node:	EMS
Failure type:	Circuit Short To Ground
DTC description:	Faulty sensor
Monitoring condition:	Running conditions
Fault indication:	Yellow alarm status
DTL:	10 seconds
DTC stored:	Yes
Replacement value:	None
Symptom:	None
DTC conditions:	Temperature Of Heater Element in NOxSensor Downstream not reached and Internal Short Circuit Low signal from Downstream NOx sensor is equal to "Short Wire Detected"
Probable cause:	• Downstream NOx Sensor Heater Element Short Circuit Low (Internal sensor fault)
Action:	1 Replace the Downstream NOx Sensor. After NOx sensor replacement run VODIA routine "Urea Adaption Reset".

P22A312

NOx Sensor Heater Control Bank 1 Sensor 2	
System:	NOx sensors
SPN [FMI]:	520838 [3]
DTC node:	EMS
Failure type:	Circuit Short To Battery
DTC description:	Faulty sensor
Monitoring condition:	Running conditions
Fault indication:	Yellow alarm status
DTL:	10 seconds
DTC stored:	Yes
Replacement value:	None
Symptom:	None
DTC conditions:	Internal Nox Heater Short Circuit High signal containing status and error byte received from Downstream NOx sensor evaluated as NOT_RELIABLE
Probable cause:	• Downstream NOx Sensor Heater Element Short Circuit (Internal sensor fault)
Action:	1 Replace the Downstream NOx Sensor. After NOx sensor replacement run VODIA routine "Urea Adaption Reset"

P22A313

NOx Sensor Heater Control Bank 1 Sensor 2	
System:	NOx Sensors
SPN [FMI]:	520838 [5]
DTC node:	EMS
Failure type:	Circuit Open
DTC description:	Faulty sensor
Monitoring condition:	Running conditions
Fault indication:	Yellow alarm status
DTL:	10 seconds
DTC stored:	Yes
Replacement value:	None
Symptom:	None
DTC conditions:	Temperature Of Heater Element in NOxSensor Downstream not reached and Internal Open Circuit signal from Downstream NOx sensor is equal to "Open Wire Detected"
Probable cause:	• Downstream NOx Sensor Heater Element Open Circuit (Internal sensor fault)
Action:	1 Replace the Downstream NOx Sensor. After NOx sensor replacement run VODIA routine "Urea Adaption Reset".

P22A601

NOx sensor heater sense circuit, bank 1 sensor 2	
System:	NOx sensors
SPN [FMI]:	520838 [12]
DTC node:	EMS
Failure type:	General Electrical Failure
DTC description:	Faulty sensor
Monitoring condition:	Running conditions
Fault indication:	Yellow alarm status
DTL:	10 seconds
DTC stored:	Yes
Replacement value:	None
Symptom:	None
DTC conditions:	Internal NOx Heater General Electric signal containing status and error byte received from Downstream NOx sensor evaluated as NOT_RELIABLE"
Probable cause	• Internal sensor fault
Action:	1 Replace the Downstream NOx Sensor. After NOx sensor replacement run VODIA routine "Urea Adaption Reset"

P22FB92

NOx Sensor Performance - Sensing Element Bank 1 Sensor 1	
SPN [FMI]:	3216 [12]
Node:	EMS
FTB Name:	Performance or Incorrect Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	360 seconds
DTC Monitor Test Conditions:	High EATS-temperature (exhaust temp. sensor #3) >200°C for > 6min
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	(The upstream NOx sensor has failed to report signal quality good, within the allowed maximum time after start)
Possible Root Cause:	• Faulty Upstream NOx Sensor. (Internal sensor fault)
Corrective Action:	1 Run NOx Conversion test routine using VODIA (only to be used if engine is permitted to run at 1900rpm). If test fails in sensor evaluation, replace the sensor and re-run the test. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P22FE00

NOx Sensor Performance - Sensing Element Bank 1 Sensor 2	
SPN [FMI]:	3226 [12]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	600 seconds
DTC Monitor Test Conditions:	High EATS-temperature (exhaust temp. sensor #3) >200°C for > 10min
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	(The downstream NOx sensor has failed to report signal quality good, within the allowed maximum time after start)
Possible Root Cause:	• Faulty Downstream NOx Sensor. (Internal sensor fault)
Corrective Action:	1 Run NOx Conversion test routine using VODIA (only to be used if engine is permitted to run at 1900rpm). If test fails in sensor evaluation, replace the sensor and re-run the test. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

P242800

Exhaust Gas Temperature Too High	
SPN [FMI]:	173 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	2 seconds
Functional Behaviour Description:	Derate according to the engine protection map.
Failure Event:	Exhaust temperature exceeds the set value of the engine protection parameter. (For parameters, see the engine protection map.)
Corrective Action:	1 Check that the exhaust pipe has not been damaged and that there are no restrictions. 2 Check the sensor. 3 Check the exhaust back pressure.

P242A64

Exhaust Gas Temperature Sensor Bank 1 Sensor 3	
SPN [FMI]:	3245 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	60 seconds
DTC Monitor Test Conditions:	EATS-temperature (Exhaustgas temp. sensor #3) > 200°C and engine running in steady-state (No quick changes in engine speed and torque) for > 1min.
Functional Behaviour Description:	Warning system activated
Failure Event:	Exhaust temperature sensor #3 shows abnormal values compared to exhaust temperature sensor #1 and #2 at conditions where they should be close together.
Possible Root Cause:	• Exhaust temperature sensor #3 is faulty. Most probable cause is reductant fluid crystal buildup around the sensor. Another cause could be that the exhaust piping can be too long or be cooled too much, causing exhaust temperatures to drop more than allowed compared to exhaust temperature sensor #1 at certain conditions. Also the sensor can be not properly fastened or hang outside the exhaust flow.
Corrective Action:	1 Check for reductant crystal buildup in front of SCR. 2 Check exhaust temperature sensor #3 for malfunction or wrong position (away from exhaust flow).

P244A00

Aftertreatment 1 Diesel Particulate Filter Differential Pressure Too Low (Bank 1)	
SPN [FMI]:	3936 [1]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	120 seconds
DTC Monitor Test Conditions:	High EATS-temperature (exhaust temp. sensor #3) >260°C and engine running in steady-state (No quick changes in engine speed and torque) for > 2min.
Functional Behaviour Description:	Warning system activated
Failure Event:	At conditions where the DPF shall be in full operation, the differential pressure is too low, indicating the filter is badly damaged or removed.
Possible Root Cause:	The pipe from the upstream side of the DPF to the differential pressure sensor might be blocked , broken or loose, inhibiting the sensor to measure the pressure before the DPF. Or the DPF internal is removed/broken/cracked. The pipes to the sensor might also be switched or the sensor mounted backwards.
Corrective Action:	1 Check DPF front and back for cracks
	2 Check the exhaust system for leaks
	3 Check the mounting of differential pressure sensor (not backwards)
	4 Check upstream (front) pressure pipe to differential pressure sensor for cracks
	5 Replace sensor

P244B00

Aftertreatment 1 Diesel Particulate Filter Differential Pressure Too High (Bank 1)	
SPN [FMI]:	3936 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	120 seconds
DTC Monitor Test Conditions:	High EATS-temperature (exhaust temp. sensor #3) >260°C and engine running in steady-state (No quick changes in engine speed and torque) for > 2min.
Functional Behaviour Description:	More faultcodes orginating from the same sort of error should be present, limiting the engines performance.
Failure Event:	At conditions where the DPF shall be in full operation, the differential pressure is too high, indicating the filter is badly damaged or full.
Possible Root Cause:	The pipe from the downstream side of the DPF to the differential pressure sensor might be blocked , broken or loose, inhibiting the sensor to measure the pressure after the DPF. Or the DPF internal is broken/blocked.
Corrective Action:	1 Check DPF front and back for blocking
	2 Check the exhaust system for leaks
	3 Check the mounting of differential pressure sensor (not backwards)
	4 Check downstream (back) pressure pipe to differential pressure sensor for blocks
	5 Replace sensor

P245209

Particulate Filter Pressure Sensor "A"	
SPN [FMI]:	3251 [12]
Node:	EMS
FTB Name:	Component Failures
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1s
DTC Monitor Test Conditions:	Engine running
Functional Behaviour Description:	None
Failure Event:	The differential pressure sensor value is out of range
Possible Root Cause:	• Faulty differential pressure sensor
Corrective Action:	1 Replace the differential pressure sensor. Run VODIA routine "Differential Pressure Sensor, Reset"

P245264

Particulate Filter Pressure Sensor "A"	
SPN [FMI]:	3251 [2]
Node:	EMS
FTB Name:	Signal Plausibility Failure
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	120 seconds
DTC Monitor Test Conditions:	Ignition ON and Engine stand still.
Functional Behaviour Description:	Warning system activated
Failure Event:	At startup or shutdown, when the engine is not running, the differential pressure over the DPF is too high. In normal conditions with no exahust flow, the differential pressure is close to zero.
Possible Root Cause:	• The sensor might be broken, either by physical damage or by being frozen. Another cause could also be blocked, waterfilled, frozen with ice, cracked or loose pipes to the differential pressure sensor.
Corrective Action:	1 Check mounting and condition of pipes to differential pressure sensor 2 Check for stuck water or ice in pipes 3 Inspect pipes for crystal or soot buildup 4 When risk for ambient degrees below zero, the sensor might have been broken by frozen water in pipes. Check for correct mounting of pipes to sensor and replace sensor.

P246300

Particulate Filter Restriction - Soot Accumulation Bank 1	
SPN [FMI]:	3064 [0]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	30 seconds
DTC Monitor Test Conditions:	Engine running
Functional Behaviour Description:	Regeneration needed
Failure Event:	(SPN 3719) Soot load level indicator ≥70 ≤79
Possible Root Cause:	• High ash or soot load. Regeneration not succeded.
Corrective Action:	1 Start service regeneration
	2 Check for high ash load in aftertreatment diesel particulate filter. Use VODIA to read out "Ash Load" status
	3 Check of clogging of aftertreatment diesel particulate filter. If filter replaced, VODIA routine "DPF Reset" must be runned.
	4 Check for faulty leaking EGR valve
	5 Check for faulty DPF differential pressure sensor

P24A400

Diesel Particulate Filter Restriction - Soot Accumulation Too High (Bank 1)	
SPN [FMI]:	3064 [16]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	30 seconds
DTC Monitor Test Conditions:	Engine running
Functional Behaviour Description:	Engine derate. Regeneration needed.
Failure Event:	(SPN 3719) Soot load level indicator >99
Possible Root Cause:	• High soot level indication
Corrective Action:	1 Check for high ash load in aftertreatment diesel particulate filter. Use VODIA to read out "Ash Load" status
	2 Check of clogging of aftertreatment diesel particulate filter
	3 Check for faulty leaking EGR valve
	4 Check for faulty DPF differential pressure sensor
	5 Replace Diesel Particulate Filter. If filter replaced, VODIA routine "DPF Reset" must be runned.

P250A11

Engine Oil Level Sensor	
SPN [FMI]:	98 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	35 seconds
Functional Behaviour Description:	None
Failure Event:	U at B4 < 0.05V
Possible Root Cause:	• SC: B4, GND
Corrective Action:	1 Check all cables and connections between the sensor and the EMS

P250A13

Engine Oil Level Sensor	
SPN [FMI]:	98 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	35 seconds
Functional Behaviour Description:	None
Failure Event:	U at B4 < 0.2V
Possible Root Cause:	• OC: B4
	• OC: B3
Corrective Action:	1 Check all cables and connections between the sensor and the EMS

P250F00

Engine Oil Level Too Low	
SPN [FMI]:	98 [1]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
Functional Behaviour Description:	The engine could shut off unexpectedly.
Failure Event:	Engine oil level is below the set alarm level.
Possible Root Cause:	• Low oil level • Oil leakage • Faulty sensor
Corrective Action:	1 Check the oil level in the engine. 2 Check that no leakage occurs. 3 Check the sensor.

P253911

Low Pressure Fuel System Sensor	
SPN [FMI]:	94 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	U at B16 below normal range
Possible Root Cause:	• SC: B16, GND • Faulty sensor
Corrective Action:	1 Check all cables and connections between the sensor and the EMS 2 Check the contact pressure at sensor connector and in socket B16 in the EMS connector. 3 Check the sensor

P253912

Low-Pressure Fuel System Sensor Circuit	
SPN [FMI]:	94 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	U at B16 > 4.85V
Possible Root Cause:	• SC: B16, Vbat • OC: Sensor GND • Faulty sensor
Corrective Action:	1 Check all cables and connections between the sensor and the EMS 2 Check the contact pressure at sensor connector and in socket B16 in the EMS connector. 3 Check the sensor.

P253913

Low-Pressure Fuel System Sensor Circuit	
SPN [FMI]:	94 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	7 seconds
Functional Behaviour Description:	None
Failure Event:	U at B16 < 0.15V
Possible Root Cause:	• OC: 5+ • OC: B16 • SC: B16, GND • Faulty sensor
Corrective Action:	1 Check all cables and connections between the sensor and the EMS 2 Check the contact pressure at sensor connector and in socket B16 in the EMS connector 3 Check the sensor

P255611

Engine Coolant Level Sensor/Switch	
SPN [FMI]:	111 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at B23 < 2.8V
Possible Root Cause:	• SC: B23, GND • Faulty sensor/switch
Corrective Action:	1 Check all cables and connections between the sensor/switch and the EMS. 2 Check the sensor/switch.

P255612

Engine Coolant Level Sensor/Switch	
SPN [FMI]:	111 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	U at B23 > 23.5V
Possible Root Cause:	• SC: B23, Vbat • Faulty sensor
Corrective Action:	1 Check all cables and connections between the sensor/switch and the EMS. 2 Check the sensor/switch.

P255613

Engine Coolant Level Sensor/Switch	
SPN [FMI]:	111 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	18.9V< U at B23 < 19.6V
Possible Root Cause:	• OC: B23 • Faulty sensor/switch
Corrective Action:	1 Check all cables and connections between the sensor/switch and the EMS. 2 Check the contact pressure at sensor connector and in socket B23 in the EMS connector. 3 Check the sensor/switch.

P256000

Engine Coolant Level Low	
SPN [FMI]:	111 [1]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	12 seconds
Functional Behaviour Description:	None
Failure Event:	Engine coolant level is below the set alarm level.
Possible Root Cause:	• Low coolant level
Corrective Action:	1 Check the coolant level. If low coolant level check the coolant water system for leakage by a pressure test. 2 Bleed the coolant water system.. 3 Check all cables and connections between the sensor/switch and the EMS.

P25A911

Piston Cooling Oil Control	
SPN [FMI]:	4812 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	None
Failure Event:	Short circuit to ground
Possible Root Cause:	• SC: B41, GND • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P25A912

Piston Cooling Oil Control	
SPN [FMI]:	4812 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	None
Failure Event:	Short circuit to battery voltage.
Possible Root Cause:	• SC: B41, Vbat • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor

P25A913

Piston Cooling Oil Control	
SPN [FMI]:	4813 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	None
Failure Event:	Open Circuit
Possible Root Cause:	• OC: B41 • Faulty sensor
Corrective Action:	1 Check all cables and connectors between the sensor and the EMS. 2 Check the sensor.

P25AE00

Piston Cooling Oil Pressure Too Low	
SPN [FMI]:	4811 [1]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Red alarm status
DTC Monitor Detection Time:	10 seconds
DTC Monitor Test Conditions:	Engine must be running for(30s + 30s)
Functional Behaviour Description:	Engine shuts off
Failure Event:	Piston Cooling Oil pressure below set point
Possible Root Cause:	• Low oil level • Fuel in oil • Faulty Piston Cooling Jet (PCJ) valve or wiring • Faulty oil temperature sensor or wiring
Corrective Action:	1 Check oil level 2 Check for fuel in oil. Replace oil and filter if contaminated. 3 Check all cables and connectors between the PCJ and the EMS 4 Check the PCJ valve 5 Check all cables and connectors between the oil temperature sensor and the EMS 6 Check the oil temperature sensor

P260011

Coolant Pump "A" Control	
SPN [FMI]:	4814 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	Measured voltage is below 43% of Battery voltage
Possible Root Cause:	• SC: A4, GND • Faulty actuator
Corrective Action:	1 Check all cables and connections between the actuator and the EMS. 2 Check the actuator

P260012

Coolant Pump "A" Control	
SPN [FMI]:	4814 [3]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	Voltage at A4 below normal range
Possible Root Cause:	• SC: A4, Vbat • Faulty actuator
Corrective Action:	1 Check all cables and connections between the actuator and the EMS. 2 Check the actuator

P260013

Coolant Pump "A" Control	
SPN [FMI]:	4814 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	6 seconds
Functional Behaviour Description:	None
Failure Event:	Measured voltage is below 43% of Battery voltage OR Measured voltage is above 61% of Battery voltage.
Possible Root Cause:	• OC: A4 • Faulty actuator
Corrective Action:	1 Check all cables and connections between the actuator and the EMS. 2 Check the actuator

P2A1212

Injection Pump Fuel Metering Control "C" (Cam/Rotor/Injector)	
SPN [FMI]:	653 [2]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current reaches 16 A before (time) 35 µs OR Measured Low current does not reach 6.6 A within (time) 150 µs
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:59 A:32

P2A1214

Injection Pump Fuel Metering Control "C" (Cam/Rotor/Injector)	
SPN [FMI]:	653 [1]
Node:	EMS
FTB Name:	Circuit Short To Ground or Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current does not reach 16 A within (time) 300 µs
Possible Root Cause:	1 Faulty wiring 2 Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:59 A:32

P2A1612

Injection Pump Fuel Metering Control "D" (Cam/Rotor/Injector)	
SPN [FMI]:	654 [2]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current reaches 16 A before (time) 35 µs OR Measured Low current does not reach 6.6 A within (time) 150 µs
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:60 A:56

P2A1614

Injection Pump Fuel Metering Control "D" (Cam/Rotor/Injector)	
SPN [FMI]:	654 [1]
Node:	EMS
FTB Name:	Circuit Short To Ground or Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current does not reach 16 A within (time) 300 µs
Possible Root Cause:	1 Faulty wiring 2 Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:60 A:56

P2A1692

Injection Pump Fuel Metering Control "D" (Cam/Rotor/Injector)	
SPN [FMI]:	654 [18]
Node:	EMS
FTB Name:	Performance or Incorrect Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Loss of high fuel pressure pumping capacity
Possible Root Cause:	• Faulty high fuel pressure pump • Faulty cam profile
Corrective Action:	1 Check the high fuel pressure pump 2 Check if rotated cam profile

P2A1A12

Injection Pump Fuel Metering Control "E" (Cam/Rotor/Injector)	
SPN [FMI]:	655 [2]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current reaches 16 A before (time) 35 µs OR Measured Low current does not reach 6.6 A within (time) 150 µs
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
	A:60 A:48

P2A1A14

Injection Pump Fuel Metering Control "E" (Cam/Rotor/Injector)	
SPN [FMI]:	655 [1]
Node:	EMS
FTB Name:	Circuit Short To Ground or Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current does not reach 16 A within (time) 300 µs
Possible Root Cause:	• Faulty wiring. • Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:60 A:48

P2A1E12

Injection Pump Fuel Metering Control "F" (Cam/Rotor/Injector)	
SPN [FMI]:	656 [2]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current reaches 16 A before (time) 35 µs OR Measured Low current does not reach 6.6 A within (time) 150 µs
Possible Root Cause:	• Faulty wiring • Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:60 A:40

P2A1E14

Injection Pump Fuel Metering Control "F" (Cam/Rotor/Injector)	
SPN [FMI]:	656 [1]
Node:	EMS
FTB Name:	Circuit Short To Ground or Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Measured High current does not reach 16 A within (time) 300 μs
Possible Root Cause:	1 Faulty wiring 2 Faulty injector
Corrective Action:	1 Check the harness of the injector 2 Check the injector 3 Check the injector connector
Connector info:	A:60 A:40

P2A1E92

Injection Pump Fuel Metering Control "F" (Cam/Rotor/Injector)	
SPN [FMI]:	656 [18]
Node:	EMS
FTB Name:	Performance or Incorrect Operation
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Engine derate
Failure Event:	Loss of high fuel pressure pumping capacity
Possible Root Cause:	• Faulty high fuel pressure pump • Faulty cam profile
Corrective Action:	1 Check the high fuel pressure pump 2 Check if rotated cam profile

P2CE113

Intake Air Heater "C" Circuit/Open	
SPN [FMI]:	626 [5]
Node:	EMS
FTB Name:	Circuit Open
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Preheat relay will not activate
Failure Event:	Voltage at B25 outside normal range
Possible Root Cause:	• OC: A4 • Faulty actuator
Corrective Action:	1 Check all cables and connections between the actuator and the EMS. 2 Check the actuator

P2CE311

Intake Air Heater "C" Circuit Low	
SPN [FMI]:	626 [4]
Node:	EMS
FTB Name:	Circuit Short To Ground
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Preheat relay will not activate
Failure Event:	Voltage at B25 below normal range
Possible Root Cause:	• SC: A4, GND • Faulty actuator
Corrective Action:	1 Check all cables and connections between the actuator and the EMS. 2 Check the actuator

P2CE412

Intake Air Heater "C" Circuit High	
SPN [FMI]:	626 [3]
Node:	EMS
FTB Name:	Circuit Short To Battery
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Preheat relay will not activate
Failure Event:	Voltage at B25 above normal range
Possible Root Cause:	• SC: A4, Vbat • Faulty actuator
Corrective Action:	1 Check all cables and connections between the actuator and the EMS. 2 Check the actuator

U000188

CAN Communication Backbone 2 Net	
SPN [FMI]:	639 [2]
Node:	EMS
FTB Name:	Bus Off
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	AM-Tool can not read fault codes
Failure Event:	Missing CAN communication on BB2
Possible Root Cause:	• OC/SC: B22, B21
Corrective Action:	1 Check wiring harness and connectors 2 Verify correct termination resistance

U001088

CAN Communication Backbone 1 Net	
SPN [FMI]:	639 [2]
Node:	EMS
FTB Name:	Bus Off
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	Engine can not be started or if engine is running it can only be stopped by pushing the aux-stop.
Failure Event:	Missing CAN communication on BB1.
Possible Root Cause:	• OC/SC: B51, B55
Corrective Action:	1 Check all wiring connected to CAN backbone 1. (see wiring diagram)

U008088

Vehicle communication engine subnet	
SPN [FMI]:	1668 [2]
Node:	EMS
FTB Name:	Bus Off
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	1 seconds
Functional Behaviour Description:	None
Failure Event:	Missing CAN communication on engine subnet.
Possible Root Cause:	• OC/SC: Engine subnet wiring • OC/SC: Engine subnet wiring
Corrective Action:	1 Check all wiring connected to Engine subnet. (see wiring diagram) 2 Check the ACM CAN sensor power supply wiring.

U014100

Lost Communication With Body Control Module "A"	
SPN [FMI]:	2017 [9]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	9 seconds
Failure Event:	The EMS has lost communication with the DCU.
Corrective Action:	1 Check all wiring and connectors between the EMS and the DCU

U029D00

Lost Communication With NOx Sensor "A"	
SPN [FMI]:	3216 [9]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	Lost communication with upstream NOx sensor on Vehicle Communication Engine Subnet.
Possible Root Cause:	• Upstream Nox sensor not powered. Software incompatibility with upstream NOx sensor.
Corrective Action:	1 Check all cables and connections to the upstream NOx sensor. 2 Replace the sensor. If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

U029E00

Lost Communication With NOx Sensor "B"	
SPN [FMI]:	3226 [9]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	10 seconds
DTC Monitor Test Conditions:	Ignition on
Functional Behaviour Description:	Inducement leading to engine derate
Failure Event:	Lost communication with downstream NOx sensor on Vehicle Communication Engine Subnet.
Possible Root Cause:	• Downstream Nox sensor not powered. Software incompatibility with downstream NOx sensor.
Corrective Action:	1 Check all cables and connections to the downstream NOx sensor 2 Replace the sensor If NOx sensor replaced, VODIA routine "EATS, Urea Adaptation, Reset" must be runned.

U02A900

Lost Communication With Charge Air Cooler Coolant Pump "A"	
SPN [FMI]:	520998 [9]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Charge air cooler coolant pump limp-home speed
Failure Event:	Lost Communication With Charge Air Cooler Coolant Pump
Possible Root Cause:	• Broken pump fuse • Fault in wiring harness/connector
Corrective Action:	1 Check the pump fuse 2 Check all cables and connectors between the actuator and the EMS

U065000

Lost Communication With Exhaust Pressure Control Valve "A" Sensor/Switch	
SPN [FMI]:	1074 [9]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	–
Functional Behaviour Description:	Reduced engine brake performance Reduced engine brake performance
Failure Event:	Lost Communication With EPG
Possible Root Cause:	• Fault in wiring harness/connector
Corrective Action:	1 Check all cables and connectors between the actuator and the EMS

U116F00

Lost Communication with Reductant Control Module on Engine Subnet	
SPN [FMI]:	520416 [9]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	9 seconds
Functional Behaviour Description:	No AdBlue/DEF dosing Derate according to the engine protection map.
Failure Event:	EMS has lost communication with ACM on the engine subnet.
Possible Root Cause:	• Broken EATS Fuse. (25A located on the engine) • OC in the dosing valve wiring • Fault in the engine subnet.
Corrective Action:	1 Check the EATS fuse. 2 Check all cables and connections to the dosing valve. 3 Check all wiring connected to engine subnet. (see wiring diagram)

U117100

Lost Communication with Body Control Module on High Speed CAN Communication Bus	
SPN [FMI]:	2036 [9]
Node:	EMS
FTB Name:	No Sub Type Information
Lamp Status:	Yellow alarm status
DTC Monitor Detection Time:	9 seconds
Failure Event:	The EMS has lost communication with the DCU.
Corrective Action:	1 Check all wiring and connectors between the EMS and the DCU.

U300001

Control Module	
SPN [FMI]:	520335 [5]
Node:	EMS
FTB Name:	General Electrical Failure
Lamp Status:	None
DTC Monitor Detection Time:	5 seconds
Functional Behaviour Description:	Engine does not start.
Failure Event:	Internal voltage supply in EMS indicates failure.
Corrective Action:	1 Replace the EMS. Service regeneration necessary to reset soot load in EMS.

U300041

Control Module	
SPN [FMI]:	—
Node:	EMS
FTB Name:	General Checksum Failure
Lamp Status:	Red alarm status
Functional Behaviour Description:	Engine can not be started
Failure Event:	Software checksum error
Corrective Action:	1 Reprogram the EMS

U300044

Control Module	
SPN [FMI]:	—
Node:	EMS
DTC description:	RAM error
Functional Behaviour Description:	Engine can not be started
Failure Event:	Data Memory Failure
Corrective Action:	1 Reprogram the EMS

U300045

Control Module	
SPN [FMI]:	—
Node:	EMS
FTB Name:	Program Memory Failure
Lamp Status:	Red alarm status
Functional Behaviour Description:	Engine can not be started
Failure Event:	Program Memory Failure
Corrective Action:	1 Reprogram the EMS 2 Replace the EMS. Service regeneration necessary to reset soot load in EMS.

U300049

Control Module	
SPN [FMI]:	—
Node:	EMS
FTB Name:	Internal Electronic Failure
Lamp Status:	Red alarm status
Functional Behaviour Description:	Engine can not be started
Failure Event:	Data Memory Failure
Corrective Action:	1 Replace the EMS

Measurements

Component	EMS #	Measure box #	Conn. pin #	Signal type	Ignition on	Engine running	Note
Air filter indicator	B31	31	4	Temperature (V)	31-6 = 0-5 V	31-6 = 0-5 V	U is depended of the temp. R_{temp}, see table 3.
	B6	6	3	(-) GND	6-bat (-) = 0 V	6-bat (-) = 0 V	-
	A29	29	2	Switch input	15-29 = 2.9 V	15-29 = 2.9 V	At clean filter, non activated switch.
	A15	15	1	Switch GND	15-bat (-) = 0 V	15-bat (-) = 0 V	-
Air inlet pressure / Intake manifold temperature	A11	11	1	(-) GND	11-bat (-) = 0 V	11-bat (-) = 0 V	-
	A47	47	2	Temperature (V)	11-47 = 0-5 V	11-47 = 0-5 V	U is depended of the temp. R_{temp}, see table 1.
	A7	7	3	(+) Supply	11-7 = 5 V	11-7 = 5 V	-
	A22	22	4	Pressure	11-22 = 0.95 V*	11-22 = 0.5-4.5 V**	U is depended of the pressure. * At sea level. ** 50-500 kPa, see table 7.
Camshaft	A46	46	1	Sensor output	-	sine wave	Coil resistance: 0.9 kΩ (+/- 10%) at 20 °C
	A45	45	2	Sensor output	-	sine wave	-
Coolant level	B23	23	1	Switch input	23-10 = Vbat x 0.8	23-10 = Vbat x 0.8	Switch open = Level ok. Switch closed = Level low
	B10	10	2	(-) GND	-	-	-
Coolant pump	A4	4	2	PWM	-	-	Low side switch
	-	-	1	(+) Supply	-	-	Coil resistance: 20 Ω (+/- 2 Ω) at 20°C
Coolant temperature	B27	27	1	Temperature (V)	27-6 = 0-5 V	27-6 = 0-5 V	U is depended of the temp. R_{temp}, see table 2.
	B6	6	2	(-) GND	6-bat (-) = 0 V	6-bat (-) = 0 V	-
Crankshaft	A38	38	1	Sensor output	-	sine wave	Coil resistance: 0.9 kΩ (+/- 10%) at 20 °C
	A37	37	2	Sensor output	-	sine wave	-
eEPG	B35	35	4	CAN L	-	-	Engine subnet L
	B36	36	2	CAN H	-	-	Engine subnet H
	-	-	1	(+) Supply	-	-	Vbat (+)
	-	-	3	(-) GND	-	-	bat (-)
EGR valve	B13	13	1	Current drive high	-	-	Coil resistance: 14 Ω (+/- 1.4 Ω) at 25°C
	B9	9	3	Current drive low	-	-	-

Component	EMS #	Measure box #	Conn. pin #	Signal type	Ignition on	Engine running	Note
ePRV	A28	28	3	PWM output	-	-	Low side switch
	A62	62	1	PWM output	-	-	High side switch
Exhaust pressure	B12	12	2	Pressure	18-12 = 0.5V	35-58 = 2.3V*	U is dependent of the pressure. * 0-700 kPa, see table 6.
	B18	18	4	(-) GND	18-bat (-) = 0 V	18-16= 0.5-4.5 V*	-
	B17	17	1	(+) Supply	18-17= 5V	18-bat (-) = 0 V	-
Fan	A1	1	A	(+) Supply	1-bat (-) = 5 V	1-bat (-) = 5 V	Fan speed sensor supply
	-	-	B	(+) Vbat	-	-	-
	B49	49	C	PWM	-	-	Low side switch. R ≈ 10.4 ±1.3 Ω at 90 °C U ≈ PWM output (clutch engagement dependent)
	A39	39	D	Fan speed (-)	-	-	The fan speed sensor is a Hall effect sensor.
	A35	35	E	Fan speed (+)	-	-	U ≈ Pulse output. 6 pulses/revolution.
Fuel pressure	B17	17	1	(+) Supply	18-17 = 5 V	35-58 = 2.3V*	-
	B16	1	2	Pressure	18-16 = 0.5 V	18-16= 0.5-4.5 V*	U is dependent of the pressure. * 0-700 kPa, see table 6.
	B18	18	4	(-) GND	18-bat (-) = 0 V	18-bat (-) = 0 V	-
Fuel pressure regulator (MPROP)	A16	16	3	PWM output	-	-	Low side switch Coil resistance: 8 Ω (+/-0.5 Ω) at 20 °C
	A12	12	1	PWM output	-	-	High side switch
Oil cooling jet pressure	B17	17	1	(+) Supply Temperature	18-17 = 5V	18-17 = 5V	-
	B18	18	4	(-) GND	18-bat (-) = 0V	18-bat (-) = 0V	-
	B19	19	2	Pressure	19-18 = 0.5V	11-18 = 0.5–4.5V*	U is dependent of the pressure. *0–700 kPa, see table 6.
Oil level / temperature	B3	3	2	Level GND	-	-	-
	B4	4	1	Current supply	-	-	-
	A31	31	3	Temperature (V)	6-31 = 0-5 V	6-31 = 0-5 V	U is depended of the temp. R_temp, see table 4.
	A6	6	4	(-) GND	6-bat (-) = 0 V	6-bat (-) = 0 V	-
Oil piston cooling jet valve	B41	41	1	PWM	-	-	Low side switch Coil resistance: 27.5 Ω (+/- 1.5 Ω) at 20°C
	-	-	2	(+) Supply			

Component	EMS #	Measure box #	Conn. pin #	Signal type	Ignition on	Engine running	Note
Oil pressure	B17	17	1	(+) Supply	17-18 = 5 V	17-18 = 5 V	-
	B11	11	2	Pressure	11-18 = 0.5 V	11-18 = 0.5-4.5 V	U is depended of the pressure. *0–700 kPa, see table 6.
	B18	18	4	(-) GND	18-bat (-) = 0 V	18-bat (-) = 0 V	-
Oil thermostat valve	B53	53	1	PWM	-	-	Low side switch
	-	-	2	(+) Supply			Coil resistance: 27.5 Ω (+/- 1.5 Ω) at 20°C
Preheat relay	B25	25	3	On/Off	-		Measured between B25 and B10: Vbat (+) when preheat relay not activated. 0 V when preheat relay activated.
	B10	10	2	(-) GND	-		
Preheat sense	B7	7	-	Relay status input	-		Measured between B7 and bat (-): 0 V when preheat relay not activated. 0.8*Vbat (+) when preheat relay activated.
Rail pressure / temperature (TAD58X) (TAD88X)	A5	5	4	Temperature	11-5 = 0-5V	11-5 = 0-5V	U is depended of the temperature, see table 5.
	A19	19	3	Pressure	11-19 = 0.85 V	11-19 = 0.85-3.65 V*	U is depended of the pressure, see table 8. *0–200 MPa ≈ 70 kPa/1mV
	A7	7	1	(+) Supply	11-7 = 5V	11-7 = 5V	-
	A11	11	2	(-) GND	11-bat (-) = 0 V	11-bat (-) = 0 V	-
Rail pressure (TAD118X) (TAD138X)	A19	19	3	Pressure	11-19 = 0.5 V	11-19 = 0.5-4.55 V*	U is depended of the pressure. *0–300 MPa ≈ 75 kPa/1mV
	A7	7	1	(+) Supply	11-7 = 5V	11-7 = 5V	-
	A11	11	2	(-) GND	11-bat (-) = 0 V	11-bat (-) = 0 V	-
Throttle	B5	5	1	Motor supply	-	-	Rated voltage: 24 V, H-bridge controlled.
	B17	17	2	(+) Supply	17-18 = 5 V	17-18 = 5 V	-
	B18	18	3	(-) GND	18-bat (-) = 0 V	18-bat (-) = 0 V	-
	B24	24	4	Throttle position	24-18 = 0.5-4.375 V	24-18 = 0.5-4.375 V	U is depended of throttle position.
	B1	1	5	Motor supply	-	-	Rated voltage: 24 V, H-bridge controlled.
Wastegate Valve	B38	38	1	PVM			Low side switch. Coil resistance: 90 Ω (+/-4.5Ω) at 23 °C
	-	-	2	(+) Vbat			-
Water in fuel	B8	8	3	Switch input	8-10 = 4.8 V	8-10 = 4.8 V	No water in fuel.
	B10	10	2	(-) GND	-	-	-

Table 1: Intake manifold temperature (50-500kPa)

Temperature	Nominal value	
0 °C	R ≈ 5774 Ω ±280 Ω	U ≈ 4,1V
+25 °C	R ≈ 2014 Ω ±74 Ω	U ≈ 3,1V
+40 °C	R ≈ 1150 Ω ±36 Ω	U ≈ 2,4V
+80 °C	R ≈ 316 Ω ±6 Ω	U ≈ 1,0 V
+125 °C	R ≈ 98 Ω ±2 Ω	U ≈ 0,4V

Table 2: Coolant temperature

Temperature	Nominal value	
0 °C	R ≈ 5800 Ω ±400 Ω	U ≈ 4,1V
+20 °C	R ≈ 2470 Ω ±150 Ω	U ≈ 3,4V
+40 °C	R ≈ 1160 Ω ±50 Ω	U ≈ 2,5V
+60 °C	R ≈ 590 Ω ±15 Ω	U ≈ 1,6V
+80 °C	R ≈ 320 Ω ±10 Ω	U ≈ 1,1V
+100 °C	R ≈ 180 Ω ±7 Ω	U ≈ 0,7V
+120 °C	R ≈ 110 Ω ±4 Ω	U ≈ 0,4V

Table 3: Air filter temperature

Temperature	Nominal value	
0 °C (+32 °F)	R ≈ 16445 Ω ±622 Ω	U ≈ 3,8V
+30 °C (+86 °F)	R ≈ 4026 Ω ±160 Ω	U ≈ 2,1V
+60 °C (+140 °F)	R ≈ 1456 Ω ±40 Ω	U ≈ 1,1V
+90 °C (+194 °F)	R ≈ 463 Ω ±20 Ω	U ≈ 0,4V
+120 °C (+248 °F)	R ≈ 198 Ω ±10 Ω	U ≈ 0,2V

Table 4: Oil temperature

Temperature	Nominal value	
0 °C (+32 °F)	R ≈ 4981 Ω ±503 Ω	U ≈ 4,0V
+20 °C (+68 °F)	R ≈ 1900 Ω ±163 Ω	U ≈ 3,1V
+40 °C (+104 °F)	R ≈ 809 Ω ±59 Ω	U ≈ 2,0V
+60 °C (+140 °F)	R ≈ 378 Ω ±24 Ω	U ≈ 1,2V
+80 °C (+176 °F)	R ≈ 191 Ω ±10 Ω	U ≈ 0,7V
+100 °C (+212 °F)	R ≈ 104 Ω ±5 Ω	U ≈ 0,4V
+120 °C (+248 °F)	R ≈ 60 Ω ±3 Ω	U ≈ 0,2V

Table 5: Rail temperature

Temperature	Nominal value
-10	U ≈ 3.7 V
0	U ≈ 3.5 V
+20	U ≈ 3.1 V
+50	U ≈ 2.4 V
+80	U ≈ 1.8 V
+100	U ≈ 1.4 V

Table 6: Oil/fuel/exhaust pressure

Pressure	Voltage
0 kPa	0.5 V
87.5 kPa	1.0 V
175 kPa	1.5 V
263 kPa	2.0 V
350 kPa	2.5 V
438 kPa	3.0 V
525 kPa	3.5 V
613 kPa	4.0 V
700 kPa	4.5 V

Table 7: Air inlet pressure

Pressure	Voltage
50 kPa	0.5 V
106 kPa	1.0 V
163 kPa	1.5 V
219 kPa	2.0 V
275 kPa	2.5 V
331 kPa	3.0 V
388 kPa	3.5 V
444 kPa	4.0 V
500 kPa	4.5 V

Table 8: Rail pressure

Pressure	Voltage
-10	U ≈ 3.7 V
0	U ≈ 3.5 V
+20	U ≈ 3.1 V
+50	U ≈ 2.4 V
+80	U ≈ 1.8 V
+100	U ≈ 1.4 V

37-0 Wiring Diagrams

Pin description

Pin	EMS 2.4	Populated (X)
A01	V5_EXT_3 Supply	X
A02	V5_EXT_3 Ground	X
A03	10A Drive 2	X
A04	10A Drive 1	X
A05	Pressure Input 10	X
A06	Pull-up Ground A-connector	X
A07	V5_EXT_1 Supply	X
A08	EECU Power Relay Drive	X
A09	Air Temp Input 4	X
A10	PWM HS Output 1	X
A11	V5_EXT_1 Ground	X
A12	NCV LS 2	X
A13	Not used	
A14	Not used	
A15	Switch Ground 1	X
A16	SV/OMV LS2	X
A17	E-PRV HS	X
A18	E-PRV LS	X
A19	Pressure Input 7	X
A20	NCV LS 1	X
A21	Pressure Input 6	X
A22	Pressure Input 1	X
A23	Pressure Input 8	X
A24	SV/OMV LS 1	X
A25	Analog Input 0	X
A26	Switch Input 2	X
A27	Switch Input 4	X
A28	NCV LS 3	X
A29	Switch Input 7	X
A30	Fluid Temp Input 4	X
A31	Fluid Temp Input 3	X

Pin	EMS 2.4	Populated (X)
A32	SV/OMV LS 3	X
A33	J1708 B	X
A34	J1708 A	X
A35	Fan Speed +	X
A36	NCV LS 6	X
A37	Crank Speed L	X
A38	Crank Speed H	X
A39	Fan Speed -	X
A40	SV/OMV LS 6	X
A41	Turbo Speed +	X
A42	Turbo Speed -	X
A43	Air Temp Input 2	X
A44	NCV LS 5	X
A45	Cam Speed H	X
A46	Cam Speed L	X
A47	Air Temp Input 1	X
A48	SV/OMV LS 5	X
A49	Turbo Speed 2	X
A50	Pressure Input 9	X
A51	PWM Input	X
A52	NCV LS 4	X
A53	Fluid Temp Input 5	X
A54	Pressure Input 11	X
A55	Switch Input 10	X
A56	SV/OMV LS 4	X
A57	EECU Ground	X
A58	Switch Input 1	X
A59	SV/OMV HS Bank 1	X
A60	SV/OMV HS Bank 2	X
A61	NCV HS Bank 2	X
A62	NCV HS Bank 1	X

Pin	EMS 2.4	Populated (X)	Pin	EMS 2.4	Populated (X)
B01	H-Bridge 2 B	X	B32	Fluid Temp Input 1	X
B02	PWM HS Output 2	X	B33	ON/OFF 1/H-Bridge 3_H	X
B03	Oil Level LS	X	B34	ON/OFF 5	X
B04	Oil Level HS	X	B35	CAN 4 L	X
B05	H-Bridge 2 A	X	B36	CAN 4 H	X
B06	Pull-up Ground B-connector	X	B37	ON/OFF HS Driver 1	X
B07	Switch Input 8	X	B38	PWM5	X
B08	Switch Input 5	X	B39	H-Bridge 3_L	X
B09	Current Drive	X	B40	Peak Hold PWM 2 LS	X
B10	Switch Ground 2	X	B41	PWM8	X
B11	Pressure Input 2	X	B42	Peak Hold PWM 2 HS	X
B12	Analog Input 3	X	B43	Temperature Input 3	X
B13	Current Drive	X	B44	Temperature Input 2	X
B14	Switch Input 9	X	B45	Peak Hold PWM 1 LS	X
B15	Buffered Idle Validation Switch	X	B46	PWM6	X
B16	Pressure Input 5	X	B47	Temperature Input 1	X
B17	V5_EXT_2 Supply	X	B48	Temperature Input 4	X
B18	V5_EXT_2 Ground	X	B49	PWM2	X
B19	Analog Input 2	X	B50	PWM10	X
B20	Pressure Input 3	X	B51	CAN 1 H	X
B21	CAN 3 L	X	B52	CAN 2/Flexray2 H	X
B22	CAN 3 H	X	B53	PWM3	X
B23	Switch Input 6	X	B54	PWM7	X
B24	Analog Input 1	X	B55	CAN 1 L	X
B25	ON/OFF 8	X	B56	CAN 2/Flexray2 L	X
B26	PWM9	X	B57	EECU supply	X
B27	Fluid Temp Input 2	X	B58	EECU ground	X
B28	Pressure Input 4	X	B59	EECU ground	X
B29	ON/OFF 6	X	B60	EECU supply	X
B30	ON/OFF 4	X	B61	EECU ground	X
B31	Air Temp Input 3	X	B62	Peak Hold PWM 1 HS	X

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