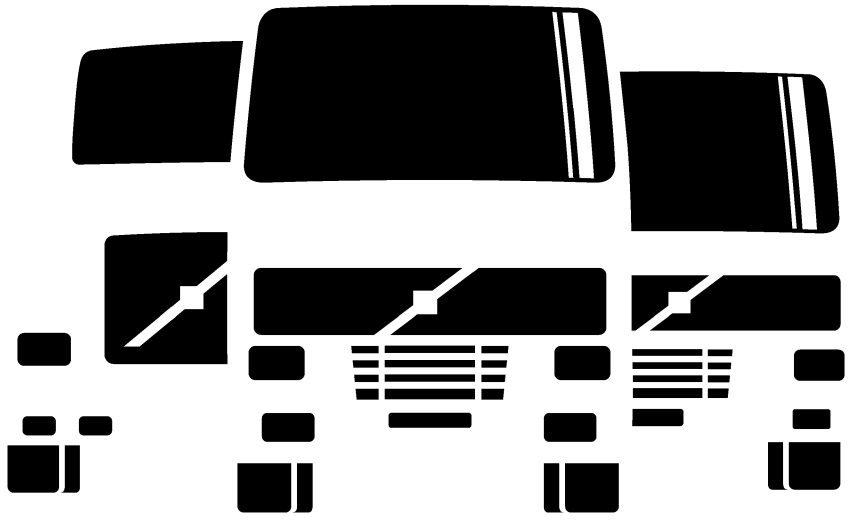
Service Manual
Trucks

Group **28**
Release **08**

Fault codes Engine (EECU)
MID 128
D9A, D12D, D16C



20132393

VOLVO

Foreword

The descriptions and service procedures contained in this manual are based on designs and methods studies carried out up to November 2007.

The products are under continuous development. Vehicles and components produced after the above date may therefore have different specifications and repair methods. When this is judged to have a significant bearing on this manual, supplementary service bulletins will be issued to cover the changes.

The new edition of this manual will update the changes.

In service procedures where the title incorporates an operation number, this is a reference to V.S.T. (Volvo Standard Times).

Service procedures which do not include an operation number in the title are for general information and no reference is made to V.S.T.

The following levels of observations, cautions and warnings are used in this Service Documentation:

Note: Indicates a procedure, practice, or condition that must be followed in order to have the vehicle or component function in the manner intended.

Caution: Indicates an unsafe practice where damage to the product could occur.

Warning: Indicates an unsafe practice where personal injury or severe damage to the product could occur.

Danger: Indicates an unsafe practice where serious personal injury or death could occur.

Volvo Truck Corporation
Göteborg, Sweden

This handbook replaces the following information:

SHB	Group	28	20013486

Order number: 20132393

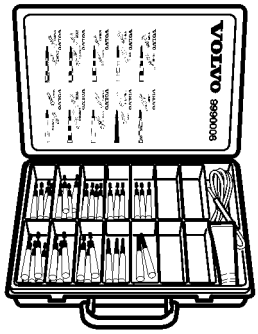
ENG28577.ihval

Contents

Operation Numbers

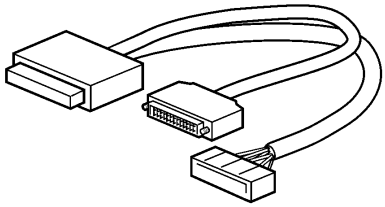
Tools

Special tools, engine

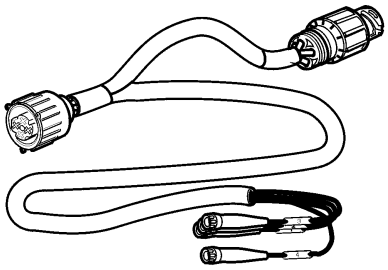


9990008
Test probes

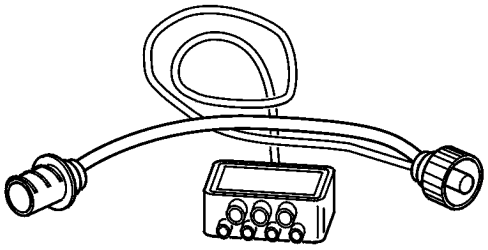
9990216
Connecting cable



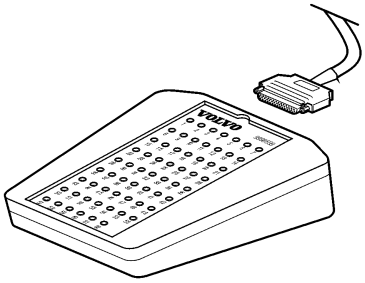
9998505
Adapter



9998534
Adapter, 4–pole

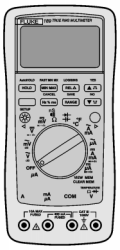


9998567
Adapter, 7–pole



9998699
Breakout box

Other special equipment, engine



9812519
Multimeter

Malfunction

MID 128 Engine control unit, fault codes

Freeze frames: For further information see “Freeze frames” page 8.

MID: Message Identification Description (identification of ECU).

PID Parameter Identification Description (identification of parameter (value)).

PPID: Proprietary Parameter Identification Description (Volvo unique identification of parameter (value)).
For more detailed information concerning these designations, see service information Group 300 Vehicle Electronics ’98 in the Information binder.

SID: Subsystem Identification Description (identification of component).

PSID: Proprietary Subsystem Identification Description (Volvo unique identification of component).

FMI: Failure Mode Identifier (identification of fault type). See also “FMI table” page 7.

Fault code	Component/Function	FMI	Section
MID 128 PID 26	Fan speed percent	3, 8	“MID 128 PID 26 Fan speed percent” page 13
MID 128 PID 45	Preheater, status	3, 4, 5	“MID 128 PID 45 Preheater relay” page 17
MID 128 PID 49	ABS control status	9	“MID 128 PID 49 ABS control status” page 21
MID 128 PID 84	Road speed	9, 11	“MID 128 PID 84 Vehicle speed” page 23
MID 128 PID 85	Cruise control status	9	“MID 128 PID 85 Cruise control status” page 25
MID 128 PID 91	Accelerator pedal position	9, 11	“MID 128 PID 91 Accelerator pedal position” page 27
MID 128 PID 94	Fuel delivery pressure	3, 4, 7	“MID 128 PID 94 Fuel delivery pressure” page 29
MID 128 PID 97	Water in fuel indicator	3, 4, 14	“MID 128 PID 97 Water in fuel indicator” page 36
MID 128 PID 98	Engine oil level	1, 4, 5	“MID 128 PID 98 Engine oil level” page 41
MID 128 PID 100	Engine oil pressure	1, 3, 4	“MID 128 PID 100 Engine oil pressure” page 46
MID 128 PID 102	Boost pressure	3, 4	“MID 128 PID 102 Boost pressure” page 51
MID 128 PID 105	Boost air temperature	3, 4	“MID 128 PID 105 Boost air temperature” page 58
MID 128 PID 107	Air filter differential pressure	0, 3, 4, 5	“MID 128 PID 107 Air filter differential pressure” page 66
MID 128 PID 108	Atmospheric pressure	3, 4	“MID 128 PID 108 Atmospheric pressure” page 71
MID 128 PID 110	Engine coolant temperature	0, 3, 4	“MID 128 PID 110 Coolant temperature” page 72
MID 128 PID 111	Coolant level:	1, 3, 4	“MID 128 PID 111 Coolant level” page 81
MID 128 PID 153	Crankcase pressure	0, 3, 4	“MID 128 PID 153 Crankcase pressure” page 85
MID 128 PID 158	Battery voltage	3, 4	“MID 128 PID 158 Battery voltage” page 90

Fault code	Component/Function	FMI	Section
MID 128 PID 172	Air inlet temperature	3, 4	“MID 128 PID 172 Air inlet temperature” page 93
MID 128 PID 175	Engine oil temperature	0, 3, 4	“MID 128 PID 175 Engine oil temperature” page 97
MID 128 PID 190	Engine rpm	0	“MID 128 PID 190 Engine rpm” page 105
MID 128 PID 224	Electronic Immobilizer	2, 12	“MID 128 PID 224 Electronic immobilizer” page 106
MID 128 PID 228	Road speed sensor calibration	11	“MID 128 PID 228 Road speed sensor calibration” page 108
MID 128 PID 245	Total distance:	9	“MID 128 PID 245 Total vehicle distance” page 109
MID 128 PPID 119	Engine coolant temperature	0	“MID 128 PPID 119 High coolant temperature” page 110
MID 128 PPID 122	VCB Engine compression brake	1, 3, 4, 5	“MID 128 PPID 122 Engine compression brake” page 111
MID 128 PPID 123	Buffer air, TC	3, 4, 5	“MID 128 PPID 123 Buffer air TC” page 115
MID 128 PPID 124	EPG 1, check	3, 4, 5	“MID 128 PPID 124 Exhaust pressure governor” page 119
MID 128 SID 1-6	1/2/3/4/5/6 Unit injectors	2, 3, 4, 5, 7, 11	“MID 128 SID 1/2/3/4/5/6 Unit injector” page 123
MID 128 SID 18	Drainage valve, water separator	3, 4, 5	“MID 128 SID 18 Drain valve, water separator” page 129
MID 128 SID 21	Engine position timing sensor	3, 8	“MID 128 SID 21 Engine position timing sensor” page 135
MID 128 SID 22	Engine speed sensor	2, 3, 8	“MID 128 SID 22 Engine speed sensor” page 140
MID 128 SID 33	Fan control	3, 4, 5	“MID 128 SID 33 Fan control” page 145
MID 128 SID 70	Preheater element 1	3, 4, 5	“MID 128 SID 70 Preheater element 1” page 149
MID 128 SID 78	Fuel priming pump	4, 5	“MID 128 SID 78 Fuel priming pump” page 152
MID 128 SID 230	Idle validation switch	3, 4	“MID 128 SID 230 Idle validation switch 1” page 156
MID 128 SID 231	SAE J1939 Control link	2, 11	“MID 128 SID 231 SAE J1939 Control link” page 157
MID 128 SID 232	5V DC supply	3, 4	“MID 128 SID 232 5 Volt DC supply sensor” page 158
MID 128 SID 250	Information link SAE J1587/J1708	12	“MID 128 SID 250 J1587/1708 Information link” page 162
MID 128 SID 253	Data set memory EEPROM	2, 12	“MID 128 SID 253 Data set memory EEPROM” page 163
MID 128 SID 254	Engine electronic control unit (EECU)	2, 8, 9, 11, 12, 13	“MID 128 SID 254 Engine electronic control unit (EECU)” page 164
MID 128 PSID 161	VIN	12	“MID 128 PSID 161 VIN” page 165

Fault code	Component/Function	FMI	Section
MID 128 PSID 162	VIN	2	“MID 128 PSID 162 VIN” page 166
MID 128 PSID 201	SAE J1939 Data link interruption	9	“MID 128 PSID 201 Communication interference, data link, vehicle control unit” page 167

FMI table

MID 128 FMI table

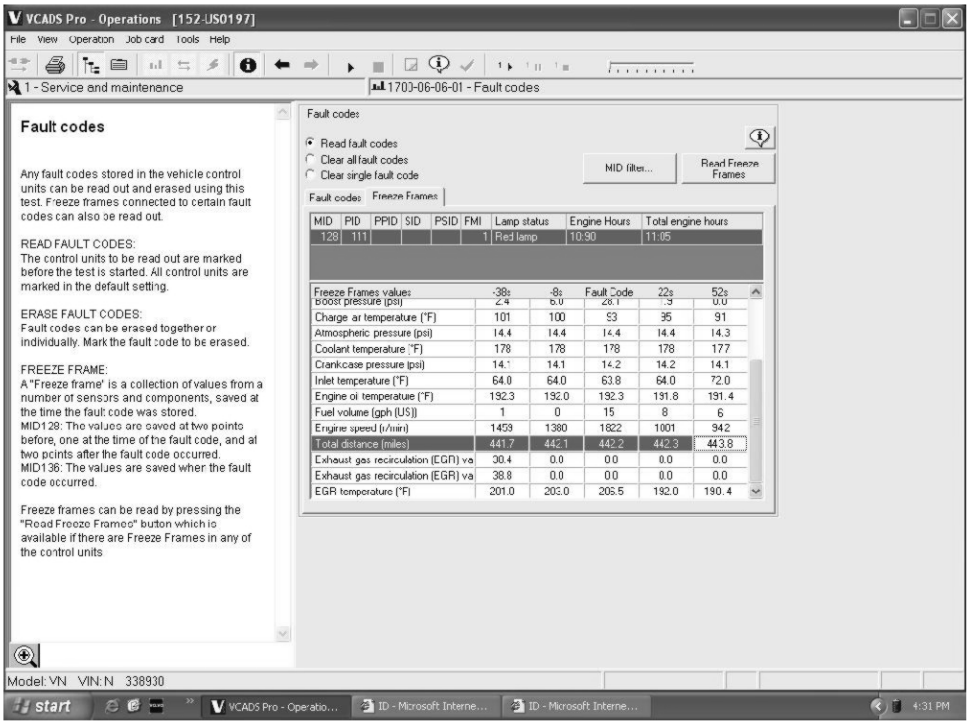
Volvo-specific for injector (MID 128 – SID 1–6)

FMI	Help
2	Short circuit to battery voltage, unit injector high voltage side.
3	Short circuit to battery voltage, unit injector low voltage side.
4	Short circuit to ground, unit injector low or high voltage side.
5	Break in the unit injector circuit.

Freeze frames

The information shown in the “freeze frames” panel comprises an overview of the values at the time when the fault code was activated. These values (before, during and after the fault code is shown) can simplify problem tracing.
Freeze frames are only active when fault codes (which indicate mechanical faults) are set. Check the values that the fault codes indicate.

Example:
If a value is close to the alarm level for a short time before the fault code is activated, the filters and liquids concerned can be contaminated.
If the value suddenly increases or decreases before the fault code is activated, it can indicate a breakdown in the system.



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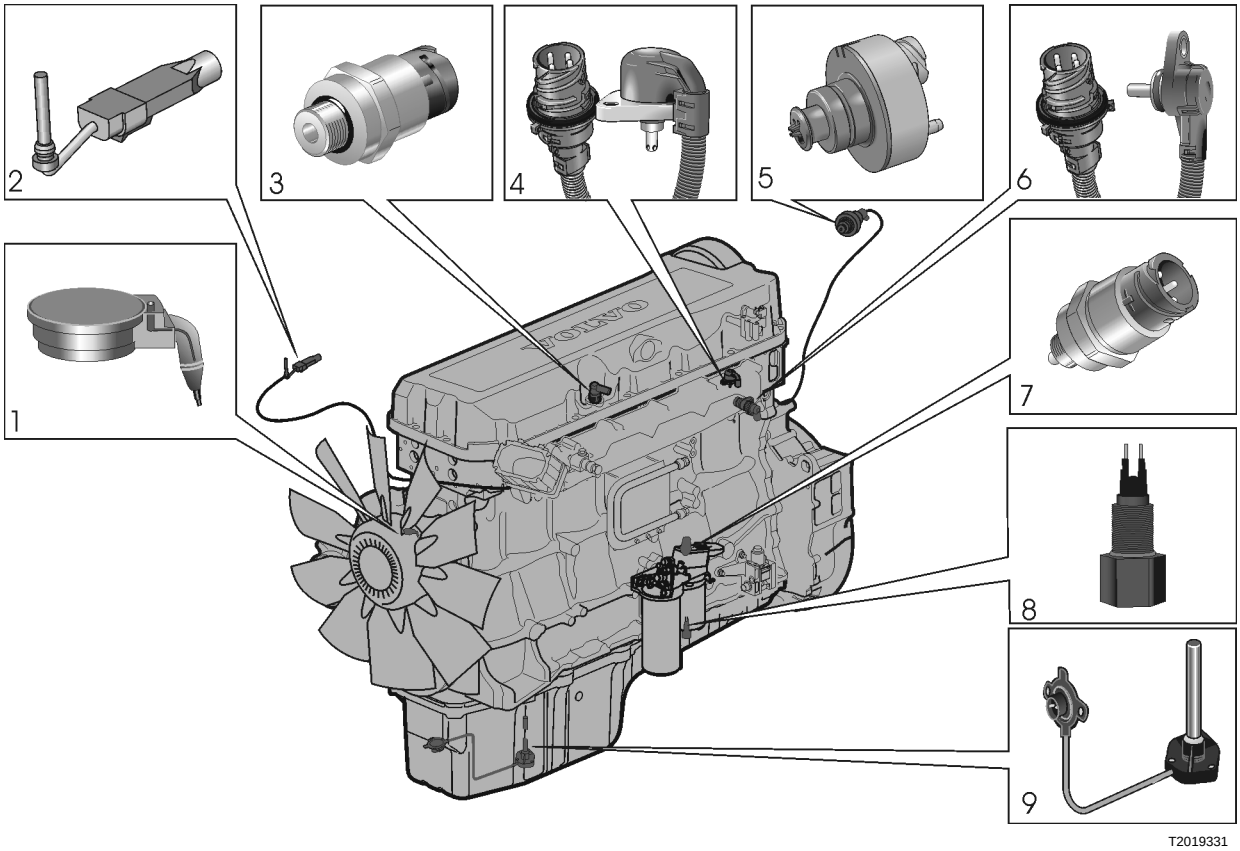
Sensor overview, D9A

The illustrations show an overview of the location the engine's different sensors and their appearance. The designation in brackets shows the component number.



1 Speed sensor, fan/solenoid valve for activation of fan (A43)

2 Sensor for coolant level (S68)

3 Sensor for crankcase pressure (B54)

4 Sensor for boost pressure/boost air temperature (B37)

5 Sensor for inlet temperature/air filter indicator (B39)

6 Sensor for coolant temperature (B21)[1]

7 Sensor for feed pressure, fuel (A44)

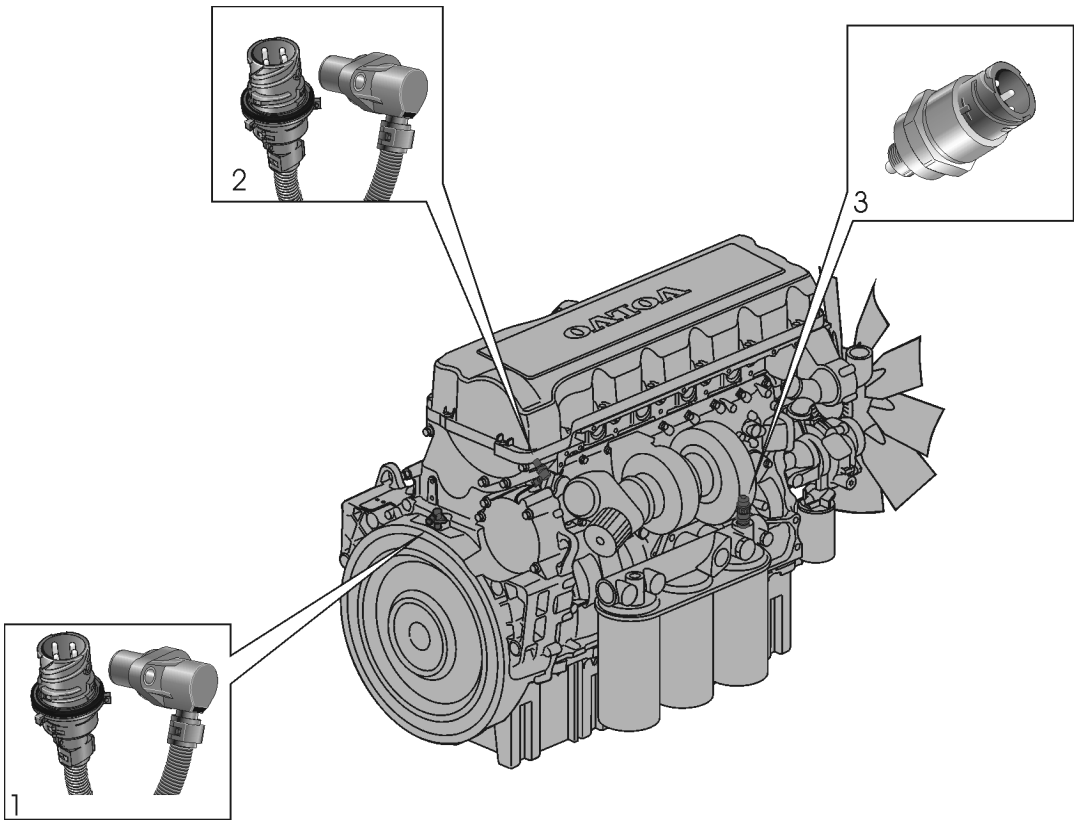
8 Sensor for water separator/water indicator (A45)

9 Type 1: Sensor for oil level (B10)
Type 2: Sensor for oil level/oil temperature (B119)

To check where the oil temperature sensor is located: Disconnect the oil level sensor's electrical connector on the sump.

- Two pins in the connector block: Oil temperature sensor is located in the oil pressure sensor in the engine block.
- Four pins in the connector block: Oil temperature sensor is located in the oil level sensor in the sump.

[1]Type 2: Sensor appearance, see "MID 128 PID 110 Coolant temperature" page 72.



1 Speed sensor, flywheel (B04)

2 Camshaft sensor, engine position (B05)

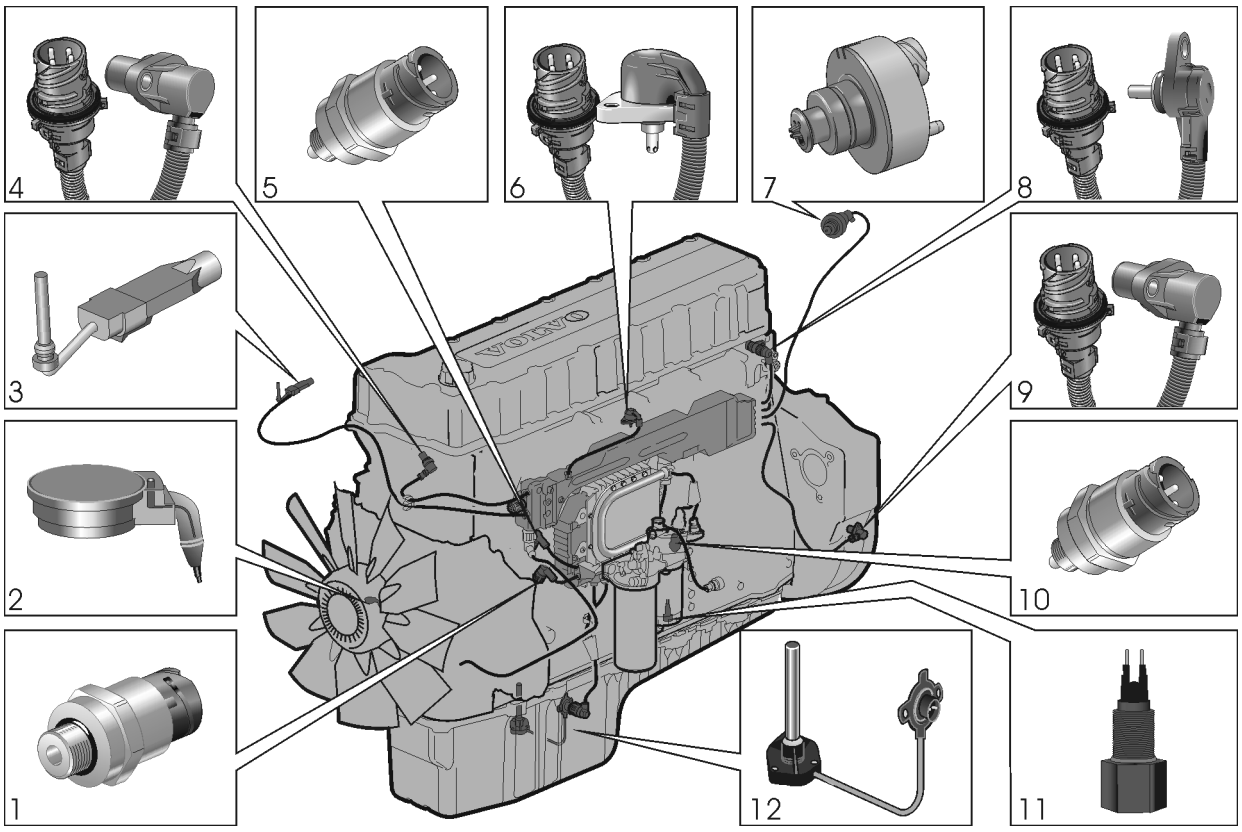
3 Type 1: Sensor for oil pressure/oil temperature (B38)
Type 2: Sensor for oil pressure (B118)

To check where the oil temperature sensor is located: Disconnect the oil level sensor's electrical connector on the sump.

- Two pins in the connector block: Oil temperature sensor is located in the oil pressure sensor in the engine block.
- Four pins in the connector block: Oil temperature sensor is located in the oil level sensor in the sump.

Sensor overview, D12D

The illustrations show an overview of the location the engine's different sensors and their appearance. The designation in brackets shows the component number.



1 Sensor for crankcase pressure (B54)

2 Speed sensor, fan/solenoid valve for activation of fan (A43)

3 Sensor for coolant level (S68)

4 Camshaft sensor, engine position (B05)

5 Type 1: Sensor for oil pressure/oil temperature (B38)
Type 2: Sensor for oil pressure (B118)

To check where the oil temperature sensor is located: Disconnect the oil level sensor's electrical connector on the sump.

- Two pins in the connector block: Oil temperature sensor is located in the oil pressure sensor in the engine block.
- Four pins in the connector block: Oil temperature sensor is located in the oil level sensor in the sump.

6 Sensor for boost pressure/boost air temperature (B37)[2]

7 Sensor for inlet temperature/air filter indicator (B39)

8 Sensor for coolant temperature (B21)[3]

9 Speed sensor, flywheel (B04)

10 Sensor for feed pressure, fuel (A44)

11 Sensor for water separator/water indicator (A45)

12 Type 1: Sensor for oil level (B10)
Type 2: Sensor for oil level/oil temperature (B119)

To check where the oil temperature sensor is located: Disconnect the oil level sensor's electrical connector on the sump.

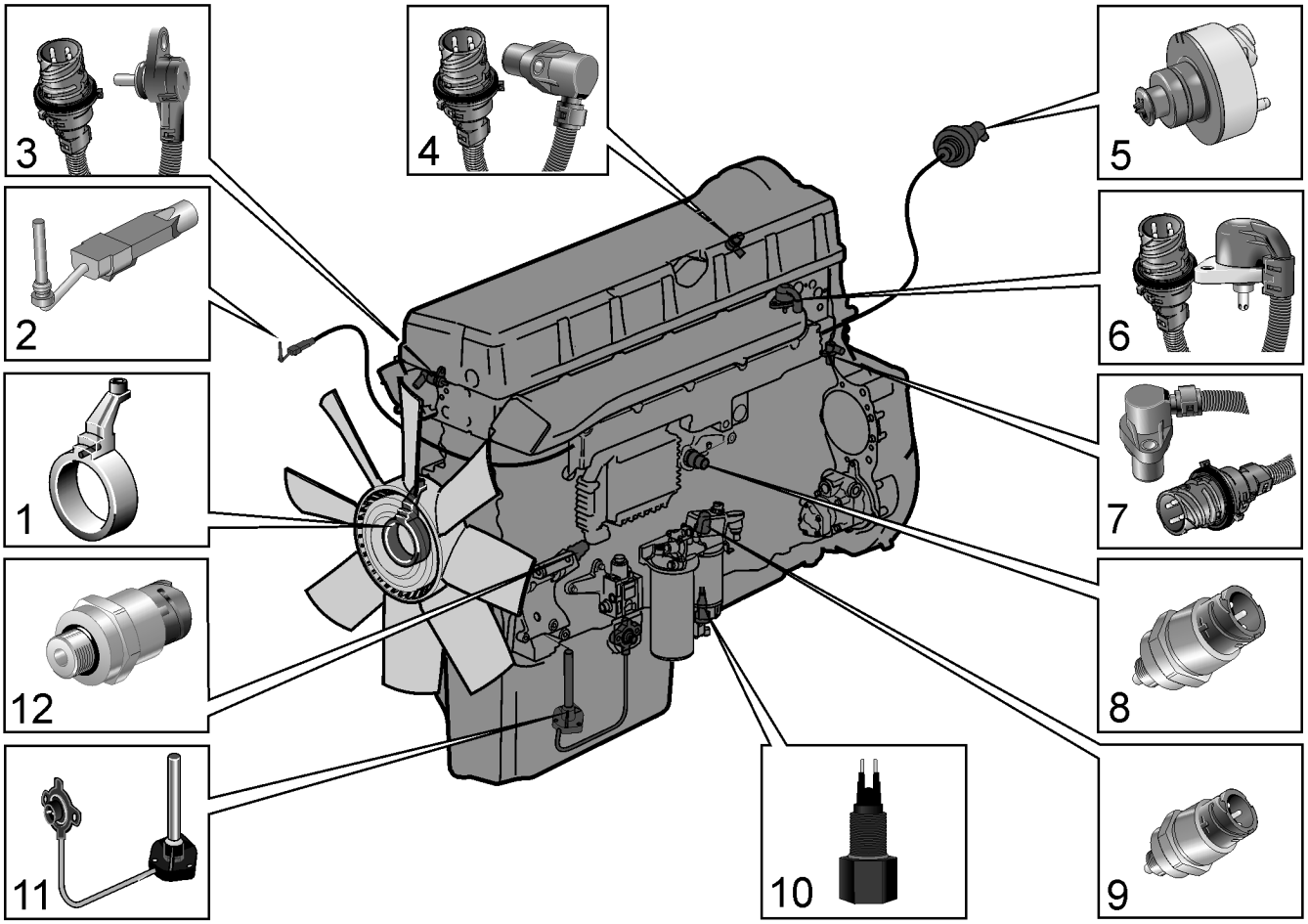
- Two pins in the connector block: Oil temperature sensor is located in the oil pressure sensor in the engine block.
- Four pins in the connector block: Oil temperature sensor is located in the oil level sensor in the sump.

[2]Type 2: Sensor appearance, see "MID 128 PID 102 Boost pressure" page 51.

[3]Type 2: Sensor appearance, see "MID 128 PID 110 Coolant temperature" page 72.

Sensor overview, D16C

The illustrations show an overview of the location the engine's different sensors and their appearance. The designation in brackets shows the component number.



T2020302

1 Speed sensor, fan/solenoid valve for activation of fan (A43)

2 Sensor for coolant level (S68)

3 Sensor for coolant temperature (B21)[4]

4 Camshaft sensor, engine position (B05)[5]

5 Sensor for inlet temperature/air filter indicator (B39)

6 Sensor for boost pressure/boost air temperature (B37)[6]

7 Speed sensor, flywheel (B04)[7]

8 Sensor for oil pressure (B118)

9 Sensor for feed pressure, fuel (A44)

10 Sensor for water separator/water indicator (A45)

11 Sensor for oil level/oil temperature (B119)

12 Sensor for crankcase pressure (B54)

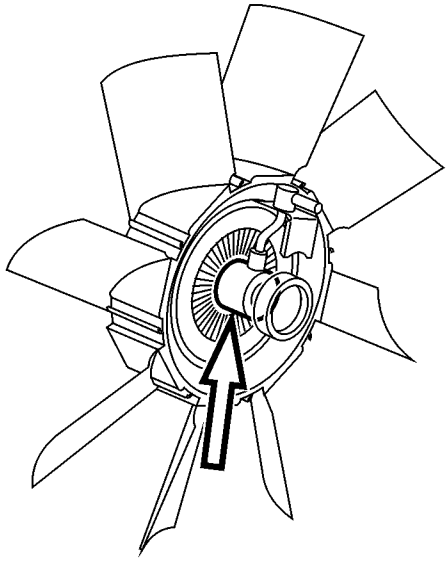
[4]Type 2: Sensor appearance, see "MID 128 PID 110 Coolant temperature" page 72.

[5]Type 2: Sensor appearance, see "MID 128 SID 21 Engine position timing sensor" page 135.

[6]Type 2: Sensor appearance, see "MID 128 PID 102 Boost pressure" page 51.

[7]Type 2: Sensor appearance, see "MID 128 SID 22 Engine speed sensor" page 140.

MID 128 PID 26 Fan speed percent



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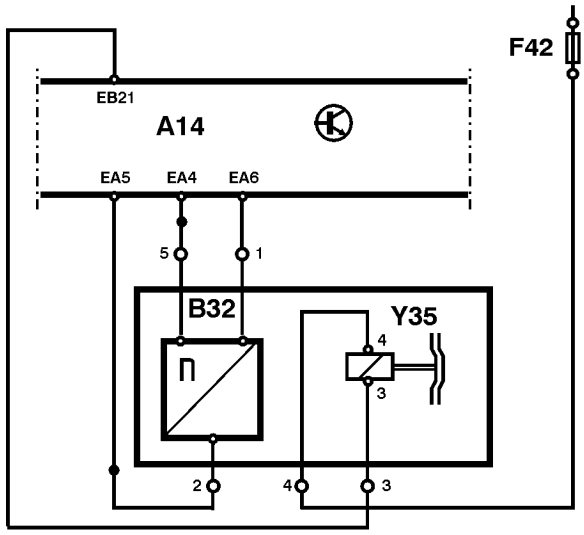


T2018716

General information

Component: (B32) Fan speed sensor

Fault code

FMI 3

Short circuit to battery voltage or break.

Condition for fault code:
- Engine running.
- Voltage on EA6 greater than 65% of battery voltage ($0.65 * U_{bat}$).

Possible cause:
- Short circuit to battery voltage, signal cable.
- Short circuit to battery voltage, supply cable.
- Break, signal cable.
- Break, supply cable.
- Break, earth cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- 100% fan speed
- High fuel consumption

Appropriate check:
- **Active FMI**
  28415–3 “MID 128 PID 26 Fan speed percent, check” page 14.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 8

Abnormal frequency.

Condition for fault code:
- The engine control unit detects extra pulses on the fan speed signal.

Possible cause:
- Poor insulation or faulty cable harness.
- Fault in sensor.
- Damaged fan.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- 100% fan speed
- High fuel consumption

Appropriate check:
- **Active FMI**
  28415–3 “MID 128 PID 26 Fan speed percent, check” page 14.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28415-3
MID 128 PID 26 Fan speed percent, check

Special tools: 9998567
Other special equipment: 9812519

Fault code information, see “MID 128 PID 26 Fan speed percent” page 13

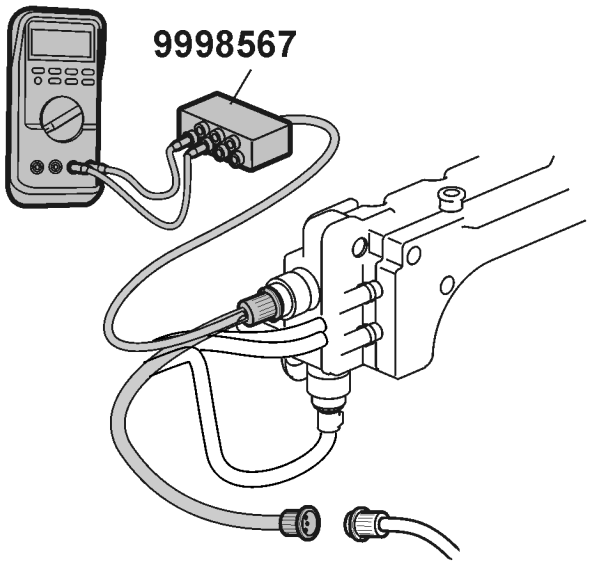
NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

Note: If any of the measurement values for the following cables are incorrect, this may have caused the component to fail. Also check if any of the component values are incorrect.



T2020814

Ground cable:

1
Conditions:
- Component connector removed.
- 7-pole adapter connected to the upper 7–pole connector block on the cable box.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
2 - Ground	R ≈ 0 Ω

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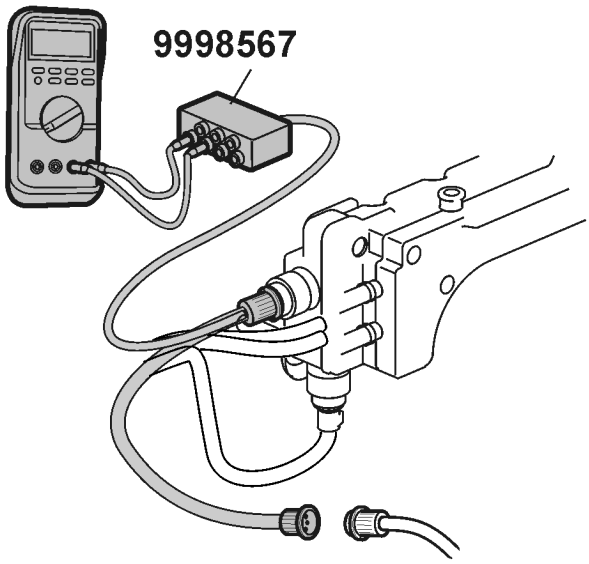

T2020814

Control cable:

2
Conditions:
- Component connector removed.
- 7-pole adapter connected to the upper 7–pole connector block on the cable box.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
1 - Ground	R ≈ 47 kΩ

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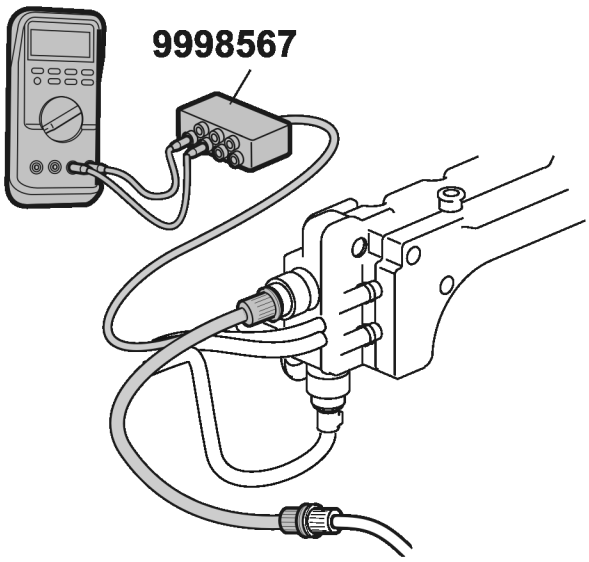
9812519



T2020689

Supply cable:

3
Conditions:
- 7-pole adapter connected **between** the upper 7–pole connector block on the cable box and the component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
5 - Ground	U ≈ 5 V

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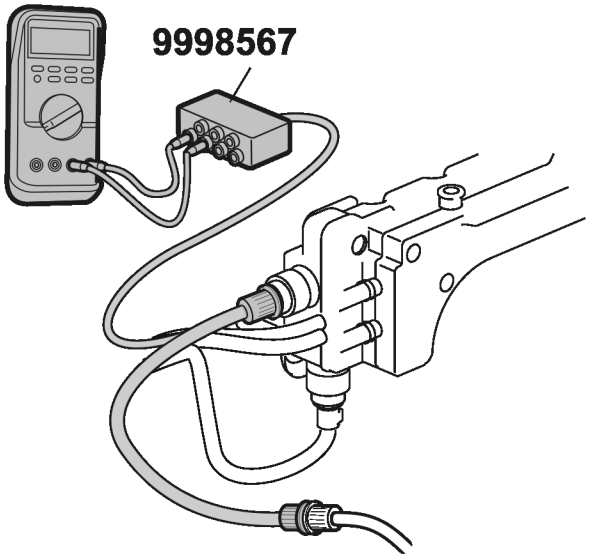


T2020689

Fan speed sensor

4
Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- 7-pole adapter connected **between** the upper 7–pole connector block on the cable box and the component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.

WARNING

The engine must be turned off.

- Engine control unit connected.
- **Turn the fan manually**.

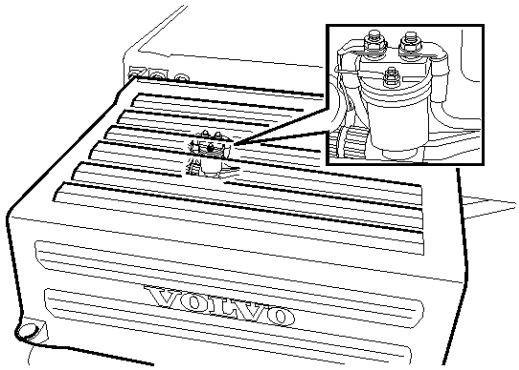
Measurement points	Expected value
1 - 2	0 - 5 V

9998567
9812519

Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

MID 128 PID 45 Preheater relay



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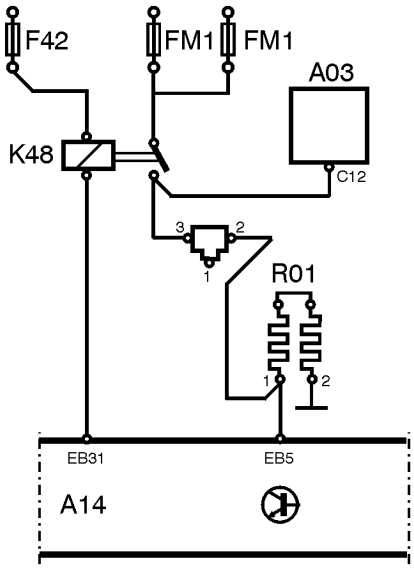


T2018686

General information

Component: (K48) Relay

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- Output activated.
- Short circuit to battery voltage on EB31.

Possible cause:
- Short circuit to battery voltage on cable between pre-heating relay and engine control unit.
- Short circuit in pre-heating relay.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit switches off the output.

Noticeable external symptoms:
- Yellow lamp lights.
- Pre-heating relay never activated.
- White smoke during cold start.
- Difficult to start in extreme cold.

Appropriate check:
- **Inactive/Active FMI**
  This fault code is only active for a short period when the ignition key is in the preheater position.
  28450–3 “MID 128 PID 45 Preheater relay, check” page 19.

FMI 4

Short circuit to ground.

Condition for fault code:
- Output closed.
- Short circuit to ground on EB31.

Possible cause:
- Short circuit to ground on cable between pre-heating relay and engine control unit.
- Fault in pre-heater relay.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Induction air too hot since pre-heating relay constantly active.

Appropriate check:
- **Active FMI**
  28450–3 “MID 128 PID 45 Preheater relay, check” page 19.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Break.

Condition for fault code:
- Output closed.
- Circuit interruption.

Possible cause:
- Blown fuse to the supply for pre-heating relay.
- Break in the cables between the engine control unit and the pre-heater relay.
- Open circuit in pre-heating relay.
- Break in feed cable to pre-heater relay.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit switches off the output.

Noticeable external symptoms:
- Yellow lamp lights.
- Pre-heating relay never activated.
- White smoke during cold start.
- Difficult to start in extreme cold.

Appropriate check:
- **Active FMI**
  28450–3 “MID 128 PID 45 Preheater relay, check” page 19.
- **Inactive FMI**
  This FMI is only active when the relay is activated. The fault code will be shown as inactive (when the fault code is read out) when the relay is not activated.

28450-3
MID 128 PID 45 Preheater relay, check

Other special equipment: 9812519

Fault code information, see “MID 128 PID 45 Preheater relay” page 17

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

Control cable:

1

Conditions:
- Blue/red cable to relay disconnected (cable goes to the engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
Blue/red cable - Ground	R ≈ 200 kΩ

9812519

Supply cable:

2

Conditions:
- Black cable to relay disconnected.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
Black cable - Ground	$U \approx U_{bat}$

9812519

Pre-heating relay

3
Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Blue/red cable to relay disconnected (cable goes to the engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

Measurement points	Expected value
Two small screw connections on the relay	$R \approx 30\ \Omega$

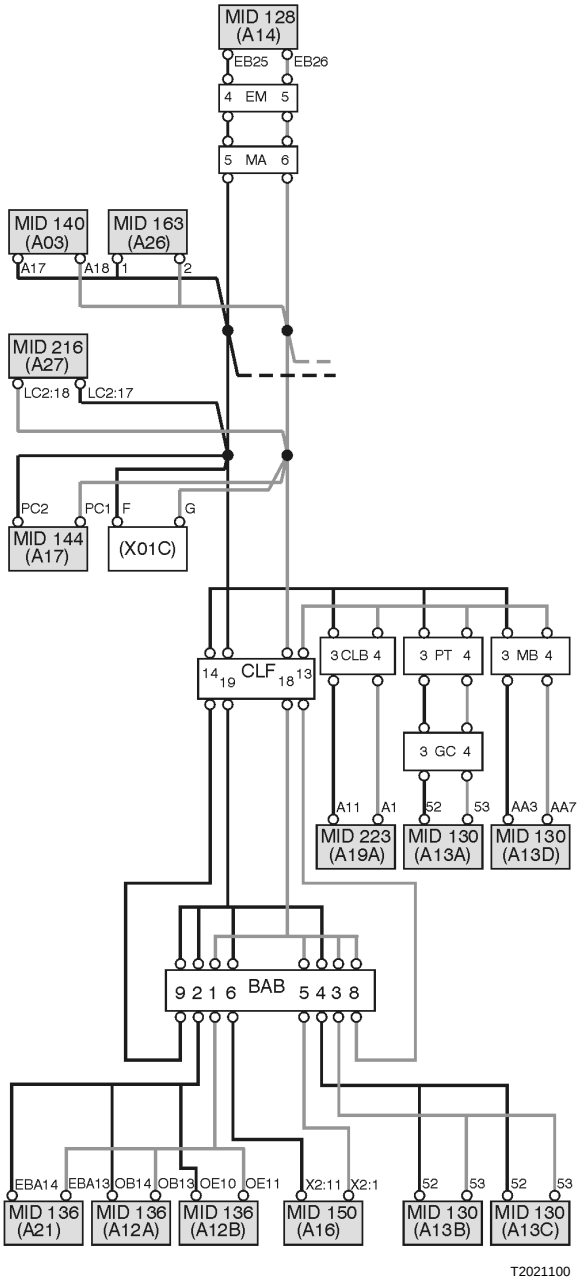
9812519

Function check

Check of pre-heater relay

1
Perform a function check, with test 33311-3 “Pre-heating, test” in VCADS Pro, after any remedial action.

MID 128 PID 49 ABS control status



Fault code

FMI 9

ABS status check not available.

Condition for fault code:

- PID 49–the message is not received sufficiently often or is not available at all.

Possible cause:

- A fault in the ABS control unit.
- Error in the information link (SAE J1708).

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:

- Yellow lamp lights.

Appropriate check:

- See “Fault tracing of fault code combinations” page 21.
- See fault codes for MID 136.

Fault tracing of fault code combinations

To simplify fault tracing, check other fault codes to get an **indication of where the fault is**.

Fault code combination A

MID 128 PID 49 **only** active (possibly in combination with fault codes from ABS/EBS control unit, MID 136).

1 Check if the ABS/EBS control unit is sending on the J1587/J1708 link by reading off the identification of the control unit with VCADS Pro (17034-3 “Vehicle information, test”)
2 **If the information can be read:**
Perform test 17004-3 “Fault codes, test mode” using VCADS Pro, to find any possible intermittent connections on link J1587/J1708 between connector block BAB (behind passenger seat) and the ABS/EBS control unit.
If the information cannot be read:
Check link J1587/J1708 between connector block BAB (behind passenger seat) and the ABS/EBS control unit. Also perform a function test of the ABS/EBS control unit, see service information group 5.

Fault code combination B

MID 128 PID 49 in combination with **additional fault codes from MID 128** (PID 84, PID 85, PID 91, PID 224, PID 228).

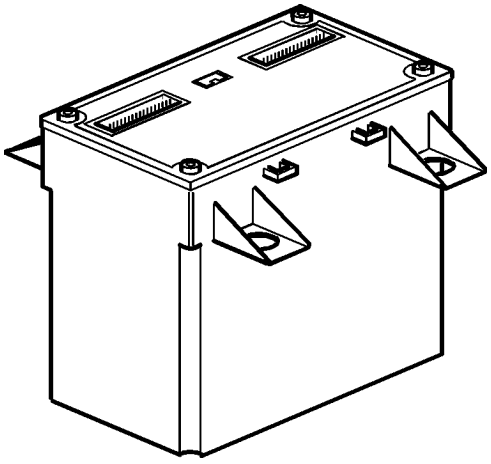
1 Check link J1587/J1708 between connector block MA (cable feed through, cab) and engine control unit
or
between connector block MA and connector block CLF (electrical box centre console).
See also, fault tracing for the other fault codes from MID 128 (PID 84, PID 85, PID 91, PID 224, PID 228) to localize the fault.

Fault code combination C

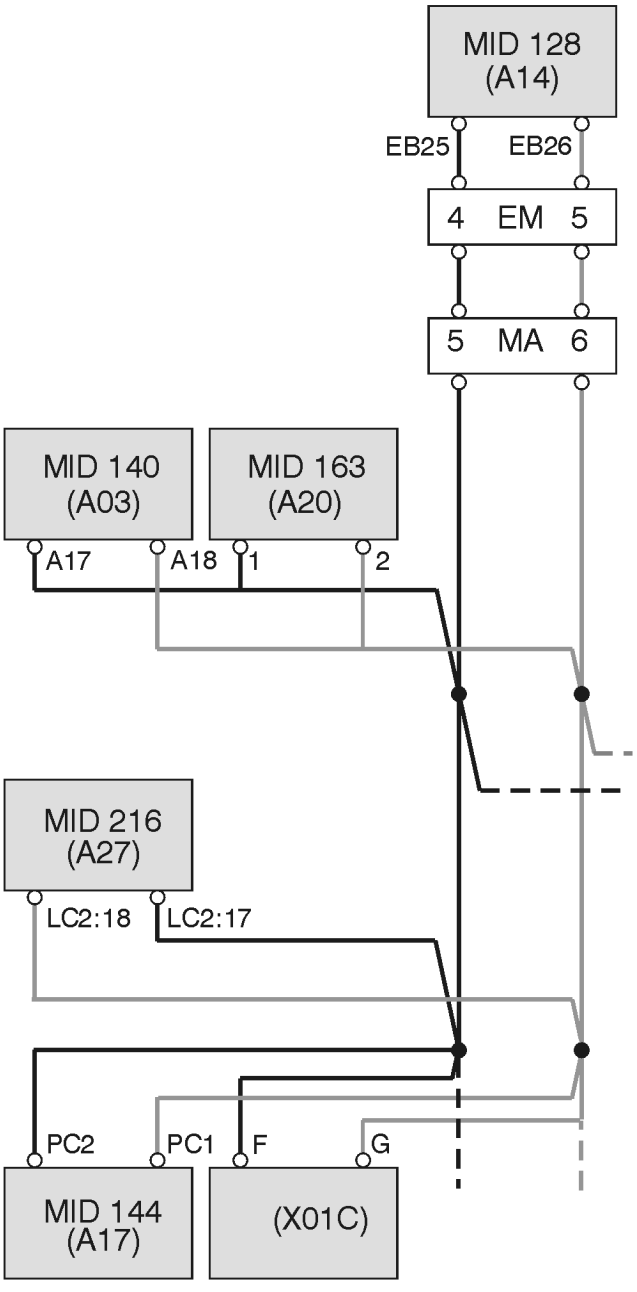
MID 128 PID 49 in combination with **fault codes for J1587/J1708 link fault** of air suspension, ABS/EBS, automatic gearbox/retarder

1 Check link J1587/J1708 between connector block CLF (electrical box centre console) connector block BAB (behind passenger seat).

MID 128 PID 84 Vehicle speed



T2012703



T2021099

General information

Component: (A17) Vehicle control unit

Fault code

FMI 9

Vehicle road speed signal not available (SAE J1708 message).

Condition for fault code:

- The vehicle road speed signal is not received sufficiently often or is not available at all.

Possible cause:

- Fault in road speed sensor.
- Error in information link (SAE J1708/J1587).
- Error in vehicle control unit.

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.
- If FMI 11 has been set, the engine control system limits engine speed to approx 1700 rpm.

Noticeable external symptoms:

- Yellow lamp lights.
- If FMI 11 has also been set, the maximum engine speed is approx. 1700 rpm.

Appropriate check:

- **Active FMI**
  See “Fault tracing of fault code combinations” page 24.
- **Inactive FMI**
  This fault code cannot be read when it is inactive, since it cannot be stored. Perform test 17004–3 “Fault codes, test mode” i VCADS Pro to check if it is an intermittent fault.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 11

Vehicle speed signal not available. (SAE J1939 message).

Condition for fault code:
- The vehicle speed signal is not available on the control link (SAE J1939).

Possible cause:
- Fault in road speed sensor.
- Fault in the control link (SAE J1939).
- Error in vehicle control unit.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The message is read from the information link (SAE J1708) instead.
- If FMI 9 has been set, the engine control system limits engine speed to approx 1700 rpm.

Noticeable external symptoms:
- Yellow lamp lights.
- If FMI 9 has also been set, the maximum engine speed is approx 1700 rpm.

Appropriate check:
- **Active FMI**
  See “Fault tracing of fault code combinations” page 24.
- **Inactive FMI**
  This fault code cannot be read when it is inactive, since it cannot be stored. Perform test 17004–3 “Fault codes, test mode” i VCADS Pro to check if it is an intermittent fault.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

Fault tracing of fault code combinations

To simplify fault tracing, check other fault codes to get an **indication of where the fault is**.

Fault code combination A (only FMI 9)

MID 128 PID 84 FMI 9 in combination with **additional fault codes from MID 128** (PID 49, PID 85, PID 91, PID 224, PID 228).

1 Check link J1587/J1708 between connector block MA (cable feed through, cab) and engine control unit
or
between connector block MA and connector block CLF (electrical box centre console).
See also, fault tracing for the other fault codes from MID 128 (PID 49, PID 85, PID 91, PID 224, PID 228) to localize the fault.

Fault code combination B (only FMI 11)

MID 128 PID 84 FMI 11 in combination with **MID 128 PSID 201**.

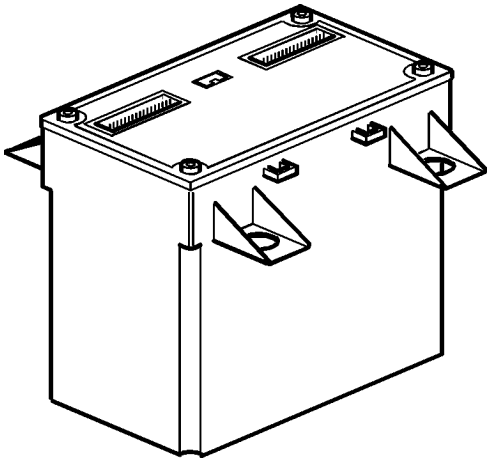
1 Fault trace according to instructions for PSID 201.

Fault code combination C

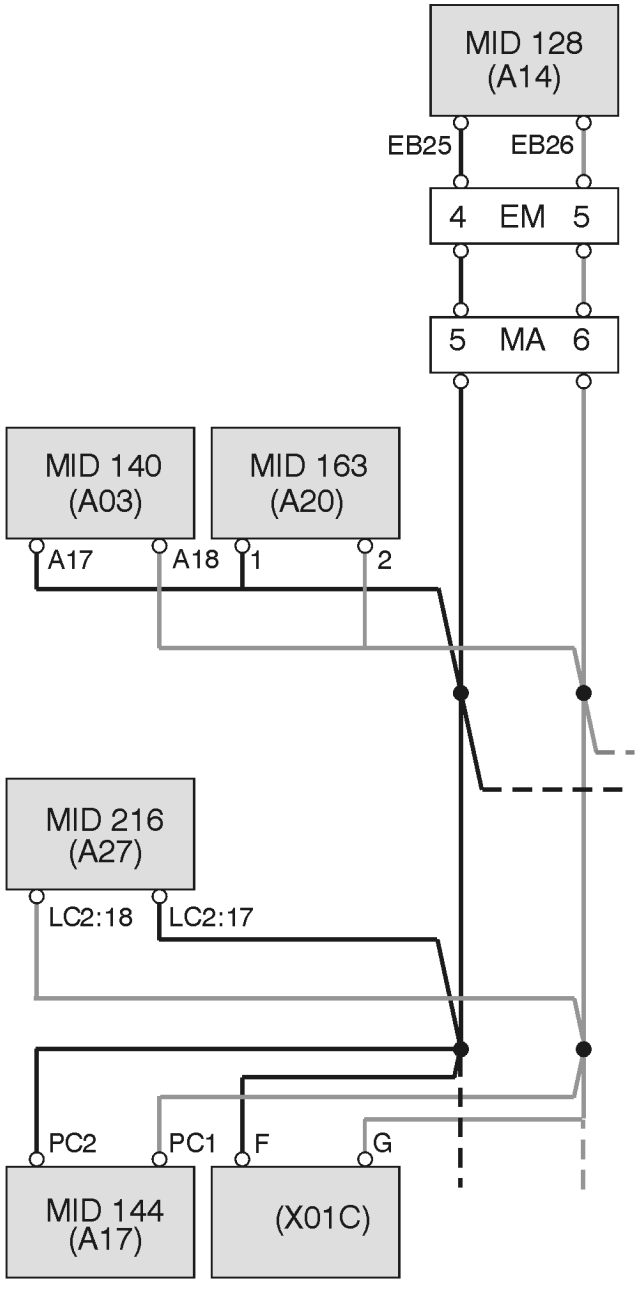
MID 128 PID 84 **FMI 9 and FMI 11** in combination with fault code from vehicle control unit **MID 144 PID 84**.

1 Check the speed sensor and tachograph as well as the wiring between the tachograph and the vehicle control unit.
For vehicles without tachographs:
Check the road speed sensor and the cable between the speedometer and vehicle control unit.

MID 128 PID 85 Cruise control status



T2012703



T2021099

General information

Component: (A17) Vehicle control unit

Fault code

FMI 9

Status message from the Cruise Control is not available (SAE J1587/J1708 message).

Condition for fault code:

- The cruise control signal is not received sufficiently often or is not available at all.

Possible cause:

- Fault in information link (SAE J1587/J1708).
- Error in vehicle control unit.

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:

- Yellow lamp lights.
- Cruise control not working

Appropriate check:

- **Active FMI**
  See “Fault tracing of fault code combinations” page 25
- **Inactive FMI**
  This fault code cannot be read when it is inactive, since it cannot be stored. Perform test 17004–3 “Fault codes, test mode” i VCADS Pro to check if it is an intermittent fault.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

Fault tracing of fault code combinations

To simplify fault tracing, check other fault codes to get an **indication of where the fault is**.

Fault code combination A

MID 128 PID 85 in combination with **additional fault codes from MID 128** (PID 49, PID 84, PID 91, PID 224, PID 228).

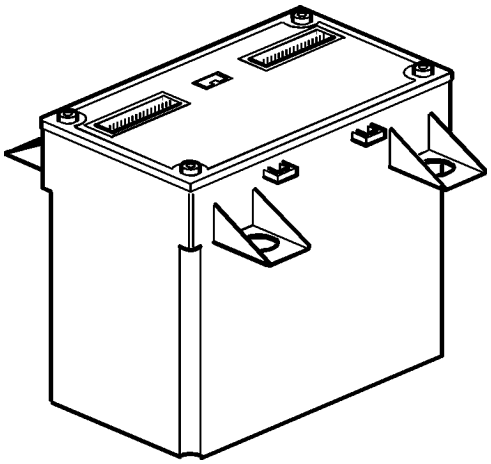
1 Check link J1587/J1708 between connector block MA (cable feed through, cab) and engine control unit
or
between connector block MA and connector block CLF (electrical box centre console).
See also, fault tracing for the other fault codes from MID 128 (PID 49, PID 84, PID 91, PID 224, PID 228) to localize the fault.

Fault code combination B

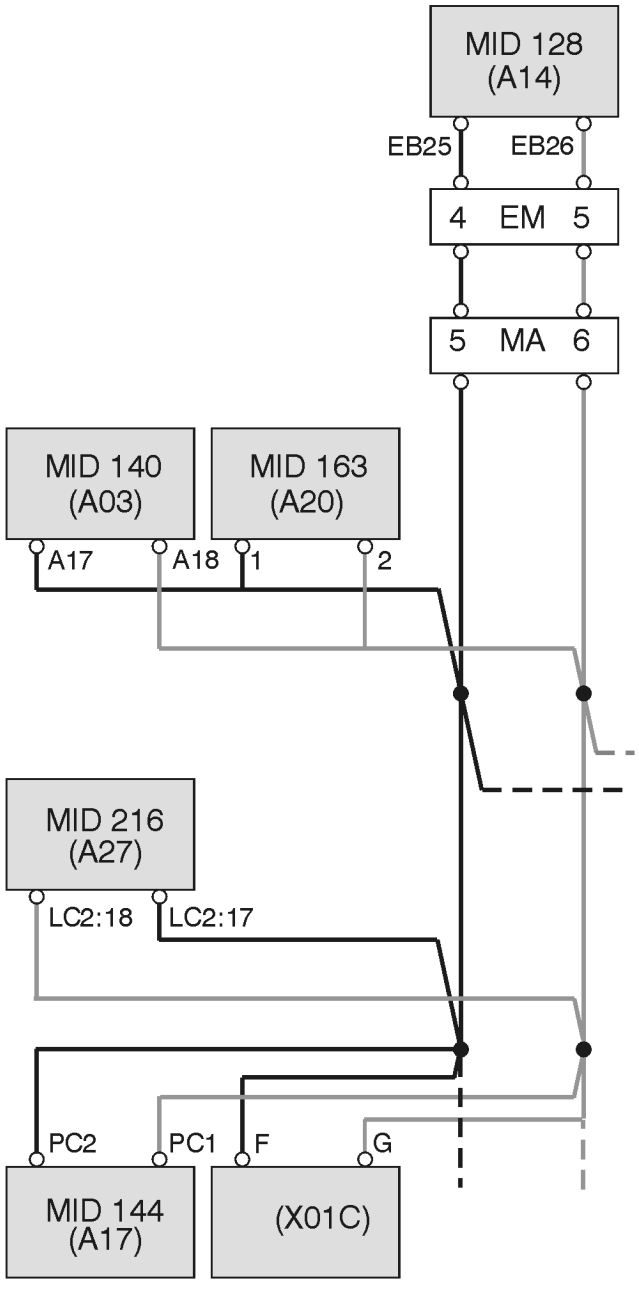
MID 128 PID 85 in combination with fault code from vehicle control unit **MID 144 PPID 71 and/or SID 243**.

1 Check the cruise control switch and cables as well as cables between the switch and vehicle control unit.

MID 128 PID 91 Accelerator pedal position



T2012703



T2021099

General information

Component: (A17) Vehicle control unit

Fault code

FMI 9

Accelerator pedal message not available. (SAE J1587/J1708 message)

Condition for fault code:

- The accelerator pedal signal is not received sufficiently often or is not available at all.

Possible cause:

- Fault in accelerator pedal sensor.
- Fault in information link (SAE J1587/J1708).
- Error in vehicle control unit.

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.
- If FMI 11 has also been set, the engine control unit changes to “Limp home mode”

Noticeable external symptoms:

- Yellow lamp lights.
- If FMI 11 has also been set, the engine will be put in the “Limp home mode” and the idling contact is used instead of the accelerator pedal position sensor.

Appropriate check:

- **Active FMI**
  See “Fault tracing of fault code combinations” page 28.
- **Inactive FMI**
  This fault code cannot be read when it is inactive, since it cannot be stored. Perform test 17004–3 “Fault codes, test mode” i VCADS Pro to check if it is an intermittent fault.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 11

Accelerator pedal message not available. (SAE J1939 message)

Condition for fault code:
- Faults in the accelerator pedal sensor are sent on the control link (SAE J1939).
- The accelerator pedal signal is not available on the control link (SAE J1939).

Possible cause:
- Fault in accelerator pedal sensor.
- Error in control link (SAE J1939).
- Error in vehicle control unit.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- Accelerator pedal signal is retrieved from the information link (SAE J1708).
- If FMI 9 has also been set, the engine control unit changes to “Limp home mode”.

Noticeable external symptoms:
- Yellow lamp lights.
- If FMI 9 has also been set, the engine will be put in the “Limp home mode” and the idling contact is used instead of the accelerator pedal position sensor.

Appropriate check:
- **Active FMI**
  See “Fault tracing of fault code combinations” page 28
- **Inactive FMI**
  This fault code cannot be read when it is inactive, since it cannot be stored. Perform test 17004–3 “Fault codes, test mode” i VCADS Pro to check if it is an intermittent fault.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

Fault tracing of fault code combinations

To simplify fault tracing, check other fault codes to get an **indication of where the fault is**.

Fault code combination A (only FMI 9)

MID 128 PID 91 FMI 9 in combination with **additional fault codes from MID 128** (PID 49, 84, PID 85, PID 224, PID 228).

1 Check link J1587/J1708 between connector block MA (cable feed through, cab) and engine control unit
or
between connector block MA and connector block CLF (electrical box centre console).
See also, fault tracing for the other fault codes from MID 128 (PID 49, 84, PID 85, PID 224, PID 228) to localize the fault.

Fault code combination B (only FMI 11)

MID 128 PID 91 FMI 11 in combination with **MID 128 PSID 201**.

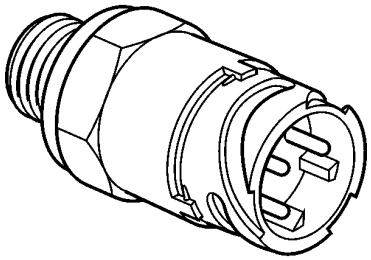
1 Fault trace according to instructions for PSID 201.

Fault code combination C

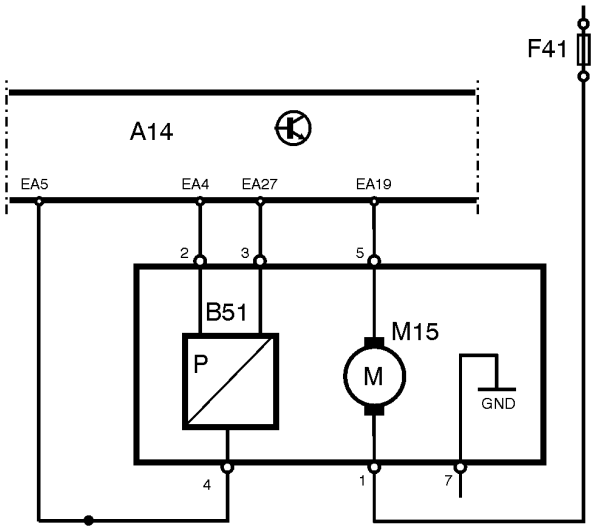
MID 128 PID 91 **FMI 9 and FMI 11** in combination with fault code from vehicle control unit **MID 144 PID 91 and/or PPID 72**.

1 Check the accelerator pedal and the cable between the accelerator pedal and vehicle control unit.

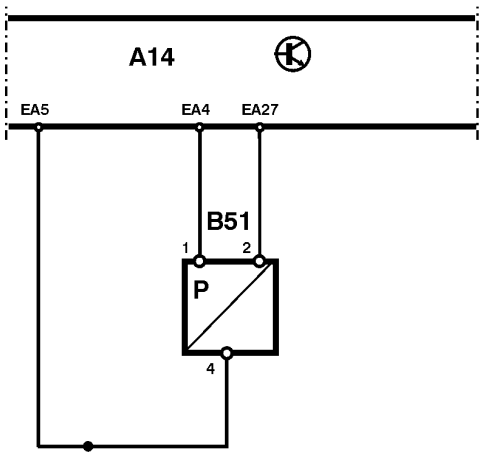
MID 128 PID 94 Fuel delivery pressure



Types 1/2



Type 1 with electric fuel pump



Type 2 with manual hand pump

General information

In addition to the fuel pressure, the sensor also measures the fuel temperature.

Component: (B51) Fuel pressure/temperature sensor

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- The voltage of EA27 exceeds 4.95 V.

Possible cause:
- Short circuit to battery voltage, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28454–3 “MID 128 PID 94 Fuel delivery pressure, check” page 31
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to battery voltage or permanent loss of signal (break).

Condition for fault code:
- The voltage of EA27 is below 0.08 V.

Possible cause:
- Break, 5 V supply cable.
- Break, signal cable.
- Break, earth cable.
- Short circuit to ground, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28454–3 “MID 128 PID 94 Fuel delivery pressure, check” page 31
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 7

Pressure too low.

Condition for fault code:
- Voltage at EA27 is below alarm limit (please refer to table).

Engine speed	Alarm limit
600	100 kPa
800	100 kPa
1000	200 kPa
1200	300 kPa
1300	300 kPa
1400	300 kPa
1500	300 kPa
1600	300 kPa
1700	300 kPa
1800	300 kPa

Possible cause:
- Clogged fuel filter.
- Air or leakage in fuel system.
- Opening pressure too low on bypass valve.
- Worn out fuel pump.
- Mechanical fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Low power output.
- Difficult to start.
- Blue smoke.

Appropriate action:
- **Active FMI**
  See service information “Feed pressure, fault tracing” (Check list B), Diagnostics, group 2309.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28454-3
MID 128 PID 94 Fuel delivery pressure, check

Special tools: 9998534/9998567
Other special equipment: 9812519

Fault code information, see “MID 128 PID 94 Fuel delivery pressure” page 29

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

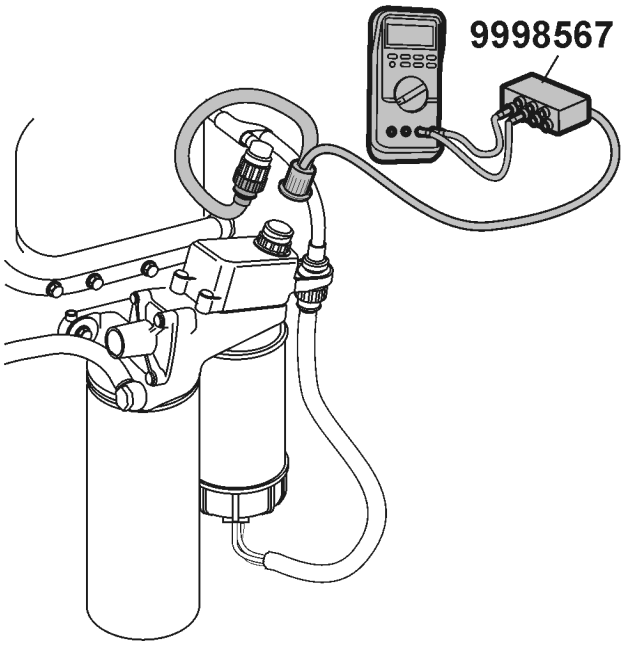
For information about the location and appearance of the sensors, see:

- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

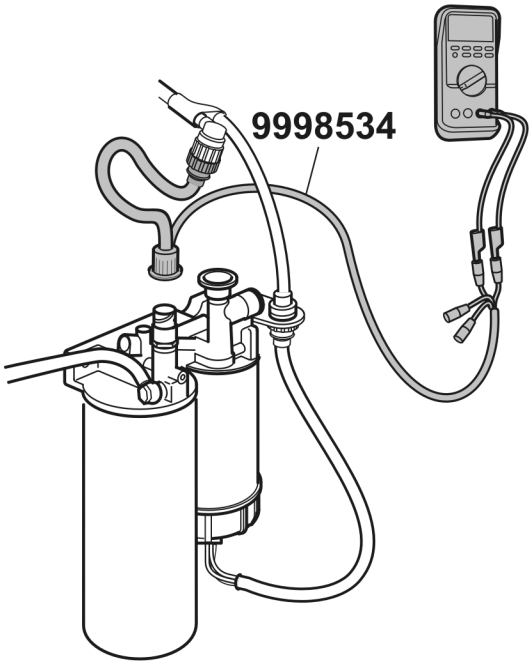
Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

Ground cable:

1



Type 1



Type 2

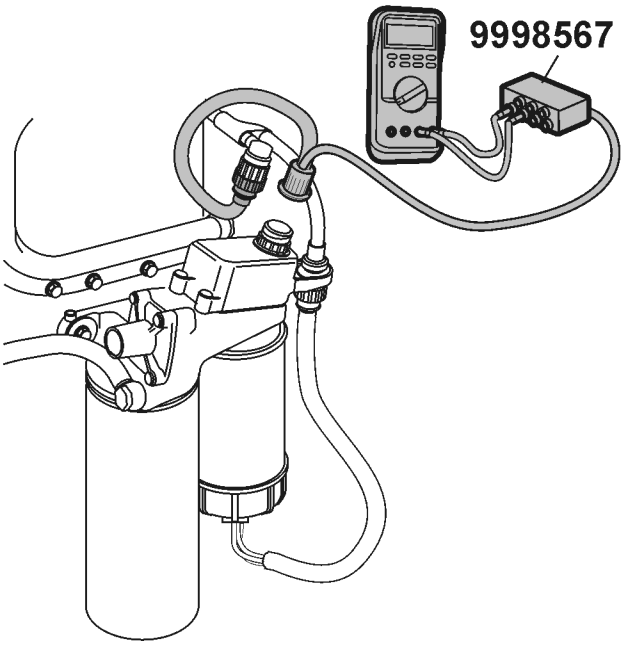
Conditions:
- Component connector removed.
- Adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
4 - Ground	R ≈ 0 Ω

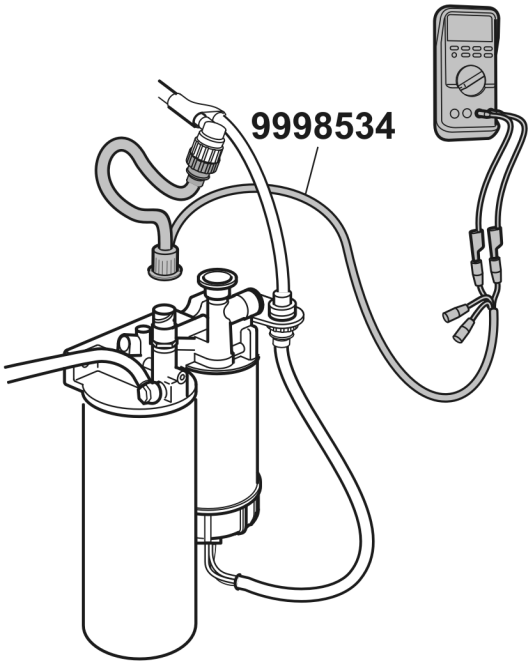
9998534, 9998567
9812519

Control cable:

2



Type 1



Type 2

Conditions:

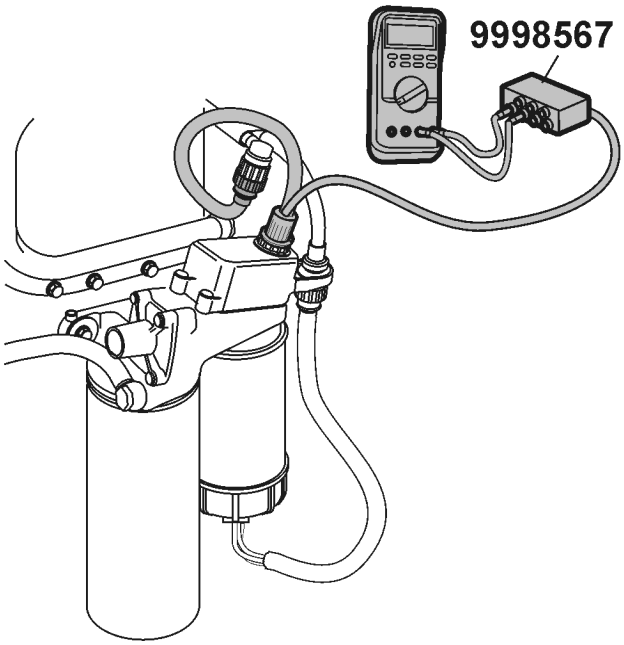
- Component connector removed.
- Adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
Type 1: 3 - Framework Type 2: 2 - Framework	R ≈ 100 kΩ

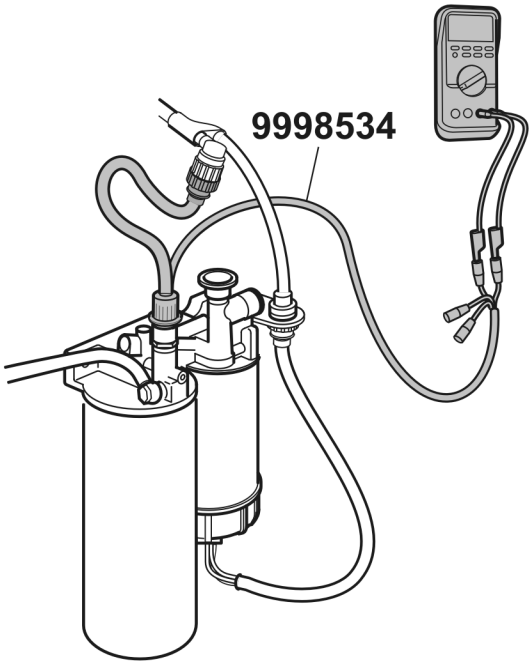
9998534, 9998567
9812519

Supply cable:

3



Type 1



Type 2

Conditions:

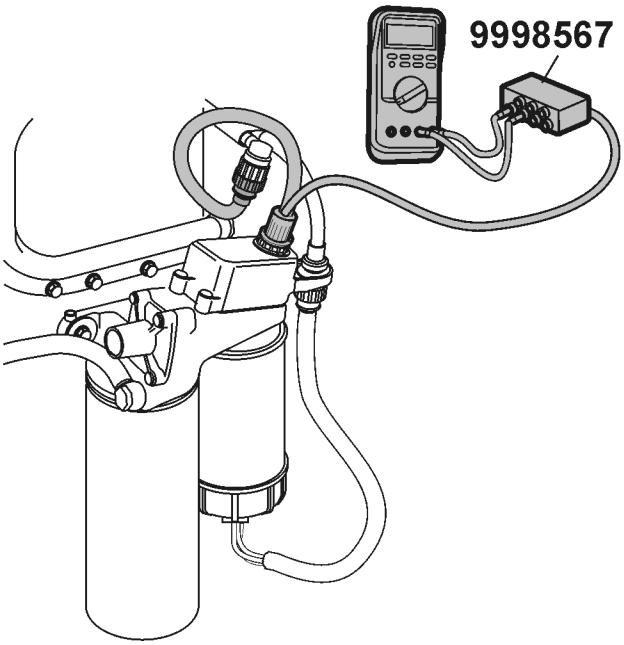
- Adapter connected **between** cable harness connector block and connector block on fuel filter housing.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	**Expected value**
Type 1: 2 - Framework Type 2: 1 - Framework	U ≈ 5 V

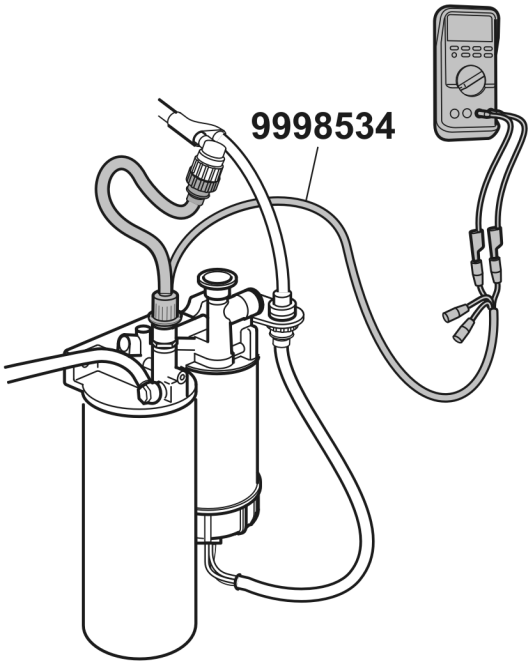
9998534, 9998567
9812519

Fuel Pressure Sensor:

4



Type 1



Type 2

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Adapter connected **between** cable harness connector block and connector block on fuel filter housing.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
Type 1: 3 - 4 Type 2: 3 - 4	U ≈ 0.5 V [1]

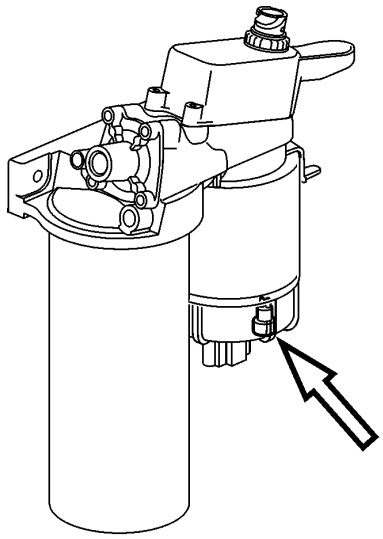
[1] Engine stationary

9998534, 9998567
9812519

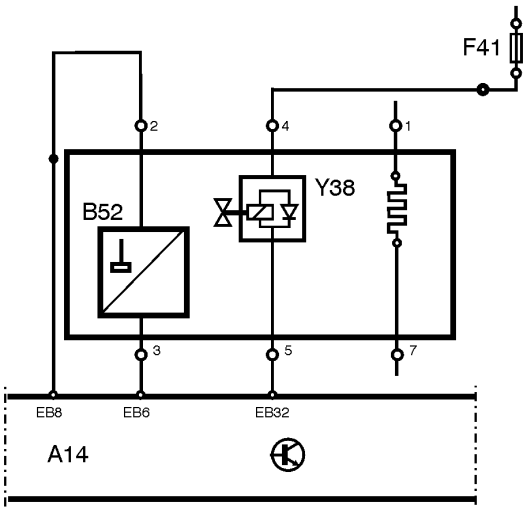
Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

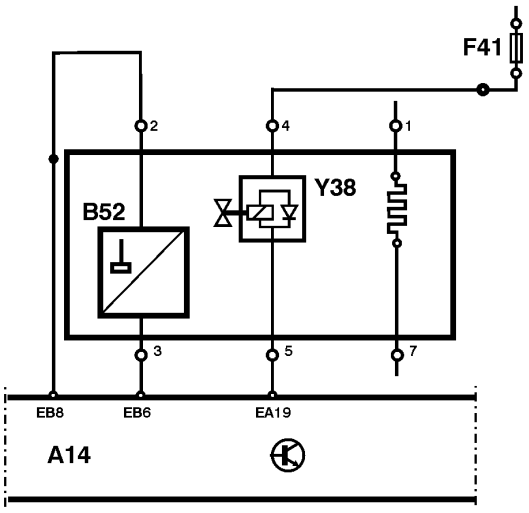
MID 128 PID 97 Water in fuel indicator



Types 1/2



Type 1 with electric fuel pump



Type 2 with manual hand pump

General information

Component: (B52) Water in fuel indicator

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- Voltage on EB6 exceeds 91% of battery voltage (0.91 * U_{bat}).

Possible cause:
- Short circuit to battery voltage, signal cable.
- Break, signal cable.
- Fault in indicator.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Indicator does not function.

Appropriate check:
- **Active FMI**
  28416–3 “MID 128 PID 97 Water in fuel indicator, check” page 38
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- Voltage on EB6 less than 5% of battery voltage (0.05 * U_{bat}).

Possible cause:
- Short circuit to ground, signal cable.
- Fault in indicator.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- Indicator does not function.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28416–3 “MID 128 PID 97 Water in fuel indicator, check” page 38
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 14

This information code is shown when the electric priming pump is active.

Condition for fault code:
- The pump is active.

Possible cause:
- The pump is activated.

Reaction from the control unit:
- Information code is set.
- Blue lamp requested

Noticeable external symptoms:
- Blue lamp lit.

28416-3
MID 128 PID 97 Water in fuel indicator, check

Special tools: 9998567
Other special equipment: 9812519

Fault code information, see “MID 128 PID 97 Water in fuel indicator” page 36

NOTE!

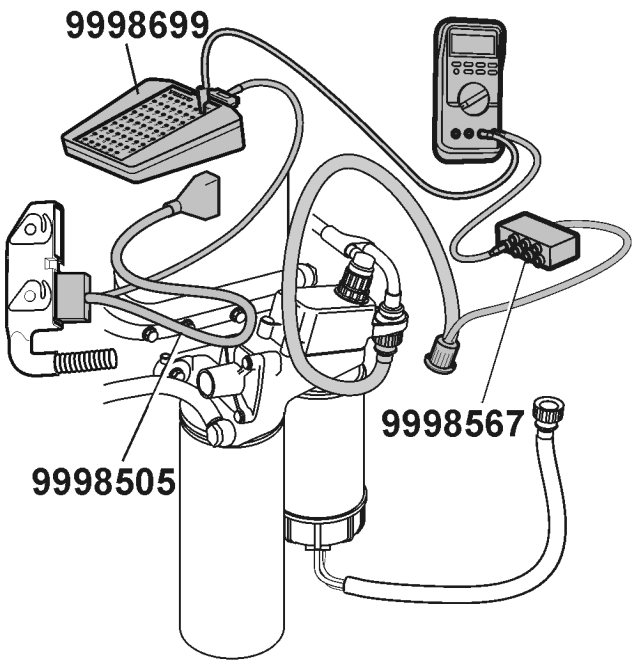
- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

For information about the location and appearance of the sensors, see:

- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.



T2021418

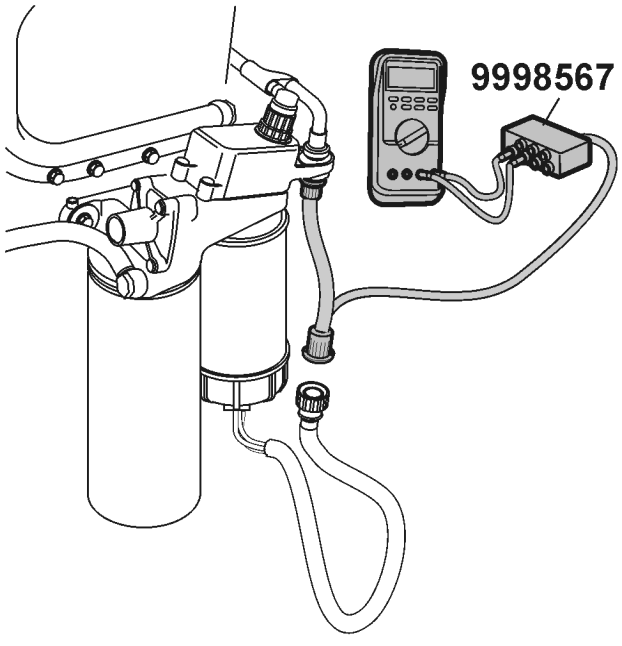
Signal cable:

1
Conditions:
- 7-pole adapter connected to the cable harness connector block (towards engine control unit) **and** measurement box with adapter connected to cable harness connector block EB.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.

Measurement points	Expected value
3 - EB6	R ≈ 0 Ω

If a break or other unexpected value is noted, then the fault is probably in the connection between the pump and the engine control unit.

9998505, 9998567, 9998699
9812519



T2020815

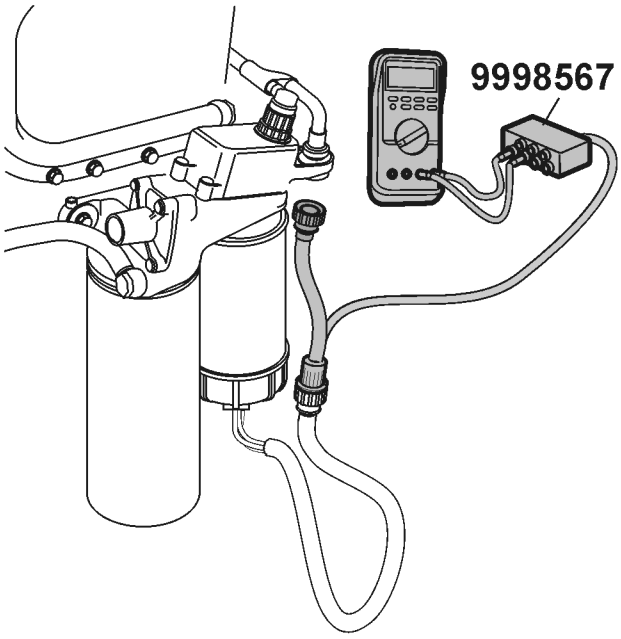
Supply cable:

2
Conditions:
- Component connector removed.
- 7-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
2 - Ground	R ≈ 0 Ω

If the expected value is not received, then the fault is probably in the supply cable between the indicator and the engine control unit. This can also have caused a fault in the indicator. Check the indicator also.

9998567
9812519



T2020818

Water in fuel indicator

3
Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component connector removed.
- 7-pole adapter connected to component connector block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

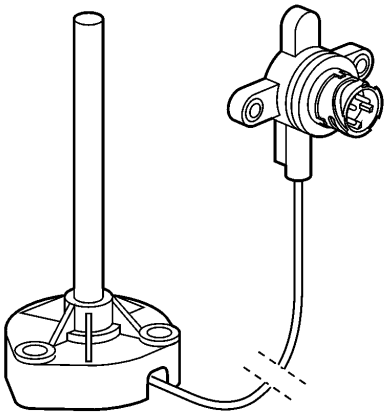
Measurement points	Expected value
2 - 3	Break (normal)

9998567
9812519

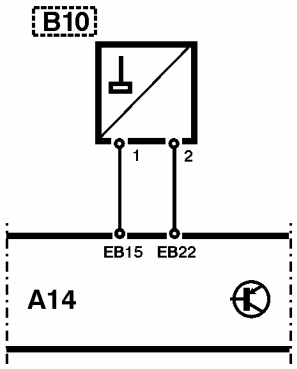
Function check

1
Perform a function check after any corrective actions, with test 23321–3“Water drainage fuel system, test” in VCADS Pro. See service information “Drainage of water in fuel system, fault tracing” (Check list S), Diagnosis, group 2331.

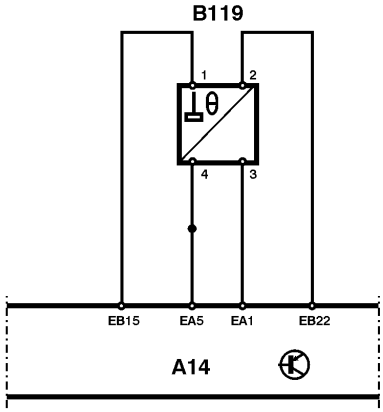
MID 128 PID 98 Engine oil level



Types 1/2



Type 1



Type 2

General information

In addition to the oil level the sensor also measures the oil temperature (Only applies to sensor type 2).

Component: (B10) Oil level sensor
or
(B119) Oil level/temperature sensor

Fault code

FMI 1

Oil level too low (WARNING level).

Condition for fault code:
- Oil level below warning level.

Possible cause:
- Low oil level
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28417–3 “MID 128 PID 98 Engine oil level, check” page 43
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- The voltage on EB15 – EB22 is under 0.5 V.

Possible cause:
- Short circuit to ground, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28417–3 “MID 128 PID 98 Engine oil level, check” page 43
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Circuit interruption.

Condition for fault code:
- The voltage on EB15–EB22 exceeds 4.95 V.

Possible cause:
- Break, signal cable.
- Break, earth cable.
- Short circuit to battery voltage, signal cable.
- Short circuit to battery voltage, ground cable.
- Short circuit to 5 V, signal cable.
- Short circuit to 5 V, ground cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28417–3 “MID 128 PID 98 Engine oil level, check” page 43
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28417-3
MID 128 PID 98 Engine oil level, check

Special tools: 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 PID 98 Engine oil level” page 41

NOTE!

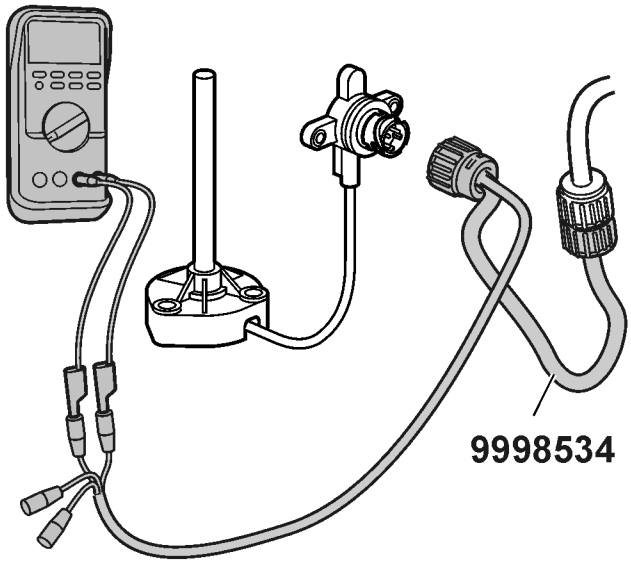
- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

For information about the location and appearance of the sensors, see:

- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.



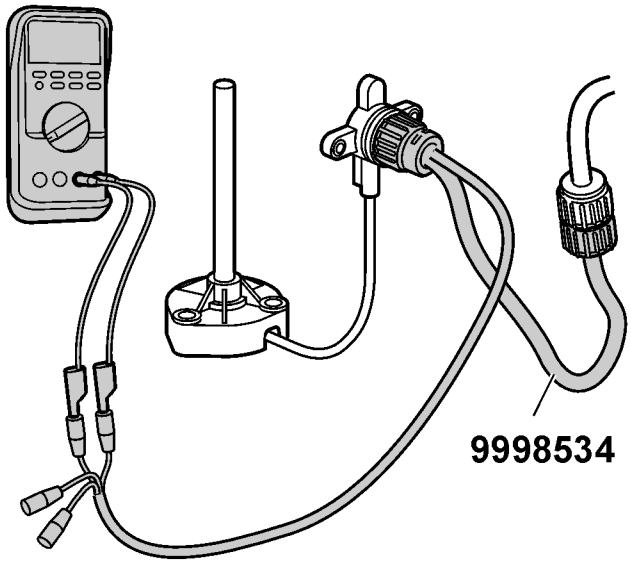
T2020820

Ground cable:

1
Conditions:
- Component connector removed.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
1 - Ground	R ≈ 3 MΩ

9998534
9812519



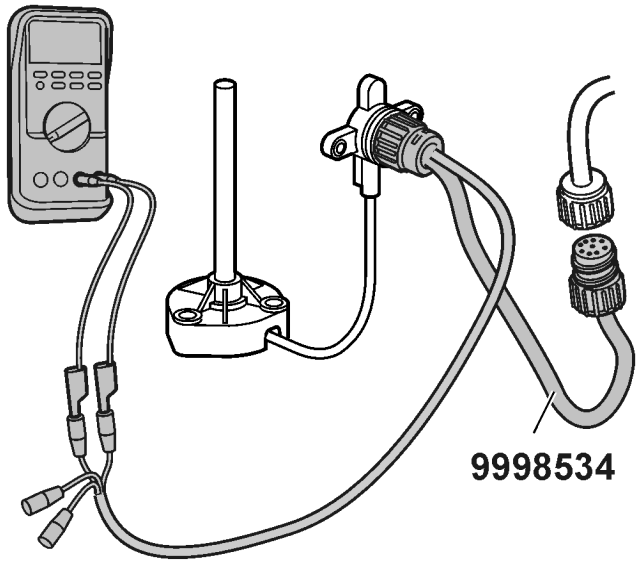
T2019798

Supply cable:

2
Conditions:
- 4-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
2 - Ground	U ≈ 2 - 4.5 V

9998534
9812519



Oil level sensor

3
Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component connector removed.
- 4-pole adapter connected to component connector block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

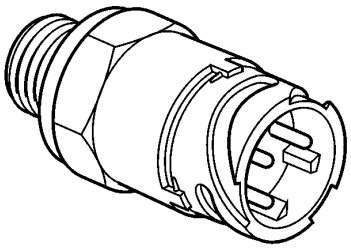
Measure-ment points	Expected value
1 - 2	Break (normal)

9998534
9812519

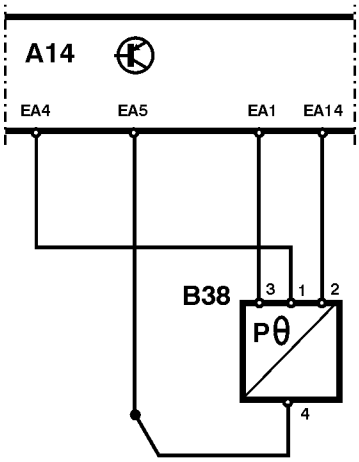
Function check

1
Perform a function check, with test “28408-3 Sensor value check, engine stationary” in VCADS Pro, after any remedial action.

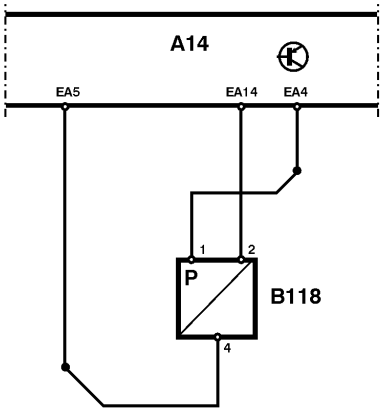
MID 128 PID 100 Engine oil pressure



Types 1/2



Type 1



Type 2

General information

In addition to the oil pressure the sensor also measures the oil temperature (Only applies to sensor type 1).

Component: (B38) Oil pressure/temperature sensor
or
(B118) Oil pressure sensor

Fault code

FMI 1

Pressure too low.

Condition for fault code:
- The voltage on EA14 is under the alarm limit.

Possible cause:
- Oil level is too low.
- Contaminated oil, slow-flowing or too thin.
- Fault in overflow valve(s).
- Worn oil pump.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Red light requested.
- Power reduction in the 1st stage and shutdown in 2nd stage (if engine protection is chosen in the data set).

Noticeable external symptoms:
- LED lights up at the oil pressure gauge.
- Power reduction (if engine protection is chosen in the data set).
- Engine switch-off when the vehicle speed falls below 3 km/h (if engine protection is chosen in the data set).

Appropriate action:
- **Active FMI**
  See service information “Oil pressure engine, fault tracing” (Check list J), Diagnostics, group 2209.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- The voltage on EA14 exceeds 4.95 V.

Possible cause:
- Short circuit to battery voltage or 5 V, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit stops sending PID 100.

Noticeable external symptoms:
- Yellow lamp lights.
- The oil pressure gauge shows 0 in the instrument.

Appropriate check:
- **Active FMI**
  28455–3 “MID 128 PID 100 Engine oil pressure, check” page 48
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to earth or break.

Condition for fault code:
- The voltage of EA14 is below 0.08 V.

Possible cause:
- Break, 5 V supply cable.
- Break, signal cable.
- Short circuit to ground, 5 V supply cable.
- Short circuit to ground, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit stops sending PID 100.

Noticeable external symptoms:
- Yellow lamp lights.
- The oil pressure gauge shows 0 in the instrument.

Appropriate check:
- **Active FMI**
  28455–3 “MID 128 PID 100 Engine oil pressure, check” page 48.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28455-3
MID 128 PID 100 Engine oil pressure, check

Special tools: 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 PID 100 Engine oil pressure” page 46

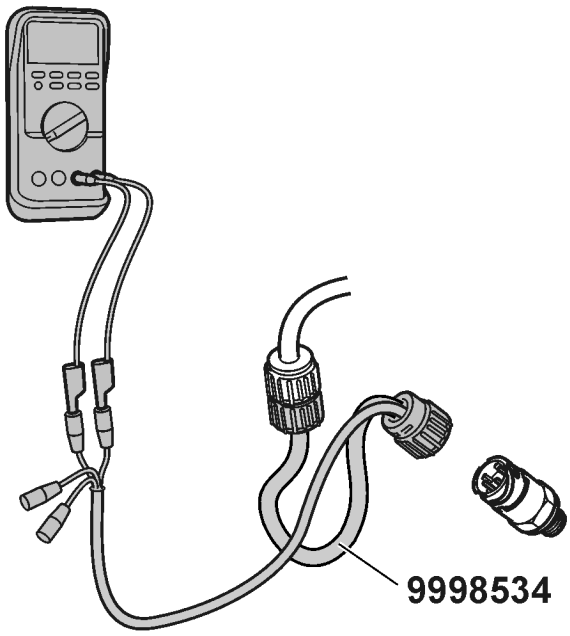
NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.



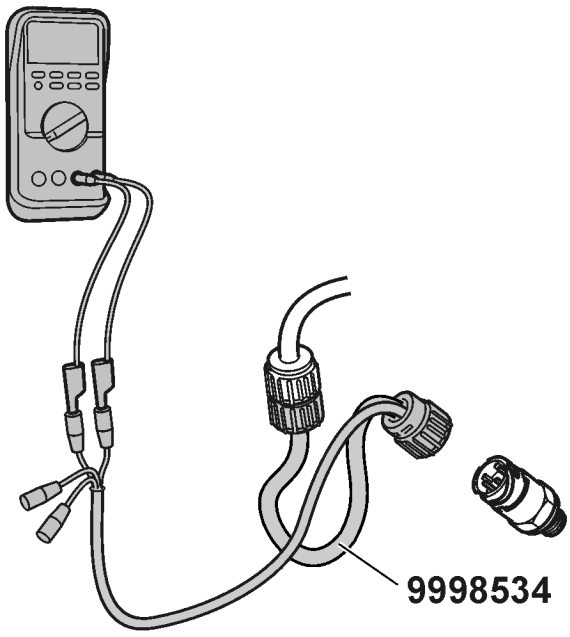
T2020822

Ground cable:

1
Conditions:
- Component connector removed.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
4 - Ground	R ≈ 0 Ω

9998534
9812519



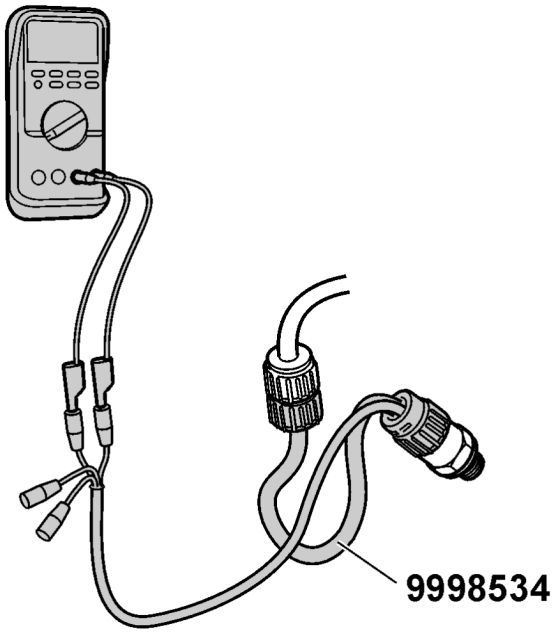
T2020822

Control cable:

2
Conditions:
- Component connector removed.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
2 - Ground	R ≈ 100 kΩ

9998534
9812519



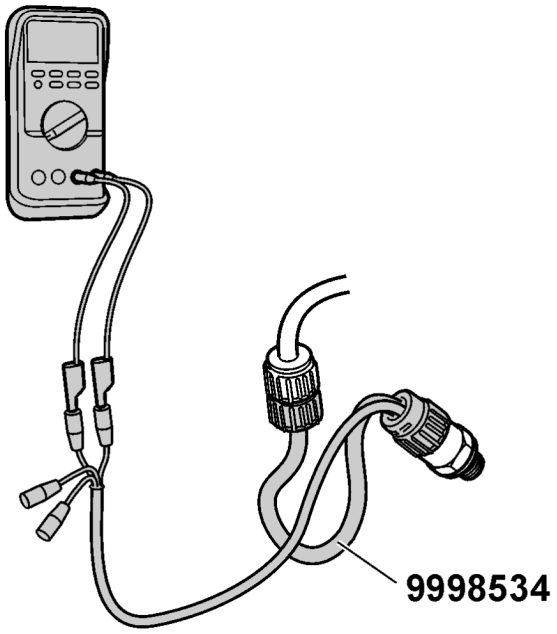
T2019799

Supply cable:

3
Conditions:
- 4-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
1 - Ground	U ≈ 5 V

9998534
9812519



T2019799

Oil pressure sensor

4
-

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- 4-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.

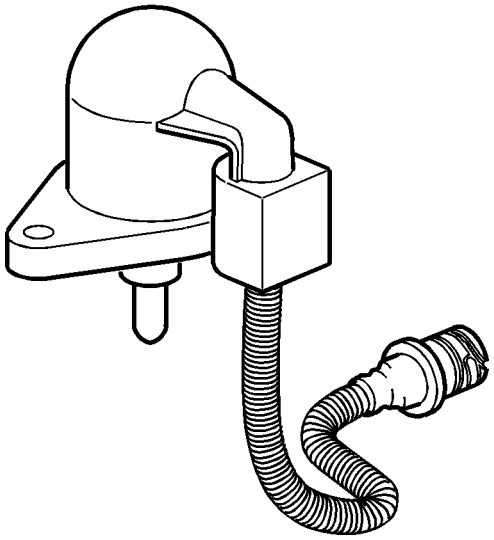
Measurement points	Expected value
2 - 4	U ≈ 0.5 V (stationary engine)

9998534
9812519

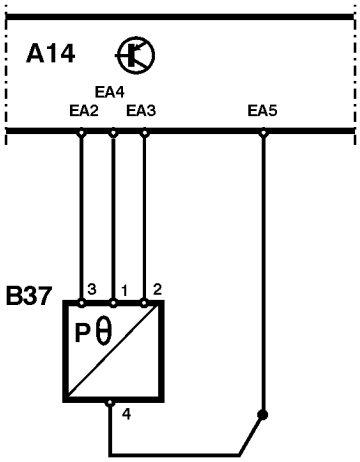
Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

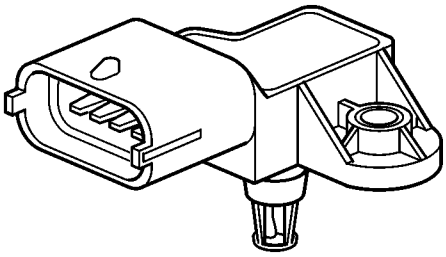
MID 128 PID 102 Boost pressure



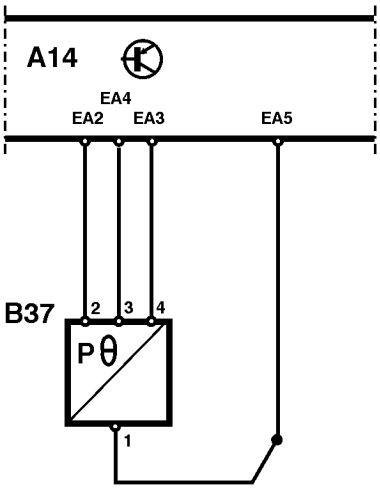
Type 1



Type 1



Type 2



Type 2

General information

In addition to the boost pressure, the sensor also measures the boost air temperature.

Component: (B37) Boost pressure/temperature sensor

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- The voltage on EA3 exceeds 4.95 V.

Possible cause:
- Short circuit to battery voltage or 5 V, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit stops sending PID 102.
- Power reduction.

Noticeable external symptoms:
- Yellow lamp lights.
- The boost pressure gauge shows 0 in the instrument.
- Low power output.

Appropriate check:
- **Active FMI**
  28456–3 “MID 128 PID 102 Boost pressure, check” page 53.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to earth or break.

Condition for fault code:
- The voltage of EA3 is below 0.08 V.

Possible cause:
- Break, 5 V supply cable.
- Break, signal cable.
- Short circuit to ground, 5 V supply cable.
- Short circuit to ground, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit stops sending PID 102.
- Power reduction.

Noticeable external symptoms:
- Yellow lamp lights.
- The boost pressure gauge shows 0 in the instrument.
- Low power output.

Appropriate check:
- **Active FMI**
  28456–3 “MID 128 PID 102 Boost pressure, check” page 53.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28456-3
MID 128 PID 102 Boost pressure, check

Special tools: 9990216, 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 PID 102 Boost pressure” page 51

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

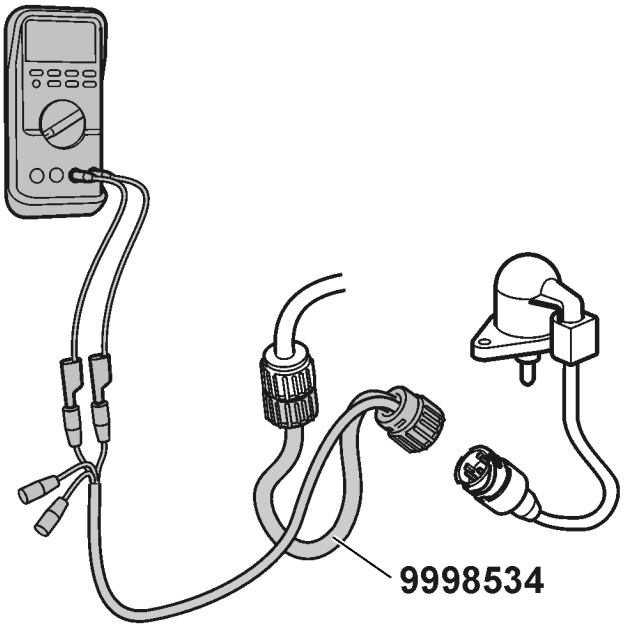
For information about the location and appearance of the sensors, see:

- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

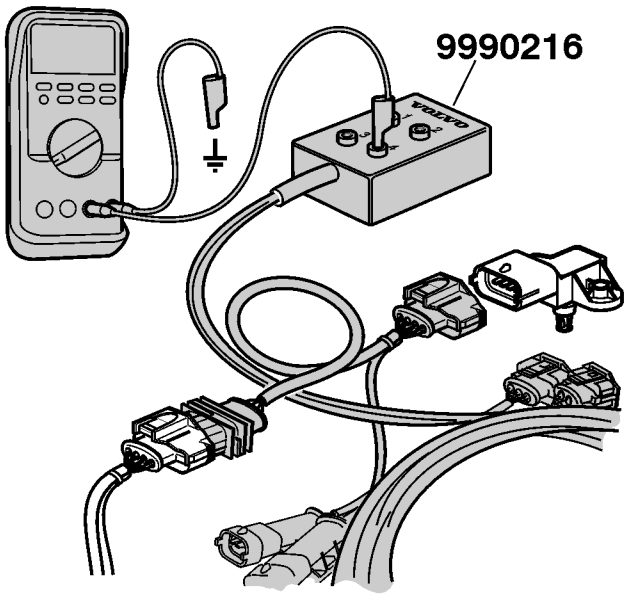
Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

Ground cable:

1



Type 1



Type 2

Conditions:

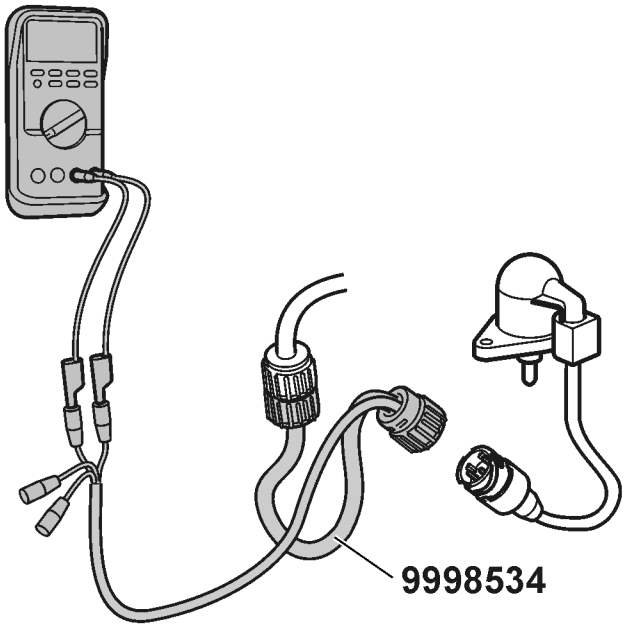
- Component connector removed.
- Adapter connected to cable harness connector block (towards engine control unit). For sensor type 1 the connector block is in the cable box.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
Type 1: 4 - Framework Type 2: 1 - Framework	R ≈ 0 Ω

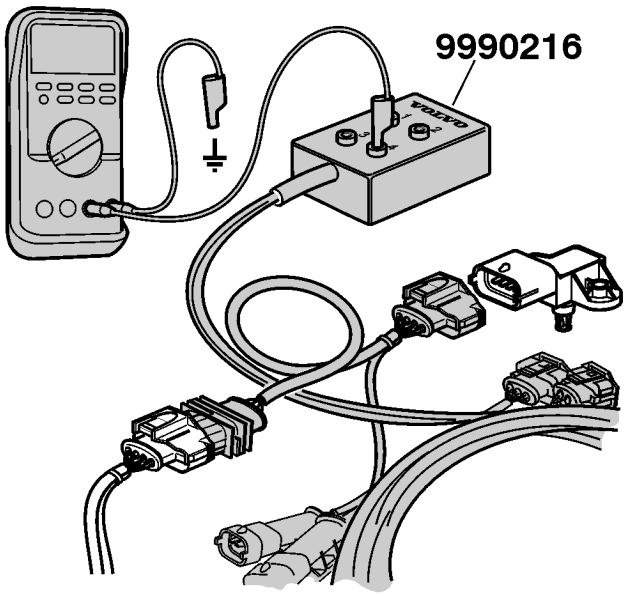
9990216, 9998534
9812519

Signal cable:

2



Type 1



Type 2

Conditions:

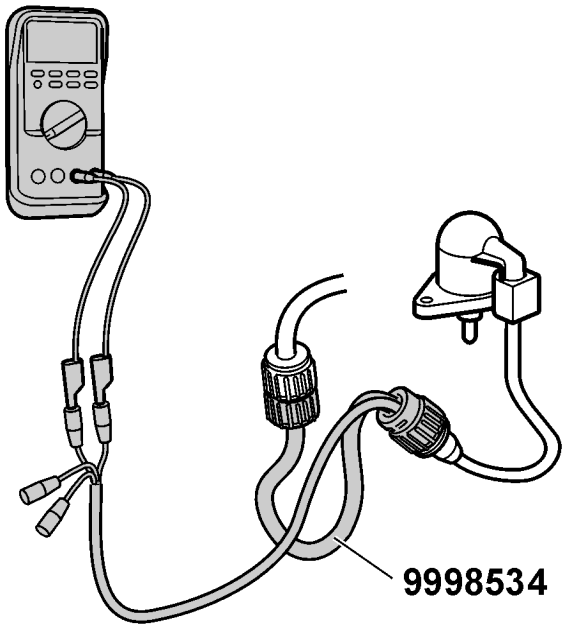
- Component connector removed.
- Adapter connected to cable harness connector block (towards engine control unit). For sensor type 1 the connector block is in the cable box.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
Type 1: 2 - Framework Type 2: 4 - Framework	R ≈ 100 kΩ

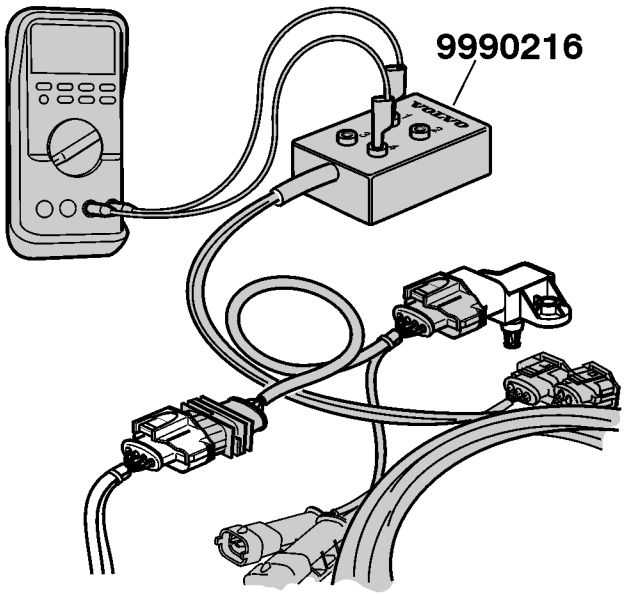
9990216, 9998534
9812519

Supply cable:

3



Type 1



Type 2

Conditions:

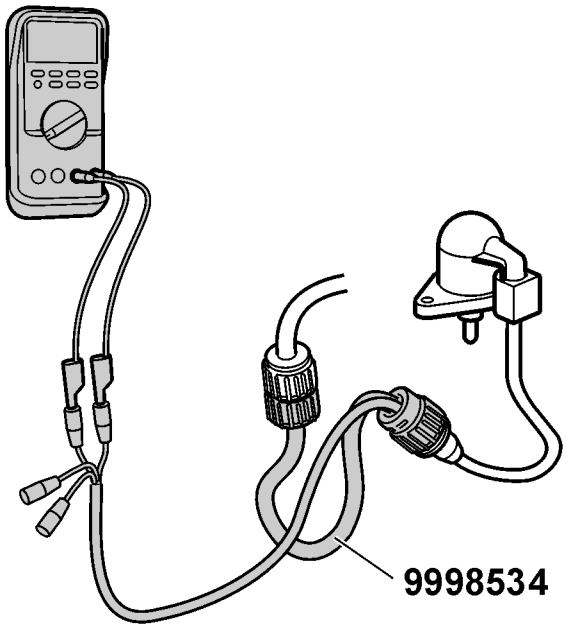
- Adapter connected **between** cable harness connector block and connector block on the component. For sensor type 1 the connector block is in the cable box.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
Type 1: 1 - 4 Type 2: 3 - 1	U ≈ 4.75 V – 5.25 V

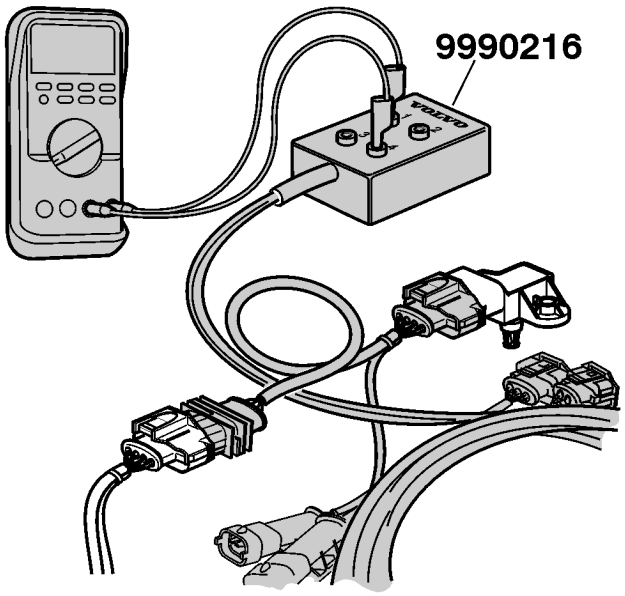
9990216, 9998534
9812519

Boost pressure sensor

4



Type 1



Type 2

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Adapter connected **between** cable harness connector block and connector block on the component. For sensor type 1 the connector block is in the cable box.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.

Measurement points	**Expected value** [1]
Type 1: 1 - 4 Type 2: 1 - 4	U ≈ 1.05 V — 1.15V

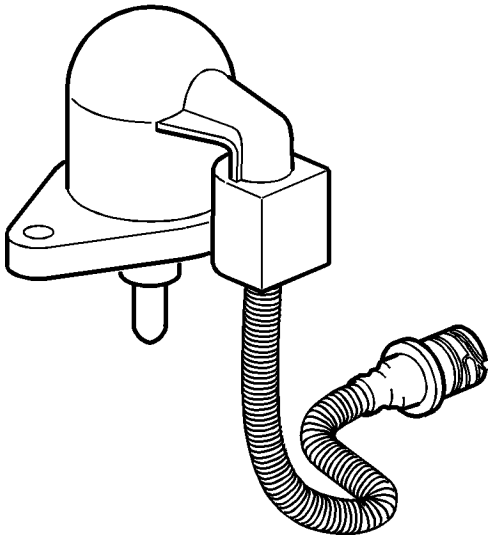
[1] Stationary engine, 0 meter above sea level

9990216, 9998534
9812519

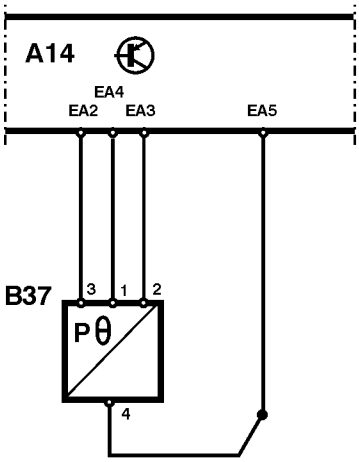
Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

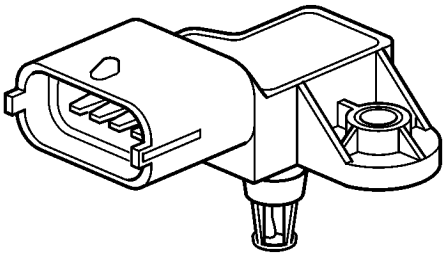
MID 128 PID 105 Boost air temperature



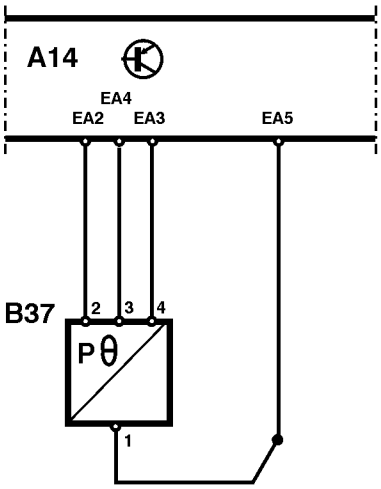
Type 1



Type 1



Type 2



Type 2

General information

In addition to the boost air temperature, the sensor also measures the boost pressure.

The boost air temperature signal is used to switch on the radiator fan.

Component: (B37) Boost pressure/temperature sensor

Fault code

FMI 3

Short circuit to battery voltage or break.

Condition for fault code:
- The voltage on EA2 exceeds 4.95 V.

Possible cause:
- Short circuit to battery or 5 V voltage, signal cable.
- Short circuit to battery voltage, ground cable.
- Break, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28457–3 “MID 128 PID 105 Boost air temperature, check” page 60.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- The voltage of EA2 is below 0.08 V.

Possible cause:
- Short circuit to ground, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28457–3 “MID 128 PID 105 Boost air temperature, check” page 60.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28457-3
MID 128 PID 105 Boost air temperature, check

Special tools: 9990216, 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 PID 105 Boost air temperature” page 58

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

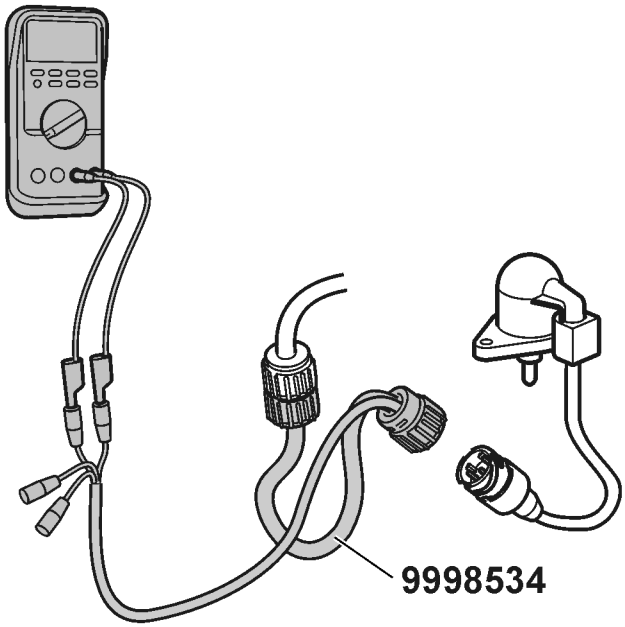
Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

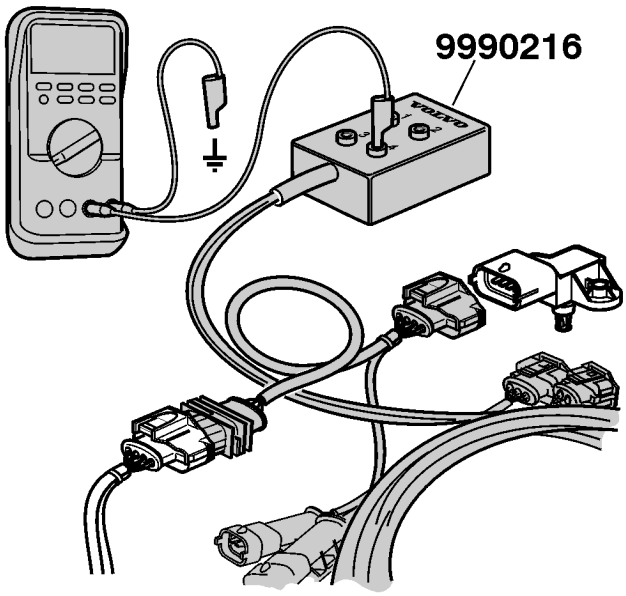
Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

Ground cable:

1



Type 1



Type 2

Conditions:

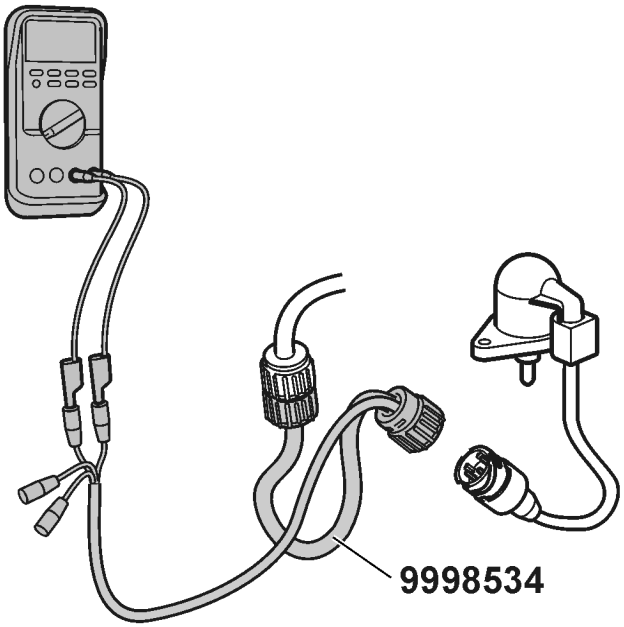
- Component connector removed.
- Adapter connected to cable harness connector block (towards engine control unit). For sensor type 1 the connector block is in the cable box.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
Type 1: 4 - Framework Type 2: 1 - Framework	R ≈ 0 Ω

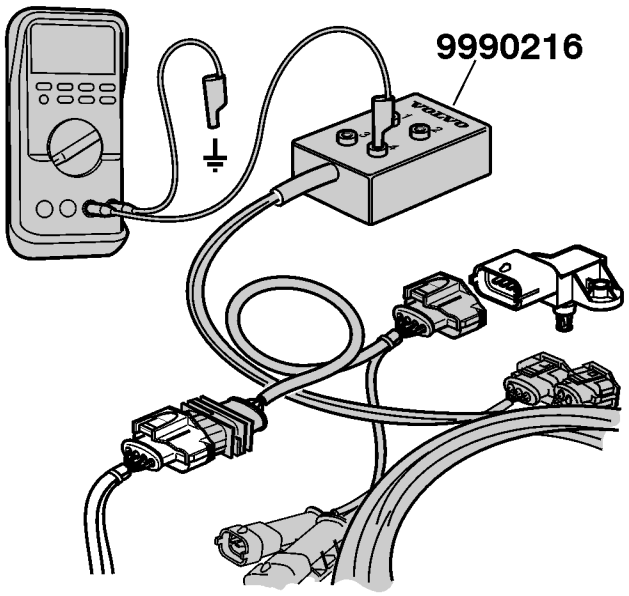
9990216, 9998534
9812519

Signal cable:

2



Type 1



Type 2

Conditions:

- Component connector removed.
- Adapter connected to cable harness connector block (towards engine control unit). For sensor type 1 the connector block is in the cable box.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

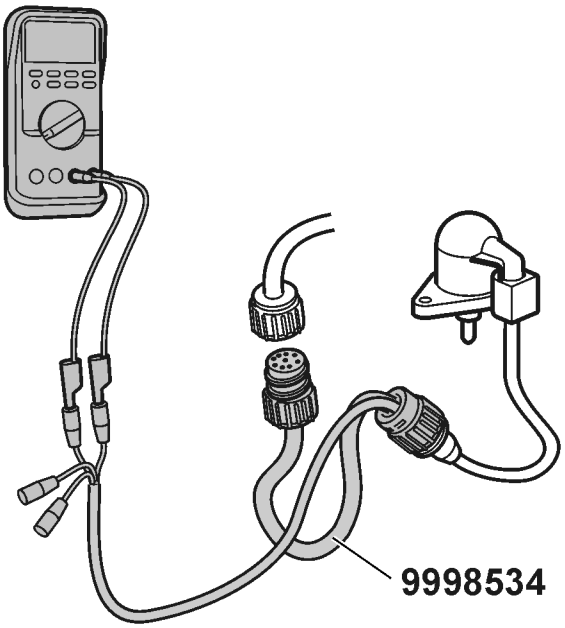
Measurement points	Expected value
Type 1: 3 - Framework Type 2: 2 - Framework	R ≈ 5.7 kΩ [1]

[1] Value may vary ±20%

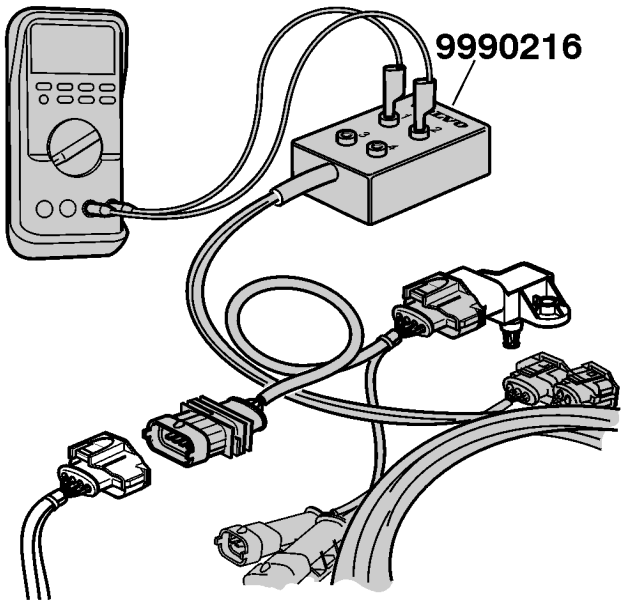
9990216, 9998534
9812519

Boost air temperature sensor

3



Type 1



Type 2

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component connector removed.
- Adaptor connected to the component connecting block. For sensor type 1 the connector block is in the cable box.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

Type 1

Measure-ment points	Temperature	Expected value
3 - 4	-40 °C	168.1±12.6 kΩ
	-30 °C	88.3±6.0 kΩ
	-20 °C	48.4±3.1 kΩ
	-10 °C	27.5±1.6 kΩ
	0 °C	16.2±0.89 kΩ
	+10 °C	9.88±0.50 kΩ
	+20 °C	6.20±0.28 kΩ
	+30 °C	4.00±0.17 kΩ
	+40 °C	2648±97 Ω
	+50 °C	1793±58 Ω
	+60 °C	1240±42 Ω
	+70 °C	873±33 Ω
	+80 °C	627±26 Ω
	+90 °C	458±20 Ω
	+100 °C	339±15 Ω
	+110 °C	255±12 Ω
	+120 °C	195±10 Ω
	+130 °C	150.2±8.0 Ω
	+140 °C	117.4±6.6 Ω
	+150 °C	92.7±5.7 Ω

Type 2

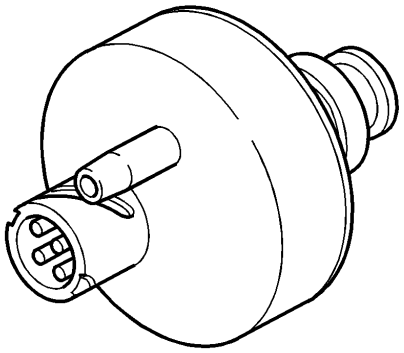
Measure-ment points	Temperature	Expected value
1 - 2	-40 °C	48.15±2.85 kΩ
	-30 °C	26.85±1.50 kΩ
	-20 °C	15.61±0.83 kΩ
	-10 °C	9.43±0.48 kΩ
	0 °C	5.89±0,28 kΩ
	+10 °C	3.79±0.17 kΩ
	+20 °C	2.51±0.11 kΩ
	+30 °C	1.72±0.07 kΩ
	+40 °C	1200±47 Ω
	+50 °C	851±32 Ω
	+60 °C	612±22 Ω
	+70 °C	446±19 Ω
	+80 °C	329±11 Ω
	+90 °C	246±7.7 Ω
	+100 °C	186±5.6 Ω
	+110 °C	142±4.4 Ω
	+120 °C	110±3.6 Ω
	+130 °C	85.5±2.9 Ω

9990216, 9998534
9812519

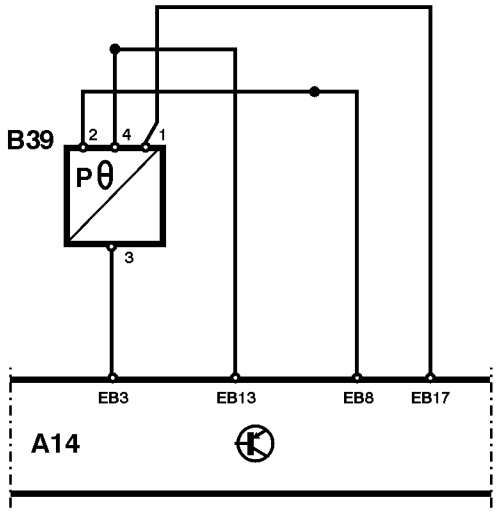
Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

MID 128 PID 107 Air filter differential pressure



T2012686



T2018692

General information

Component: (B39) Pressure drop air filter/temperature sensor

Fault code

FMI 0

Pressure drop is too large.

The pressure drop is greatest at high engine speed/load. For this reason, FMI 0 is often found as an inactive fault code.

Condition for fault code:
- Pressure drop is too large.
- Voltage on EB3 is 9–25% of battery voltage (0.09 * U_{bat} and 0.25 * U_{bat}).

Possible cause:
- Clogged air filter.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate action:
- Check the air filter.
- See service information “Boost pressure, fault tracing” (Check list A), Diagnosis, group 2550.

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- Voltage on EB3 exceeds 91% of battery voltage (0.91 * U_{bat}).

Possible cause:
- Short circuit to battery or 5 V voltage, signal cable.
- Short circuit to battery voltage, ground cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28458–3 “MID 128 PID 107 Air filter differential pressure, check” page 68.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- Voltage on EB3 less than 9% of battery voltage (0.09 * U_{bat}).

Possible cause:
- Short circuit to ground, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28458–3 “MID 128 PID 107 Air filter differential pressure, check” page 68.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Break.

Condition for fault code:
- Voltage on EB3 is 63–91% of battery voltage (0.63 * U_{bat} and 0.91 * U_{bat}).

Possible cause:
- Open circuit in signal lead.
- Break in the earth lead.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28458–3 “MID 128 PID 107 Air filter differential pressure, check” page 68.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28458-3
MID 128 PID 107 Air filter differential pressure, check

Special tools: 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 PID 107 Air filter differential pressure” page 66

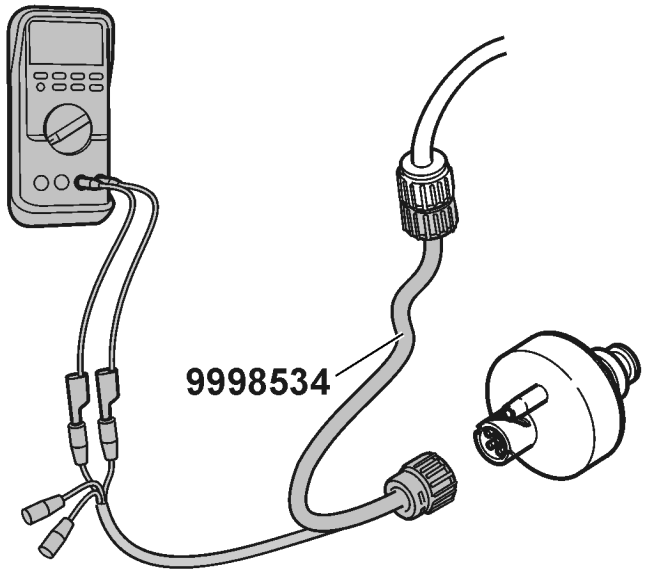
NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.



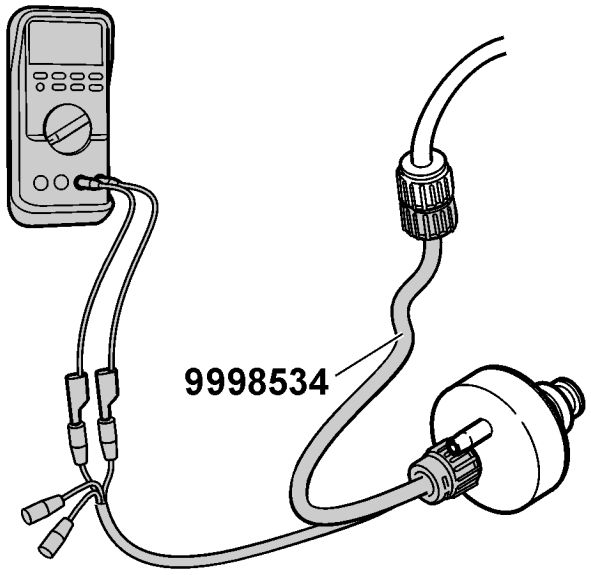
T2020826

Ground cable:

1
Conditions:
- Component connector removed.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
2 - Ground	R ≈ 0 Ω

9998534
9812519



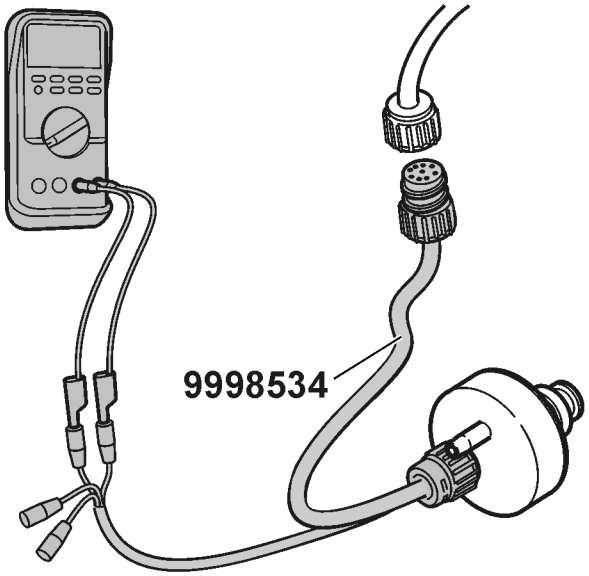
T2020693

“Signal cable”/supply cable:

2
Conditions:
- Component connector removed.
- 4-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
1 - Ground	$U \approx 0.12 * U_{bat}$

9998534
9812519



T2020827

Pressure drop sensor, air filter

3
Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component connector removed.
- 4-pole adapter connected to component connector block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

Measurement points	Nominal value
1 - 2	R ≈ 330 Ω [1]

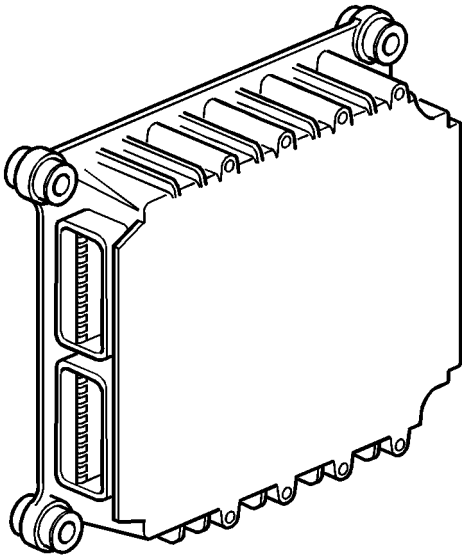
[1] If the measured value ≈ 2.2 kΩ when the engine is shut off, this indicates that the contact has stuck in the active position.

9998534
9812519

Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

MID 128 PID 108 Atmospheric pressure



T2012687

General information

The sensor is located inside the engine control unit and can therefore not be checked. The signal is used to calculate boost pressure as well as to compensate for fuel when driving at high altitudes.

Component: (A14) Engine control unit

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- The signal from the internal sensor exceeds 4.95 V.

Possible cause:
- Internal fault in the control unit.
- The control unit has been exposed to extremely high pressure.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Poor response at high altitudes.

FMI 4

Short circuit to earth or break.

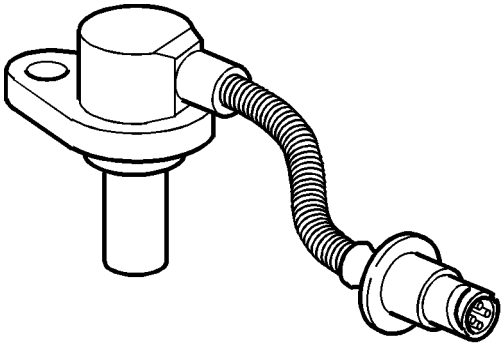
Condition for fault code:
- The signal from the internal sensor is below 0.08 V.

Possible cause:
- Internal fault in the control unit.
- The control unit has been exposed to extremely low pressure.

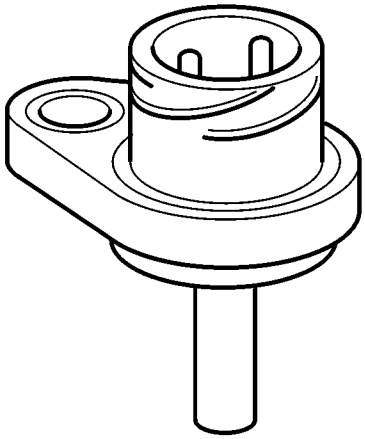
Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Poor response at high altitudes.

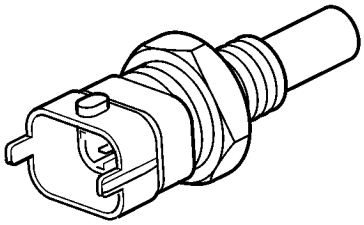
MID 128 PID 110 Coolant temperature



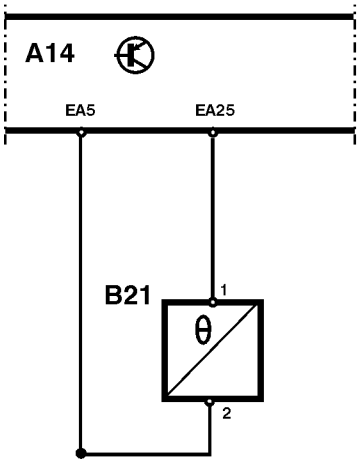
Type 1



Type 2



Type 3



Types 1/2/3

General information

Component: (B21) Coolant temperature, sensor

Fault code

FMI 0

Temperature too high.

Condition for fault code:
- The coolant temperature exceeds 101 °C.

Possible cause:
- Low coolant level.
- Fault in thermostat.
- Clogged radiator (internally/externally).
- Clogged intercooler (on the outside).
- Poor through-flow in the cooling system.
- Worn coolant pump (low pump pressure).
- Fault in pressure cap, expansion vessel.
- Fault in sensor.
- Fault in engine fan.

Reaction from the control unit:
- Fault code is set.
- Red light requested.
- Power reduction.

Noticeable external symptoms:
- Red lamp lights.
- Low power output.

Appropriate action:
- **Active FMI**
  See service information “coolant temperature, fault tracing” (Check list L), Diagnosis, group 2619.
- **Inactive FMI**
  This FMI is only active when the engine is running.
  The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 3

Short circuit to battery voltage or break.

Condition for fault code:
- The voltage on EA25 exceeds 4.95 V.

Possible cause:
- Short circuit to battery or 5 V voltage, signal cable/supply cable.
- Open circuit, signal cable/supply cable.
- Break, earth cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit stops sending PID 110.

Noticeable external symptoms:
- Yellow lamp lights.
- The coolant temperature gauge shows 0 in the instrument.

Appropriate check:
- **Active FMI**
  28460–3 “MID 128 PID 110 Engine coolant temperature, check” page 74.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- The voltage on EA25 is below 0.08 V.

Possible cause:
- Short circuit to ground, signal cable/supply cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit stops sending PID 110.

Noticeable external symptoms:
- Yellow lamp lights.
- The coolant temperature gauge shows 0 in the instrument.

Appropriate check:
- **Active FMI**
  28460–3 “MID 128 PID 110 Engine coolant temperature, check” page 74.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28460-3
MID 128 PID 110 Engine coolant temperature, check

Special tools: 9990216, 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 PID 110 Coolant temperature” page 72

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

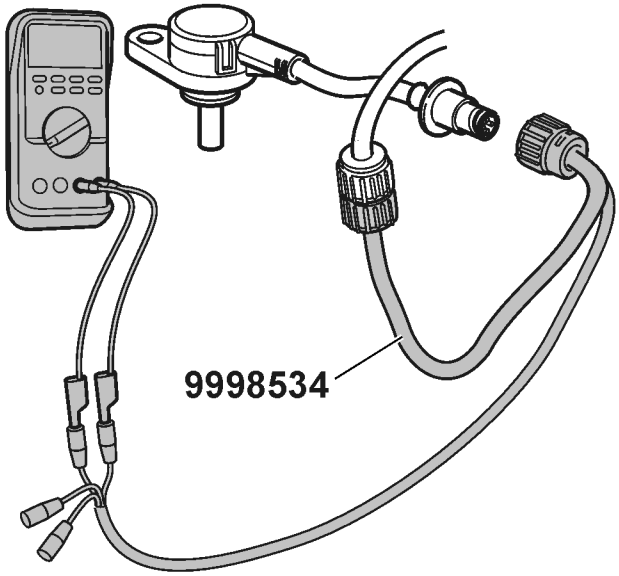
Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

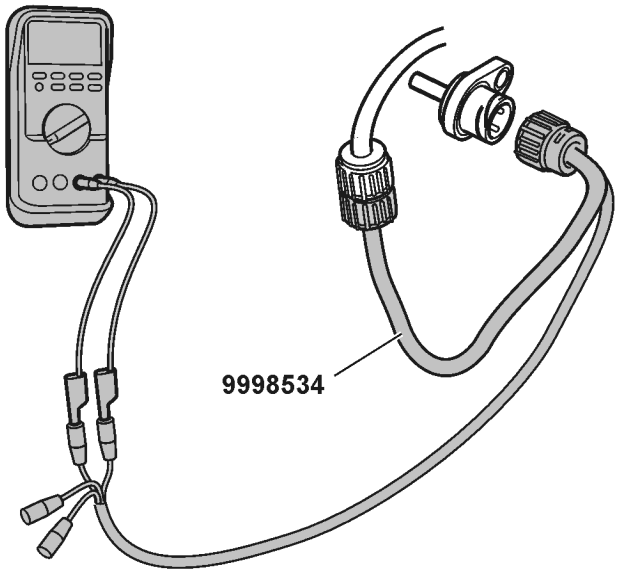
Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

Ground cable:

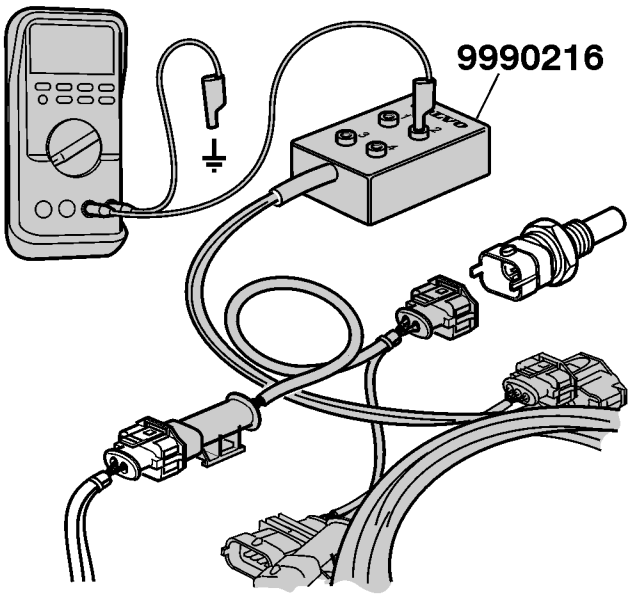
1



Type 1



Type 2



Type 3

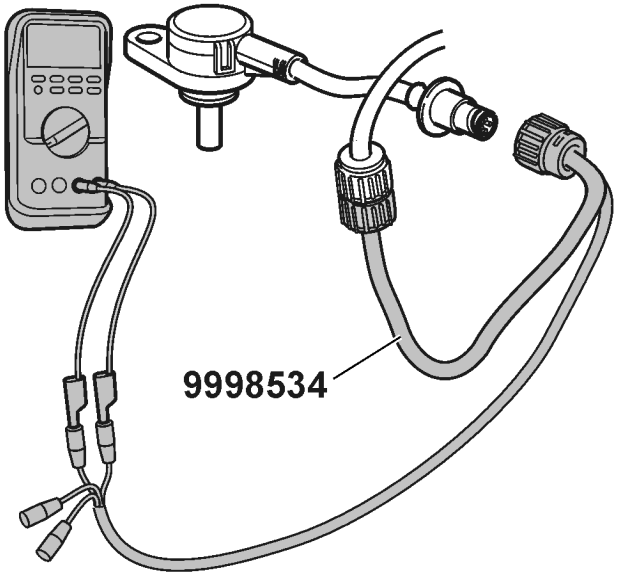
Conditions:
- Component connector removed.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
2 - Ground	R ≈ 0 Ω

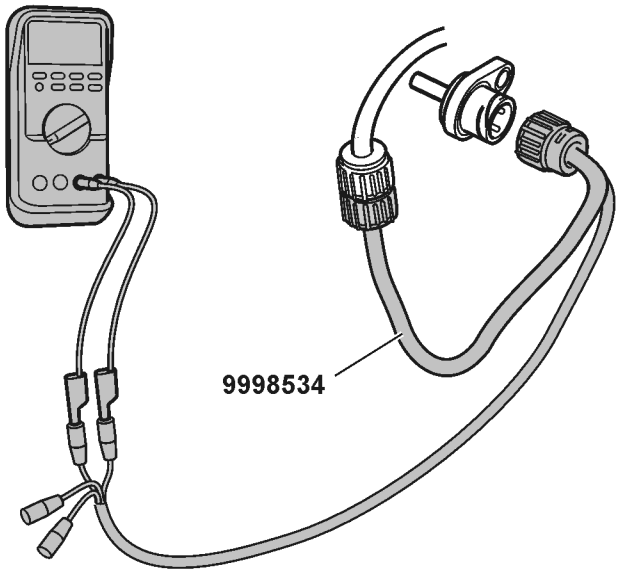
9990216, 9998534
9812519

Signal cable:

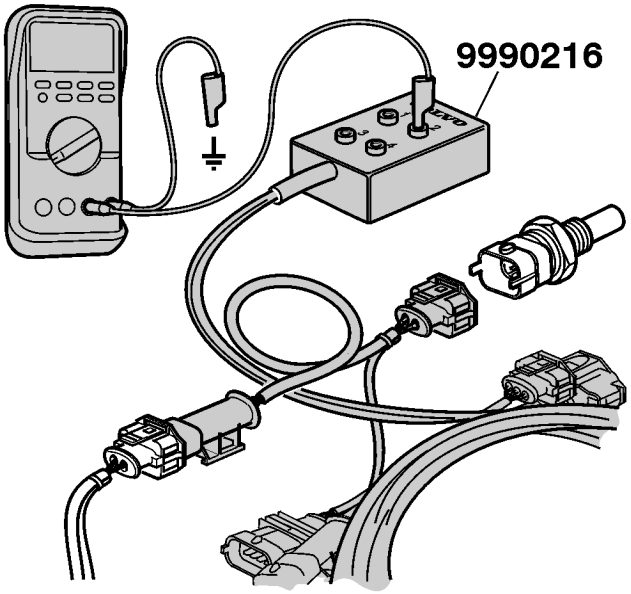
2



Type 1



Type 2



Type 3

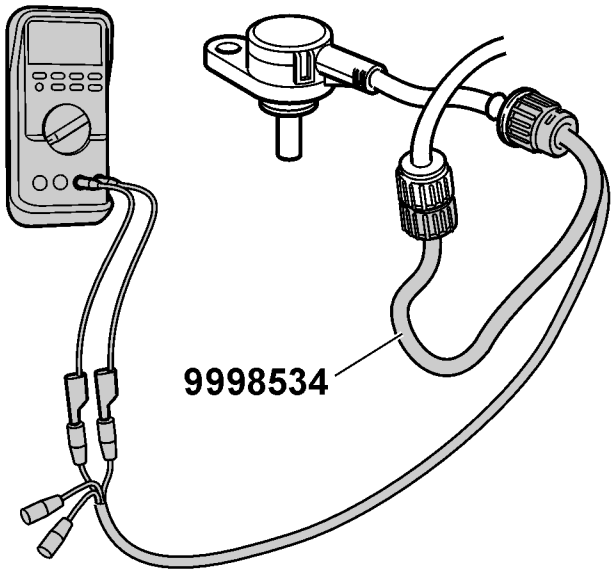
Conditions:
- Component connector removed.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
1 - Ground	R ≈ 1.4 kΩ

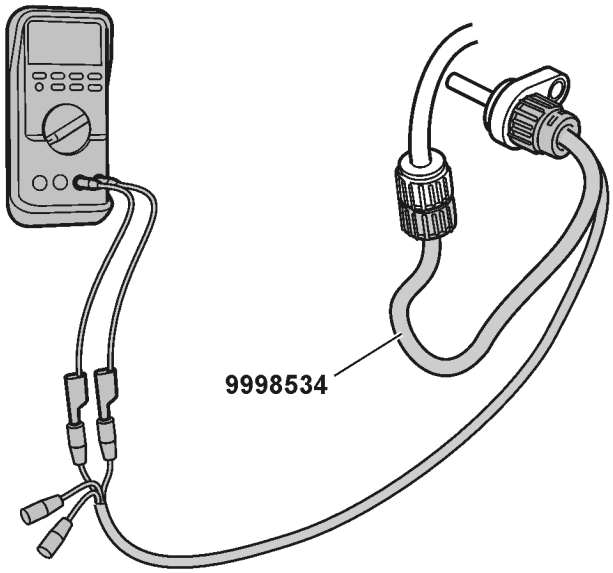
9990216, 9998534
9812519

Supply cable:

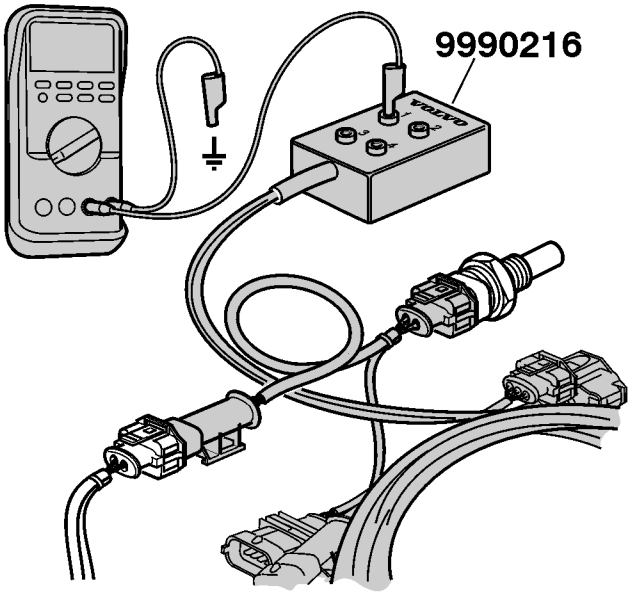
3



Type 1



Type 2



Type 3

Conditions:

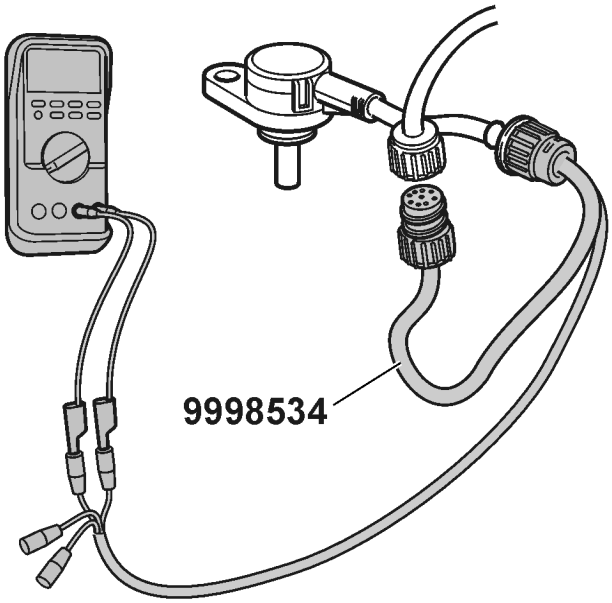
- Component connector removed.
- 4-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
1 - Ground	U ≈ 5 V

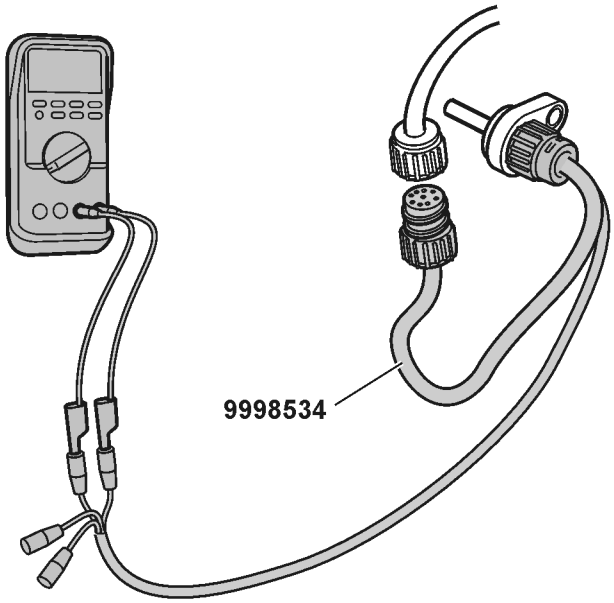
9990216, 9998534
9812519

Coolant temperature sensor

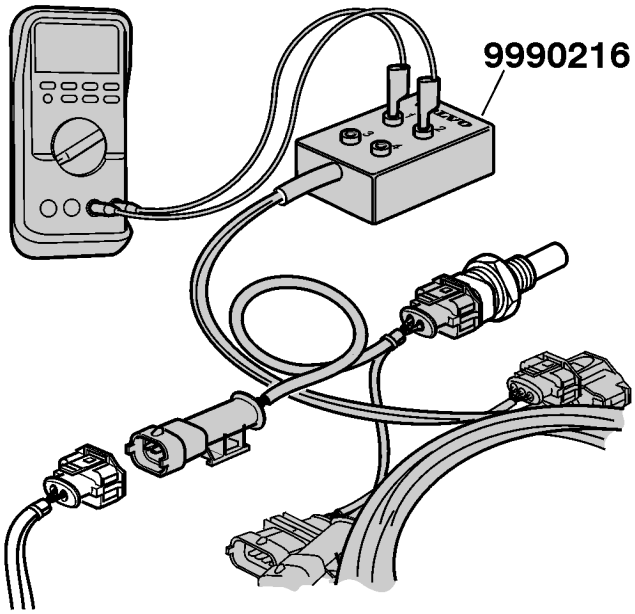
4



Type 1



Type 2



Type 3

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component connector removed.
- 4-pole adapter connected to component connector block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

Types 1 and 2

Measure-ment points	Temperature	Expected value
1 - 2	-30 °C	27.5±3.2 kΩ
	-20 °C	15.0±1.6 kΩ
	-10 °C	8.5±0.82 kΩ
	0 °C	4.9±0.44 kΩ
	10 °C	3.0±0.25 kΩ
	20 °C	1.9±0.14 kΩ
	30 °C	1205±85 Ω
	40 °C	798±52 Ω
	50 °C	542±32 Ω
	60 °C	376±20 Ω
	70 °C	267±13 Ω
	80 °C	191.1±8.5 Ω
	90 °C	139.7±5.5 Ω
	100 °C	103.7±3.7 Ω
	110 °C	78.0±2.8 O
	120 °C	59.5±2.4 Ω
	130 °C	45.9±2.0 Ω

Type 3

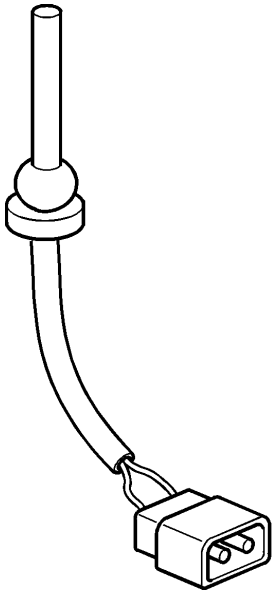
Measure-ment points	Temperature	Expected value
1 - 2	-30 °C	26.1±2.5 kΩ
	-20 °C	15.5±1.4 kΩ
	-10 °C	9.4±0.76 kΩ
	0 °C	5.9±0.43 kΩ
	10 °C	3.8±0.25 kΩ
	20 °C	2.5±0.15 kΩ
	30 °C	1707±92 Ω
	40 °C	1175±57 Ω
	50 °C	834±36 Ω
	60 °C	596±23 Ω
	70 °C	435±14 Ω
	80 °C	323±10 Ω
	90 °C	243±6 Ω
	100 °C	186±4 Ω
	110 °C	144±4 Ω
	120 °C	113±4 Ω
	130 °C	89±3 Ω

9990216, 9998534
9812519

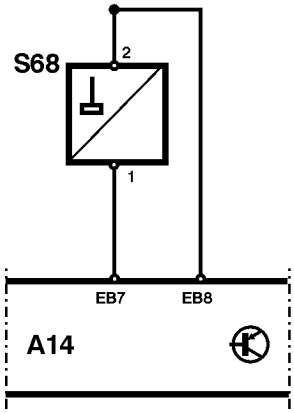
Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

MID 128 PID 111 Coolant level



T2012689



T2018694

General information

Component: (S68) Coolant level indicator

Fault code

FMI 1

Level too low.

Condition for fault code:
- Coolant level switch closed.
- Voltage on EB7 less than 45% of battery voltage (0.45 * U_{bat}).

Possible cause:
- Low coolant level.
- Short circuit to ground, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Red light requested.
- The engine control unit reduces the output after 30 seconds and switches off the engine if the vehicle speed falls below 3 km/h (if engine protection is chosen in the data set).

Noticeable external symptoms:
- Red lamp lights.
- Reduced engine output and engine switch-off when the vehicle speed falls below 3 km/h (if engine protection is chosen in the data set).

Suitable action/checks:
- **Active FMI**
  Fill with coolant.
  28461–3 “MID 128 PID 111 Coolant level, check” page 83.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 3

Short circuit to higher voltage.

Condition for fault code:
- Voltage on EB7 exceeds 95% of battery voltage (0.95 * U_{bat}).

Possible cause:
- Short circuit to battery or 24 V voltage, signal cable.
- Fault in coolant level sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28461–3 “MID 128 PID 111 Coolant level, check” page 83.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- The voltage on EB7 is close to 0 V.

Possible cause:
- Short circuit to ground, signal cable.
- Fault in coolant level sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28461–3 “MID 128 PID 111 Coolant level, check” page 83.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28461-3
MID 128 PID 111 Coolant level, check

Special tools: 9990008
Other special equipment: 9812519
Fault code information, see “MID 128 PID 111 Coolant level” page 81

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

Ground cable:

1

Conditions:
- Component connector removed.
- Resistance measurement with multimeter and test probes.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
2 - Ground	R ≈ 0 Ω

9990008
9812519

Supply cable/signal cable:

2

Conditions:
- Component connector removed.
- Voltage measurement with multimeter and test probes.
- Starter key in the **drive position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
1 - Ground	$U \approx 0.8 * U_{bat}$

9990008
9812519

Coolant level sensor

3
Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component connector removed.
- Resistance measurement with multimeter and test probes.
- Starting key in the **stop position**.
- Measurement to component.

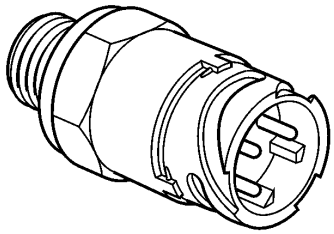
Measurement points	Expected value
1 - 2	Break (normal)
1 - 2	$R \approx 0\ \Omega$ (empty)

9990008
9812519

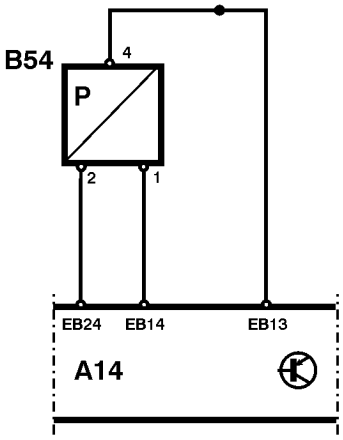
Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

MID 128 PID 153 Crankcase pressure



T2018688



T2018719

General information

Component: (B54) Crankcase pressure sensor

Fault code

FMI 0

Too high crankcase pressure.

Condition for fault code:
- Crankcase pressure too high, exceeds 8 kPa.

Possible cause:
- Clogged crankcase ventilation.
- Worn or damaged cylinder liners, pistons or piston rings.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Red light and buzzer requested.
- Reduced power output.
- Reduced engine speed.
- Engine shut down when speed is lower than 2 km/h.
- Engine braking disabled.

Noticeable external symptoms:
- Red lamp lights.
- Buzzer alarm
- Low power output.
- Engine shut down when speed is lower than 2 km/h.
- Engine braking disabled.

Appropriate check:
- **Active FMI**
  28426–3 “MID 128 PID 153 Crankcase pressure, check” page 87.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as active (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- The voltage on EB24 exceeds 4.95 V.

Possible cause:
- Short circuit to battery voltage or 5 V supply, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28426–3 “MID 128 PID 153 Crankcase pressure, check” page 87.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to earth or break.

Condition for fault code:
- The voltage on EB24 is under 0.08 V.

Possible cause:
- Break, 5 V supply cable.
- Break, signal cable.
- Short circuit to ground, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28426–3 “MID 128 PID 153 Crankcase pressure, check” page 87.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28426-3
MID 128 PID 153 Crankcase pressure, check

Special tools: 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 PID 153 Crankcase pressure” page 85

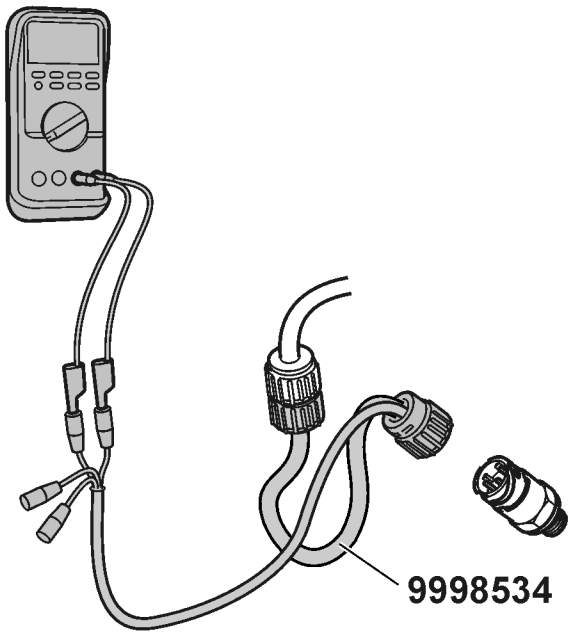
NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.



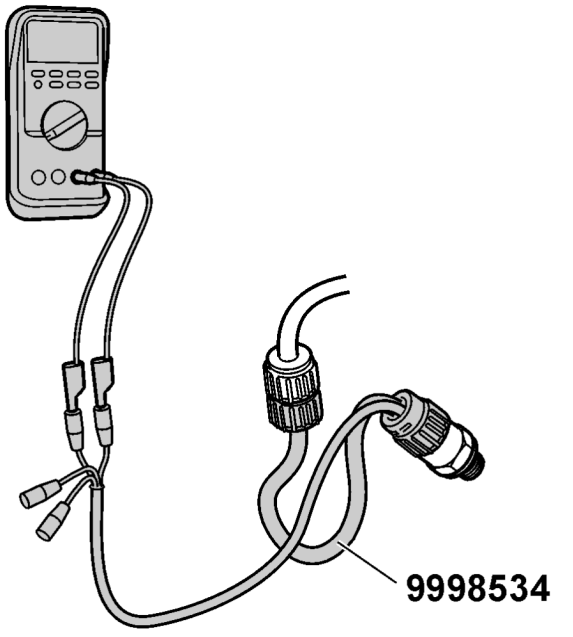
T2020822

Ground cable:

1
Conditions:
- Component connector removed.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
4 - Ground	R ≈ 0 Ω

9998534
9812519



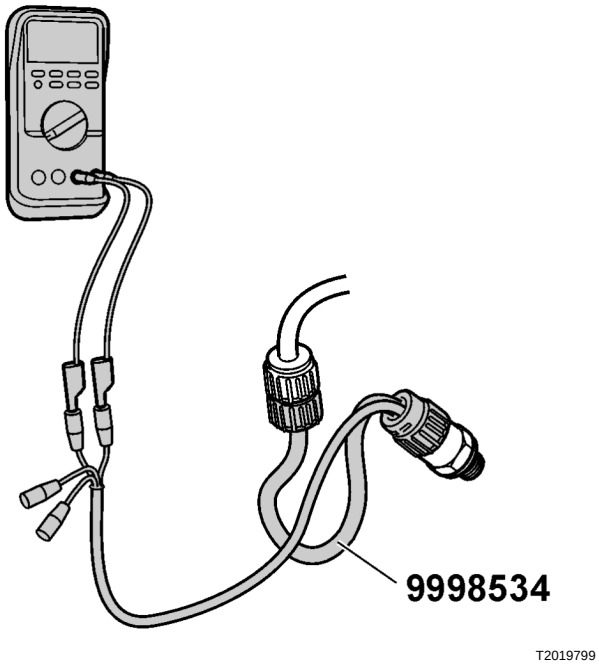
T2019799

Supply cable:

2
Conditions:
- 4-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
1 - Ground	U ≈ 4.8 - 5.15 V

9998534
9812519



T2019799

Control cable:

3
Conditions:
- 4-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
2 - Ground	U = 2.8 - 3.0 V [1]

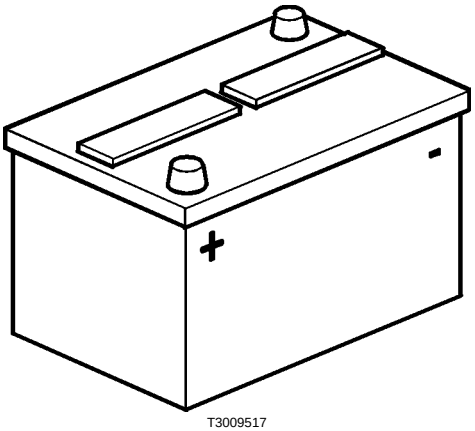
[1] At sea level, 100 kPa, engine stationary

9998534
9812519

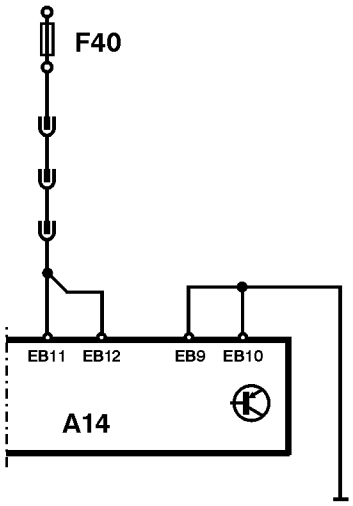
Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

MID 128 PID 158 Battery voltage



T3009517



T2018695

General information

Fault code

FMI 3

Battery voltage too high.

Condition for fault code:
- The battery voltage exceeds 36 V.

Possible cause:
- Fault in alternator.
- Fast charger connected.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28462–3 “MID 128 PID 158 Battery voltage, check” page 91.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Battery voltage too low.

Condition for fault code:
- The battery voltage less than 12 V.

Possible cause:
- Fault in alternator.
- Fault in battery, battery cables.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28462–3 “MID 128 PID 158 Battery voltage, check” page 91.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28462-3
MID 128 PID 158 Battery voltage, check

Special tools: 9998505, 9998699
Other special equipment: 9812519

Fault code information, see “MID 128 PID 158 Battery voltage” page 90

NOTE!

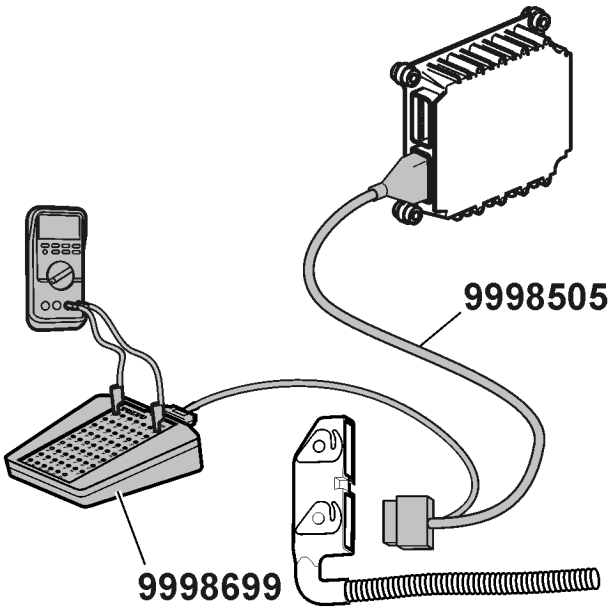
- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Function check

Supply voltage, engine control unit

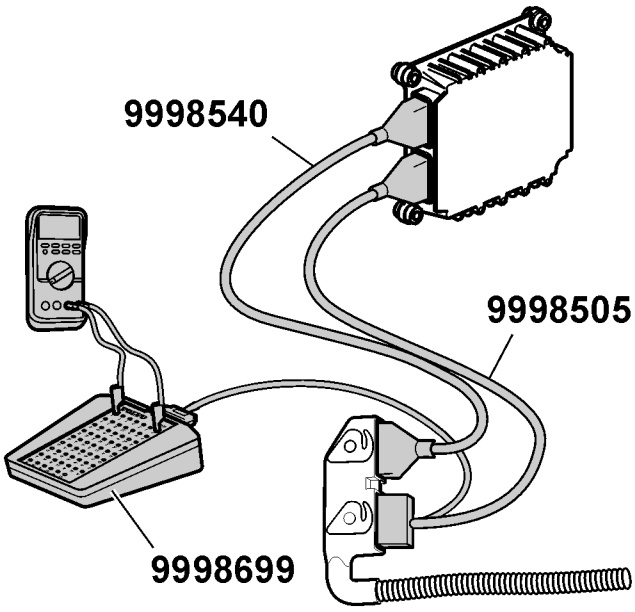
1
Conditions:
- Break-out box with adapter connected to the engine control unit connector block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.

Measurement points	Expected value
EB9 - EB10	R ≈ 0 Ω
EB11 - EB12	R ≈ 0 Ω



T2020908

9998505, 9998699
9812519



T2020695

2

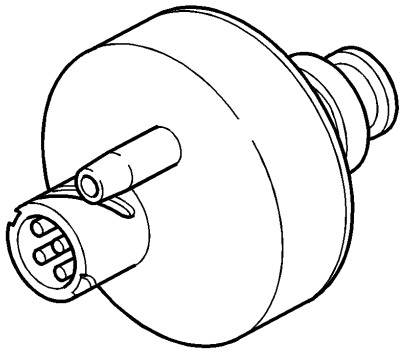
Conditions:

- Measuring box with adapter connected **between** engine control unit and cable harness.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.

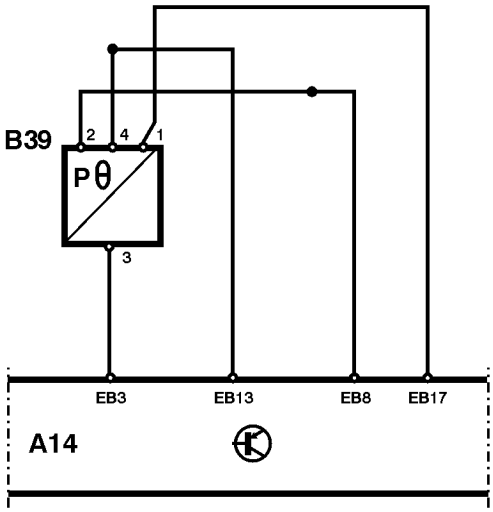
Measurement points	Expected value
EB9 - EB11	$U \approx U_{bat}$
EB10 - EB12	$U \approx U_{bat}$

9998505 , 9998699
9812519

MID 128 PID 172 Air inlet temperature



T2012686



T2018692

General information

Component: (B39) Air filter pressure/temperature sensor

Fault code

FMI 3

Short circuit to battery voltage or break.

Condition for fault code:
- The voltage of EB3 exceeds 4.95 V.

Possible cause:
- Short circuit to battery or 5 V voltage, signal cable.
- Short circuit to battery voltage, ground cable.
- Break, signal cable.
- Break, earth cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.

Appropriate check:
- **Active FMI**
  28463–3 “MID 128 PID 172 Air inlet temperature, check” page 94.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- The voltage on EB3 is under 0.08 V.

Possible cause:
- Short circuit to ground, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Blue smoke in cold weather conditions.

Appropriate check:
- **Active FMI**
  28463–3 “MID 128 PID 172 Air inlet temperature, check” page 94.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28463-3
MID 128 PID 172 Air inlet temperature, check

Special tools: 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 PID 172 Air inlet temperature” page 93

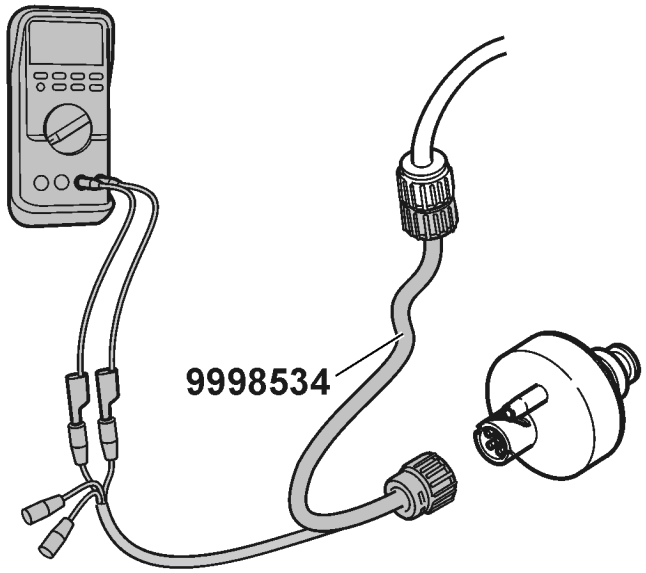
NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.



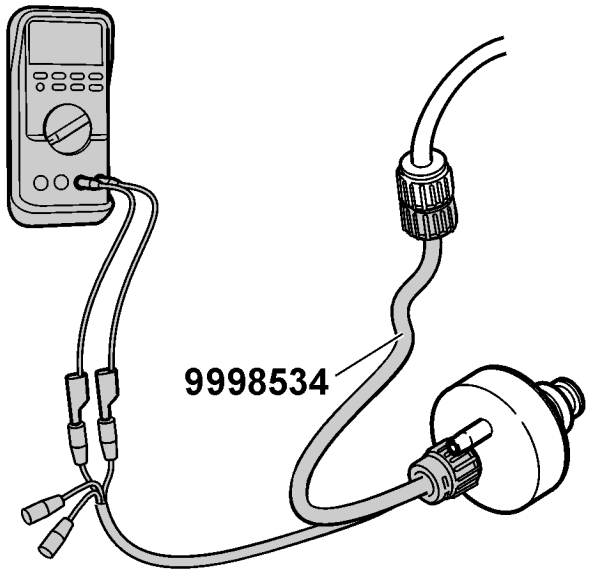
T2020826

Ground cable:

1
Conditions:
- Component connector removed.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
4 - Ground	R ≈ 0 Ω

9998534
9812519



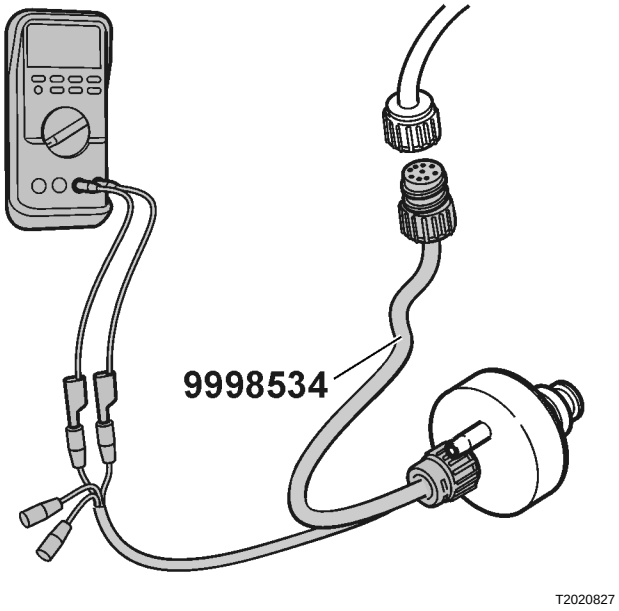
T2020693

Signal cable/supply cable:

2
Conditions:
- 4-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
3 - Ground	U ≈ 5 V

9998534
9812519



Air temperature sensor

3
Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component connector removed.
- 4-pole adapter connected to component connector block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

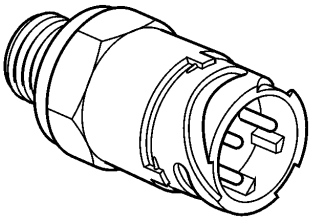
Measure-ment points	Temperature	Expected value
3 - 4	-30 °C	88.6±5.5 kΩ
	-20 °C	48.6±2.8 kΩ
	-10 °C	27.6±1.4 kΩ
	0 °C	16.3±0.76 kΩ
	10 °C	10.0±0.42 kΩ
	20 °C	6.2±0.33 kΩ
	30 °C	4.0±0.14 kΩ
	40 °C	2663±77 Ω
	50 °C	1831±45 Ω
	60 °C	1244±29 Ω
	70 °C	876±16 Ω
	80 °C	629.0±9.5 Ω
	90 °C	458.7±6.0 Ω
	100 °C	339.9±3.4 Ω

9998534
9812519

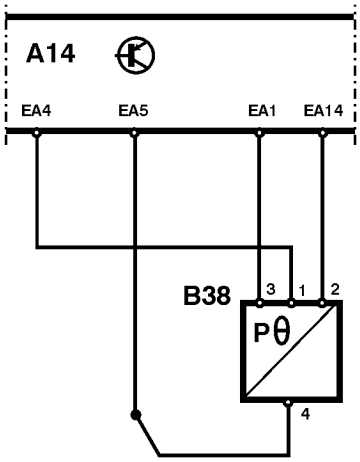
Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

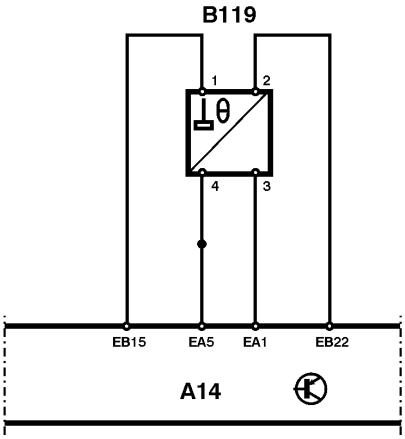
MID 128 PID 175 Engine oil temperature



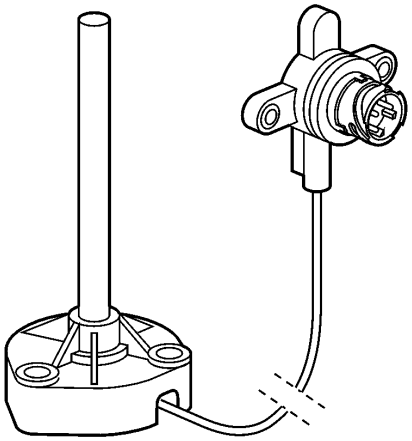
Type 1



Type 1



Type 2



Type 2

General information

In addition to the engine oil temperature the sensor also measures the oil pressure (Only applies to sensor type 2).

In addition to the engine oil temperature the sensor also measures the oil level (Only applies to sensor type 2).

Note: To check where the oil temperature sensor is located:

Separate the oil level sensor connector block on the sump.

- Two pins in the connector block: Oil temperature sensor is located in the oil pressure sensor in the engine block.
- Four pins in the connector block: Oil temperature sensor is located in the oil level sensor in the sump.

Component: (B38) Engine oil pressure/temperature sensor
or
(B119) Oil temperature/oil level sensor

Fault code

FMI 0
Temperature too high.

Condition for fault code:
- Oil temperature above 125 °C (type 1) or 135 °C (type 2).

Possible cause:
- Poor cooling capacity.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Red light requested.

Noticeable external symptoms:
- Red lamp lights.
- Power reduction in the 1st stage (at 125 °C) and shutdown in 2nd stage (if engine protection is chosen in the data set).

Appropriate action:
- **Active FMI**
  See service information “Engine coolant temperature, fault tracing” (Check list L), Diagnosis, group 2209.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 3
Short circuit to battery voltage or break.

Condition for fault code:
- The voltage on EA1 exceeds 4.95 V.

Possible cause:
- Short circuit to battery voltage or 5 V supply, signal cable.
- Break, signal cable.
- Open circuit, supply cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit stops sending PID 175.

Noticeable external symptoms:
- Yellow lamp lights.
- Engine coolant temperature gauge shows 0 in the instrument.

Appropriate check:
- **Active FMI**
  28465–3 “MID 128 PID 175 Engine oil temperature, check” page 99.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4
Short circuit to ground.

Condition for fault code:
- The voltage on EA1 is below 0.08 V.

Possible cause:
- Short circuit to ground, signal cable.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit stops sending PID 175.

Noticeable external symptoms:
- Yellow lamp lights.
- Engine coolant temperature gauge shows 0 in the instrument.

Appropriate check:
- **Active FMI**
  28465–3 “MID 128 PID 175 Engine oil temperature, check” page 99.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28465-3
MID 128 PID 175 Engine oil temperature, check

Special tools: 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 PID 175 Engine oil temperature” page 97

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

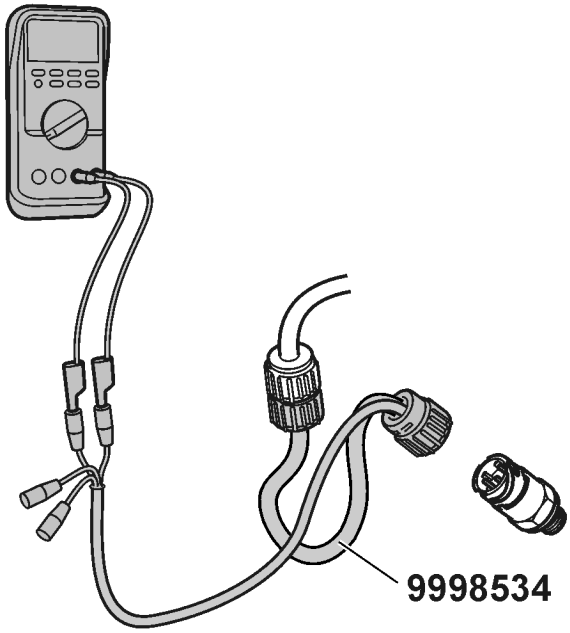
Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

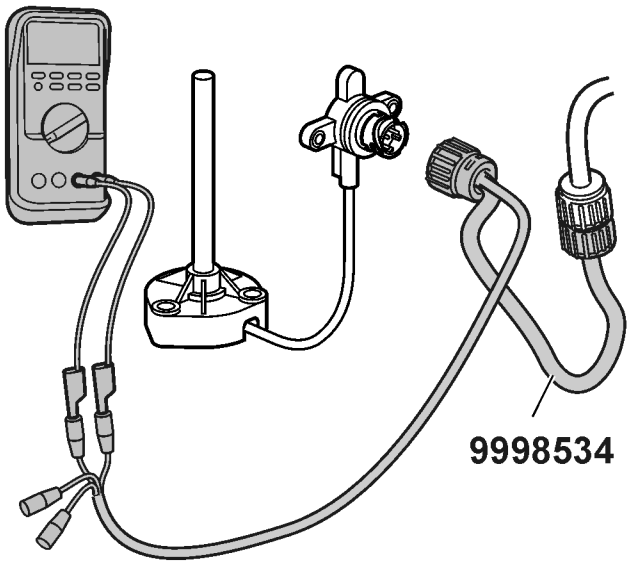
Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

Ground cable:

1



Type 1



Type 2

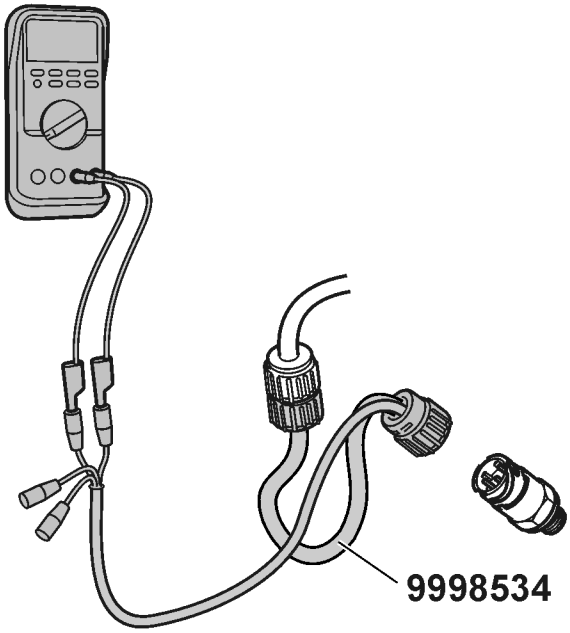
Conditions:
- Component connector removed.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
4 - Ground	R ≈ 0 Ω

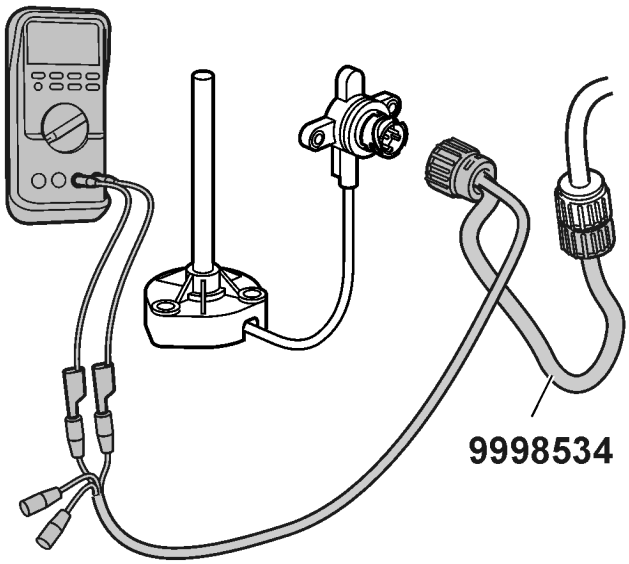
9998534
9812519

Control cable:

2



Type 1



Type 2

Conditions:

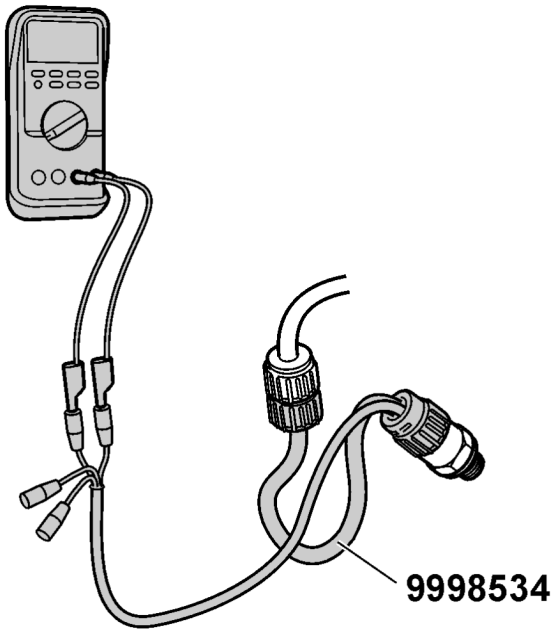
- Component connector removed.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
3 - Ground	R ≈ 1.4 kΩ

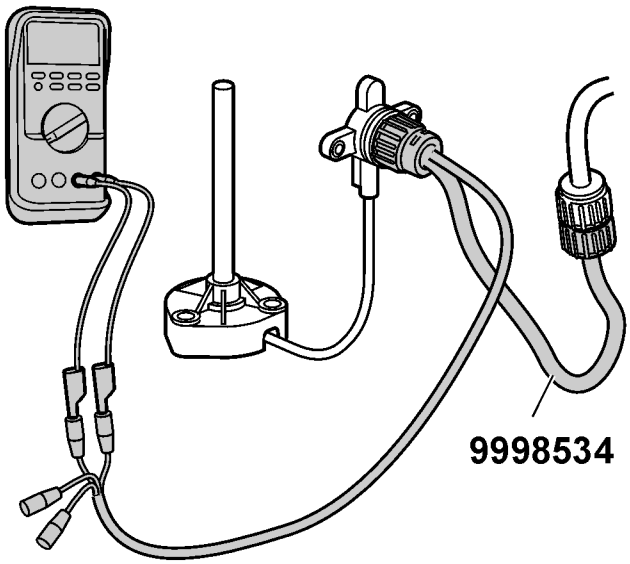
9998534
9812519

Supply cable:

3



Type 1



Type 2

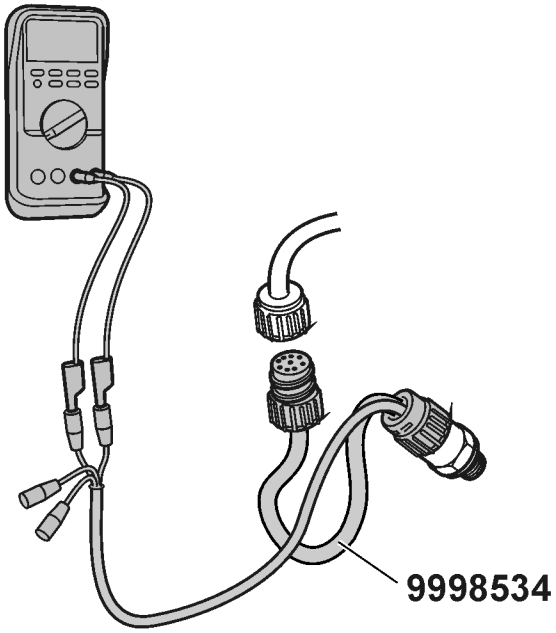
Conditions:
- 4-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
1 - Ground	U ≈ 5 V

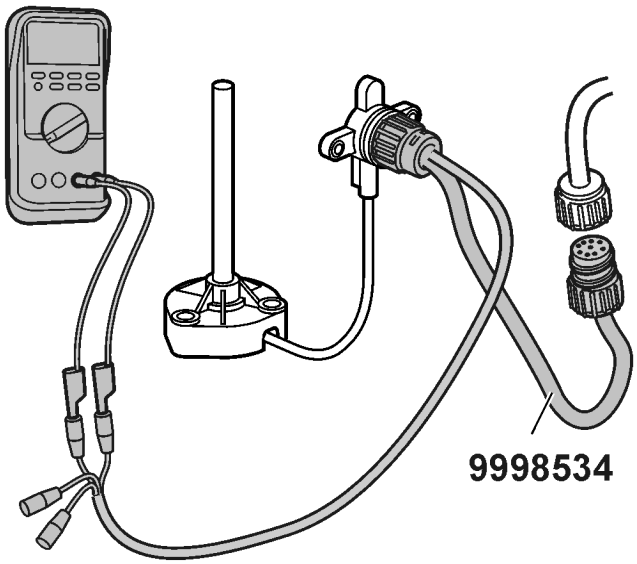
9998534
9812519

Engine oil temperature sensor

4



Type 1



Type 2

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component connector removed.
- 4-pole adapter connected to component connector block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

Measure-ment points	Temperature	Expected value
3 - 4	-30 °C	27.5±3.1 kΩ
	-20 °C	15.0±1.6 kΩ
	-10 °C	8.5±0.82 kΩ
	0 °C	4.9±0.44 kΩ
	+10 °C	3.0±0.25 kΩ
	+20 °C	1.9±0.14 kΩ
	+30 °C	1205±85 Ω
	+40 °C	798±52 Ω
	+50 °C	541±32 Ω
	+60 °C	376±20 Ω
	+70 °C	267±13 Ω
	+80 °C	191.1±8.5 Ω
	+90 °C	139.7±5.5 Ω
	+100 °C	103.7±3.7 Ω
	+110 °C	78.0±2.8 Ω
	+120 °C	59.5±2.4 Ω
	+130 °C	45.9±2.0 Ω

9998534
9812519

Function check

1
Perform a function check, with test 28407-3 “Sensor value, check (engine running)” in VCADS Pro, after any remedial action.

MID 128 PID 190 Engine rpm

Fault code

FMI 0
Engine speed too high

Condition for fault code:
- Engine speed above 2500 rpm.

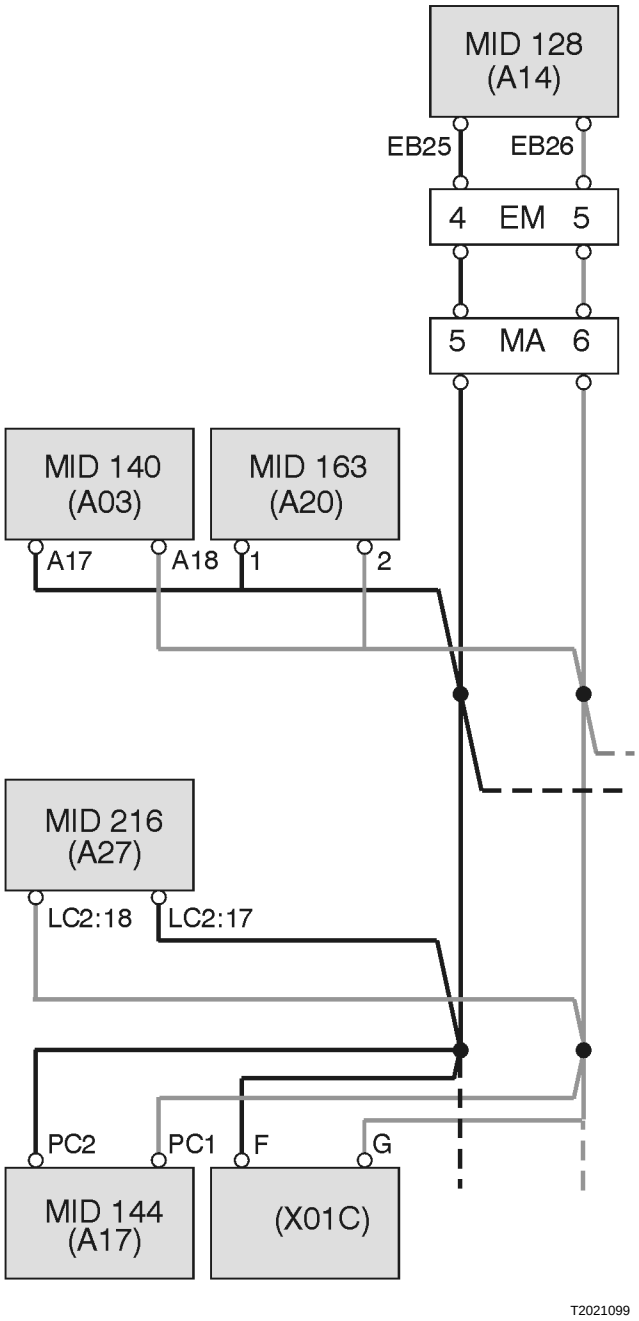
Possible cause:
- Wrong gear during engine braking.
- The engine is running on engine oil.

Reaction from the control unit:
- Fault code is set.
- Red light requested.
- Unit injector turned off, no fuel injection.
- VCB activated.

Noticeable external symptoms:
- Red lamp lights.
- Below 2 km/h:
  VCB activated. The engine is turned off.
- Above 2 km/h:
  VCB activated down to 1000 rpm.

Appropriate action:
- If it is suspected that the engine is running on engine oil, check:
  - Oil leakage, turbo aggregate.
  - Closed crankcase ventilation (if such exists).

MID 128 PID 224 Electronic immobilizer



General information

Fault code

FMI 2

Incorrect data/Incorrect response.

Condition for fault code:
- Response from Immobilizer is incorrect.

Possible cause:
- Incorrectly programmed Immobilizer or engine control unit, they do not give the same response code.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine is not allowed to start.

Noticeable external symptoms:
- Yellow lamp lights.
- The engine cannot be started.

Appropriate action:
- Update software for Immobilizer and/or engine control unit.

FMI 12

No response from Immobilizer.

Condition for fault code:
- Communication between engine control unit and Immobilizer does not function.

Possible cause:
- Immobilizer control unit damaged.
- Fault in information link SAE J1708.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine is not allowed to start.

Noticeable external symptoms:
- Yellow lamp lights.
- The engine cannot be started.

Appropriate check:
- See “Fault tracing of fault code combinations” page 107

Fault tracing of fault code combinations

To simplify fault tracing, check other fault codes to get an **indication of where the fault is**.

Fault code combination A

MID 128 PID 224 FMI 12 in combination with **no other fault codes from MID 128**.

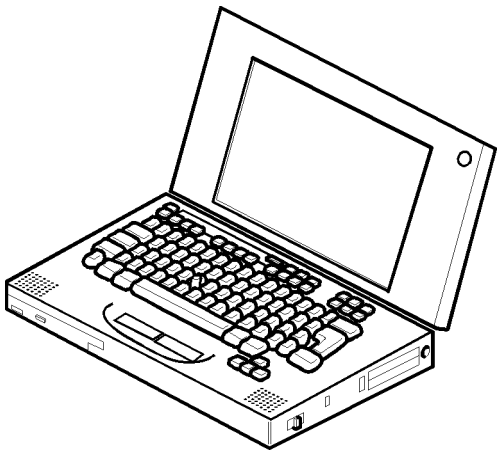
1 Check link J1587/J1708 between connector block MA (cable feed through, cab) and Immobilizer control unit in cab. Also check Immobilizer control unit, see service information group 3.

Fault code combination B

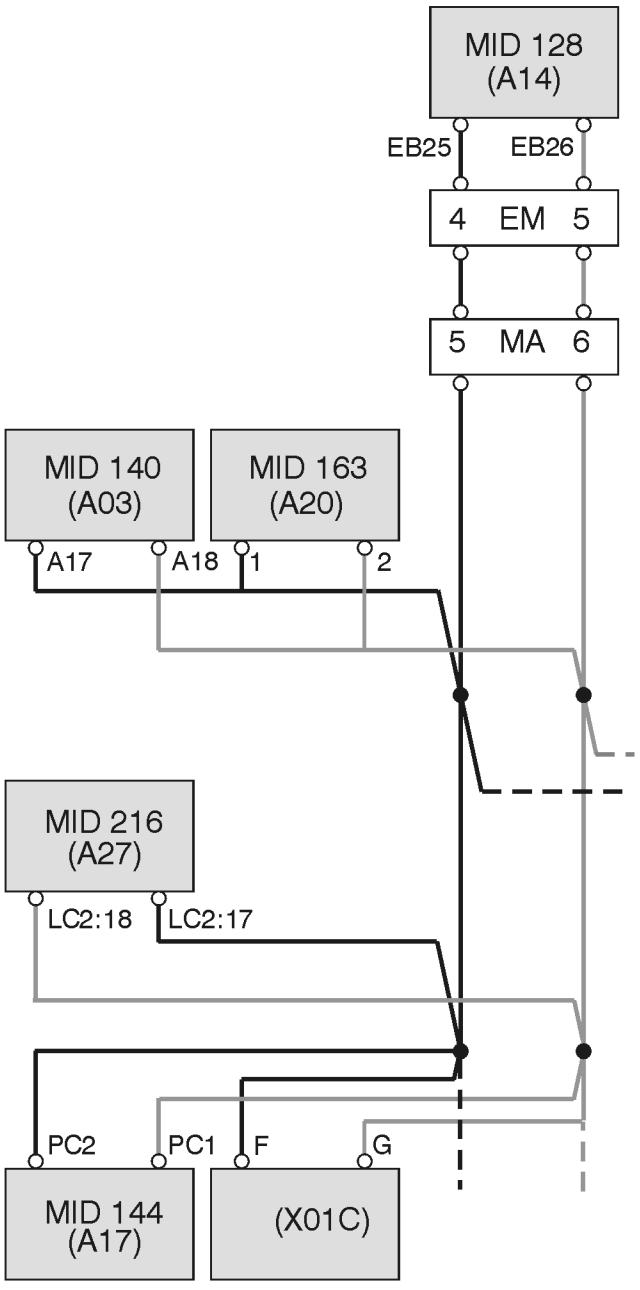
MID 128 PID 224 FMI 12 in combination with **additional fault codes from MID 128** (PID 49, 84, PID 85, PID 91, PID 228).

1 Check link J1587/J1708 between connector block MA (cable feed through, cab) and engine control unit
or
between connector block MA and connector block CLF (electrical box centre console).
See also, fault tracing for the other fault codes from MID 128 (PID 49, 84, PID 85, PID 91, PID 228) to localize the fault.

MID 128 PID 228 Road speed sensor calibration



T2012695



T2021099

General information

Component: (A14) Engine control unit

Fault code

FMI 11

Road speed sensor calibration message missing on information link (SAE J1587/J1708).

Condition for fault code:

- PID 228 message is not available on the information link (SAE J1587/J1708).

Possible cause:

- Error in information link (SAE J1708/J1587).
- Error in vehicle control unit.

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:

- Yellow lamp lights.

Appropriate check:

- See “Fault tracing of fault code combinations” page 108.

Fault tracing of fault code combinations

To simplify fault tracing, check other fault codes to get an **indication of where the fault is**.

Fault code combination A

MID 128 PID 228 FMI 11 in combination with **additional fault codes from MID 128** (PID 49, 84, PID 85, PID 91, PID 224).

1 Check link J1587/J1708 between connector block MA (cable feed through, cab) and engine control unit
or
between connector block MA and connector block CLF (electrical box centre console).
See also, fault tracing for the other fault codes from MID 128 (PID 49, 84, PID 85, PID 91, PID 224) to localize the fault.

MID 128 PID 245 Total vehicle distance

Fault code

FMI 9

Abnormal update rate.

Condition for fault code:
- PID 245 message is not available on the information link (SAE J1587/J1708).

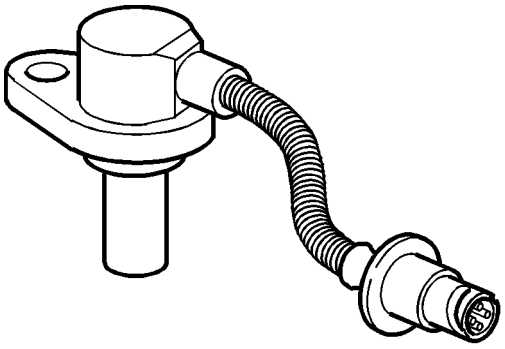
Possible cause:
- Fault in the instrument cluster.
- Fault in information link (SAE J1587/J1708).

Reaction from the control unit:
- Fault code is set.

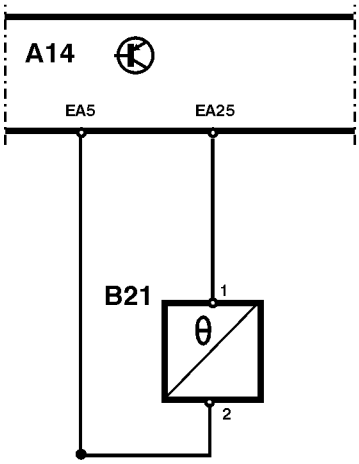
Noticeable external symptoms:
- None.

Appropriate check:
- **Active FMI**
  Check if the fault code can be rectified. Use VCADS Pro-test:“17034-3 Vehicle information, test”
- **Inactive FMI**
  This fault code cannot be read off if the information link is faulty, since it is not stored.

MID 128 PPID 119 High coolant temperature



T2012688



T2018693

General information

Component: (B21) Coolant temperature, sensor

Fault code

FMI 0

Temperature too high.

Condition for fault code:

- The coolant temperature exceeds 101 °C.

Possible cause:

- Low coolant level.
- Fault in thermostat.
- Clogged radiator (internally/externally).
- Clogged intercooler (on the outside).
- Poor through-flow in the cooling system.
- Worn coolant pump (low pump pressure).
- Fault in pressure cap, expansion vessel.
- Fault in sensor.
- Fault in engine fan.

Reaction from the control unit:

- Fault code is set.
- Red light requested.
- Power reduction.

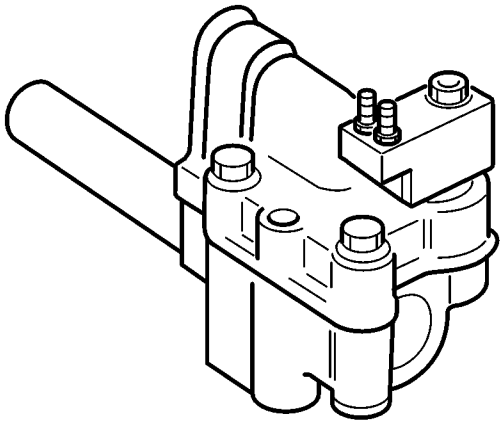
Noticeable external symptoms:

- Red lamp lights.
- Low power output.

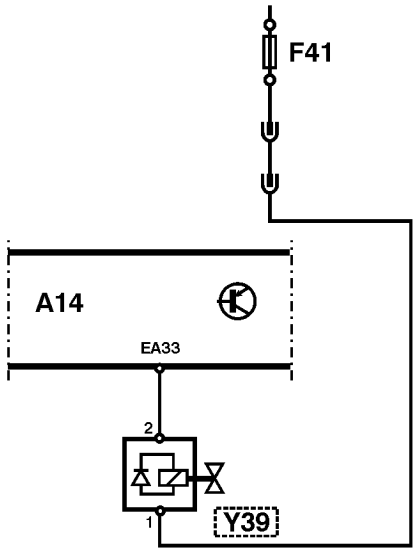
Appropriate action:

- **Active FMI**
  See service information “coolant temperature, fault tracing” (Check list L), Diagnosis, group 2619.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

MID 128 PPID 122 Engine compression brake



T2018926



T2020934

General information

Component: (Y39) VCB solenoid valve

Fault code

FMI 1 (Information code)

Oil temperature is too low.

Condition for information code:
- Output activated.
- Oil temperature below 55 °C (type 1) or 60 °C (type 2).

Possible cause:
- Oil temperature below 55 °C (type 1) or 60 °C (type 2).
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Blue lamp requested

Noticeable external symptoms:
- Blue lamp lit.
- Reduced engine braking because the VCB cannot be activated.

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- Output activated.
- Short circuit to battery voltage on EA33.

Possible cause:
- Short circuit to battery voltage between the VCB solenoid valve and engine control unit.
- Short circuit in VCB solenoid valve.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The output is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Reduced engine braking because the VCB cannot be activated.

Appropriate check:
- **Active FMI**
  28468–3 “MID 128 PPID 122 Engine compression brake, check” page 113.
- **Inactive FMI**
  This FMI is only active when the VCB solenoid valve is activated. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- Output not activated.
- Short circuit to ground on EA33.

Possible cause:
- Short circuit to ground between the VCB solenoid valve and engine control unit.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The output is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- VCB is on all the time.
- Engine stops

Appropriate check:
- **Active FMI**
  28468–3 “MID 128 PPID 122 Engine compression brake, check” page 113.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Circuit interruption.

Condition for fault code:
- Output not activated.
- Break in the VCB circuit.

Possible cause:
- Break between the VCB solenoid valve and engine control unit.
- Break in the supply cable to VCB solenoid valve.
- Short circuit in VCB solenoid valve.
- Blown fuse for supply to VCB solenoid valve.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The output is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Reduced engine braking because the VCB cannot be activated.

Appropriate check:
- **Active FMI**
  28468–3 “MID 128 PPID 122 Engine compression brake, check” page 113.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28468-3
MID 128 PPID 122 Engine compression brake, check

Other special equipment: 9812519

Fault code information, see “MID 128 PPID 122 Engine compression brake” page 111

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

“Ground cable”/Control cable:

1

Conditions:
- Component cables disconnected.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
Ground [1]	R ≈ 220 kΩ

[1] Measure both cables to find which is the ground cable.

9812519

Supply cable:

2

Conditions:
- Component cables disconnected.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
Supply cable - Ground [1]	$U \approx U_{bat}$

[1] Measure both cables to find which is the supply cable.

9812519

Actuator compression brake, VCB

3
Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component cables disconnected.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

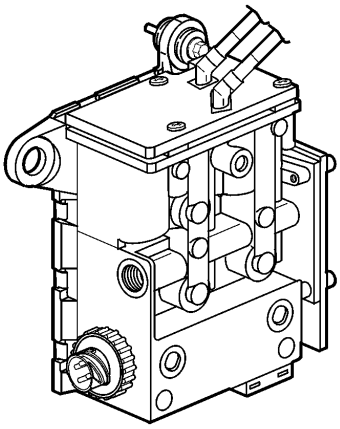
Measurement points	Expected value
1 - 2	$R \approx 95\ \Omega$
1 - Ground	Open circuit
2 - Ground	Open circuit

9812519

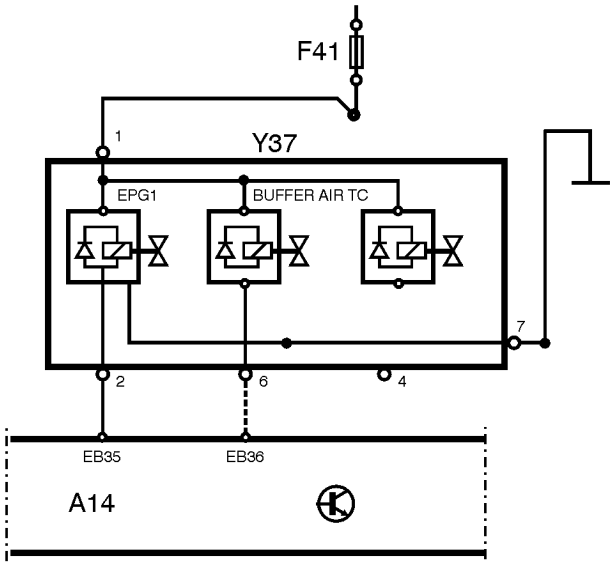
Function check

1
Perform a function check after any remedial actions. See service information “Engine brake, fault tracing” (Check list O), Diagnosis, group 2531.

MID 128 PPID 123 Buffer air TC



T2019349



T2018698

General information

Buffer air to TC unit.

Component: (Y37) Solenoid valve, buffer air

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- Output activated.
- Short circuit to battery voltage on EB36.

Possible cause:
- Short circuit to battery voltage between the VCB solenoid valve and engine control unit.
- Short circuit in solenoid valve.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- Outputs EB35 and EB36 are closed.

Noticeable external symptoms:
- Yellow lamp lights.
- The TC buffer air does not work when the engine is idling.
- Blue smoke when idling.

Appropriate check:
- **Active FMI**
  28431–3 “MID 128 PPID 123 Buffer air TC, check” page 117.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- Output activated.
- Short circuit to earth on EB36.

Possible cause:
- Short circuit to ground between the VCB solenoid valve and engine control unit.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- No buffer air.

Appropriate check:
- **Active FMI**
  28431–3 “MID 128 PPID 123 Buffer air TC, check” page 117.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Break.

Condition for fault code:
- Output activated.
- Circuit interruption.

Possible cause:
- Blown fuse for supply to buffer air.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- Outputs EB35 and EB36 are closed.

Noticeable external symptoms:
- Yellow lamp lights.
- The TC buffer air does not work when the engine is idling.
- Blue smoke when idling.

Appropriate check:
- **Active FMI**
  28431–3 “MID 128 PPID 123 Buffer air TC, check” page 117.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28431-3
MID 128 PPID 123 Buffer air TC, check

Special tools: 9998567
Other special equipment: 9812519
Fault code information, see “MID 128 PPID 123 Buffer air TC” page 115

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

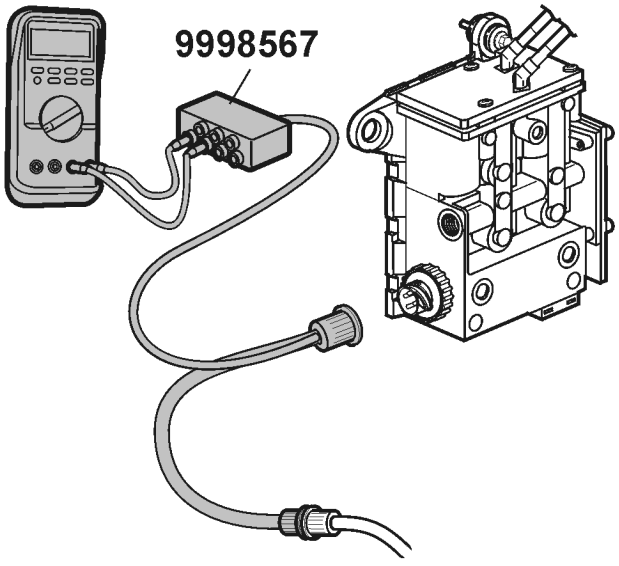
Test measurements

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

“Ground cable”/Control cable:

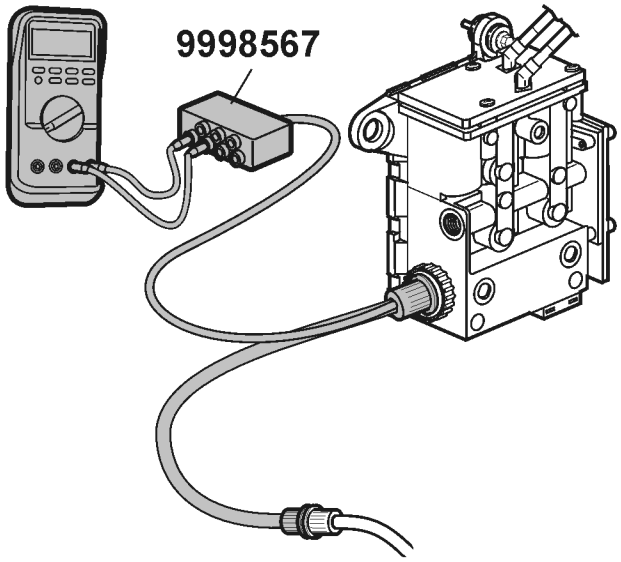
1
Conditions:
- Component connector removed.
- 7-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement toward the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
6 - Ground	R ≈ 200 kΩ



T2020844

9998567
9812519



T2020842

Supply cable:

2

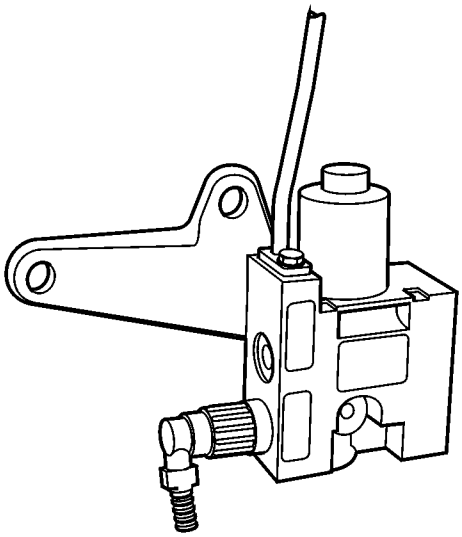
Conditions:

- 7-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

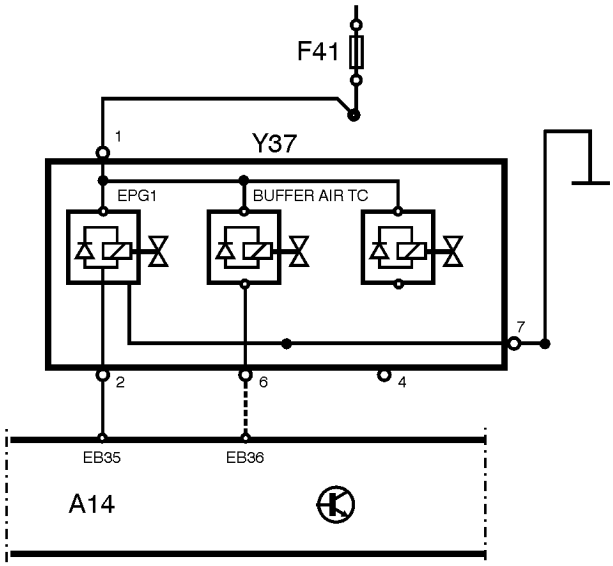
Measurement points	Expected value
1 - Ground	$U \approx U_{bat}$

9998567
9812519

MID 128 PPID 124 Exhaust pressure governor



T2018699



T2018698

General information

This function offers step-less exhaust braking and a heat retention function.

Component: (Y37) Solenoid valve, Exhaust pressure governor

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- Output activated.
- Short circuit to battery voltage on EB35.

Possible cause:
- Short circuit to battery voltage between solenoid valve and engine control unit.
- Short circuit in solenoid valve.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- Output EB35 is closed.

Noticeable external symptoms:
- Yellow lamp lights.
- Engine brake out of order
- Heat retention does not function.

Appropriate check:
- **Active FMI**
  28471–3 “MID 128 PPID 124 Exhaust pressure governor 1, check” page 121.
- **Inactive FMI**
  This FMI is only active when the PWM valve is activated. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- Output not activated.
- Short circuit to earth on EB35.

Possible cause:
- Short circuit to earth between solenoid valve and engine control unit.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Exhaust pressure governor constantly activated.
- Low power output.
- Extreme smoke production (black).

Appropriate check:
- **Active FMI**
  28471–3 “MID 128 PPID 124 Exhaust pressure governor 1, check” page 121.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Break.

Condition for fault code:
- Output activated.
- Break in the exhaust pressure governor circuit.

Possible cause:
- Break between solenoid valve and engine control unit.
- Break in supply cable to solenoid valve.
- Blown fuse for supply to exhaust pressure governor.
- Break in the solenoid valve.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The following outputs are closed:
  EB35 and EA33

Noticeable external symptoms:
- Yellow lamp lights.
- Engine brake out of order

Appropriate check:
- **Active FMI**
  28471–3 “MID 128 PPID 124 Exhaust pressure governor 1, check” page 121.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28471-3
MID 128 PPID 124 Exhaust pressure governor 1, check

Special tools: 9998567
Other special equipment: 9812519

Fault code information, see “MID 128 PPID 124 Exhaust pressure governor” page 119

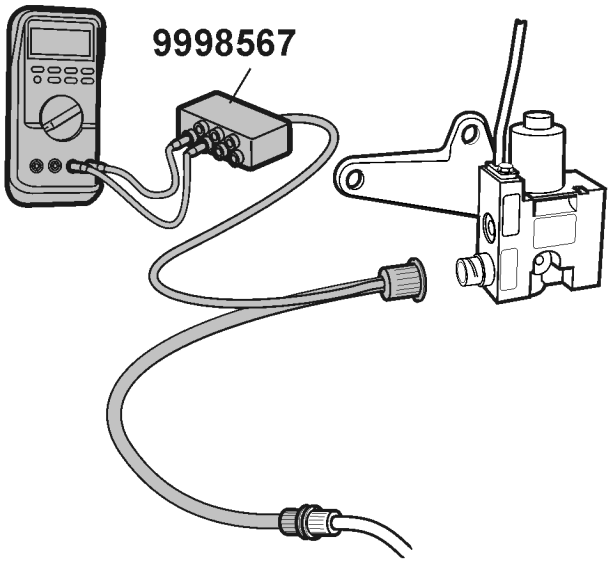
NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

“Ground cable”/Control cable:

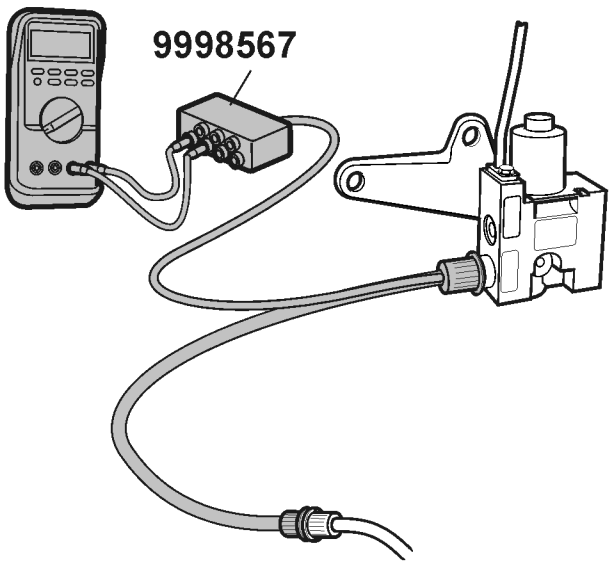


T2020846

1
Conditions:
- Component connector removed.
- 7-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
2 - Ground	R ≈ 200 kΩ

9998567
9812519



T2020847

Supply cable:

2
Conditions:
- 7-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

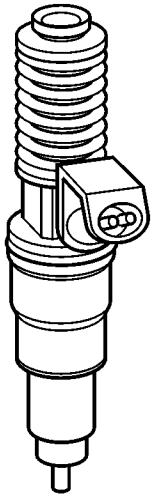
Measurement points	Expected value
1 - Ground	$U \approx U_{bat}$

9998567
9812519

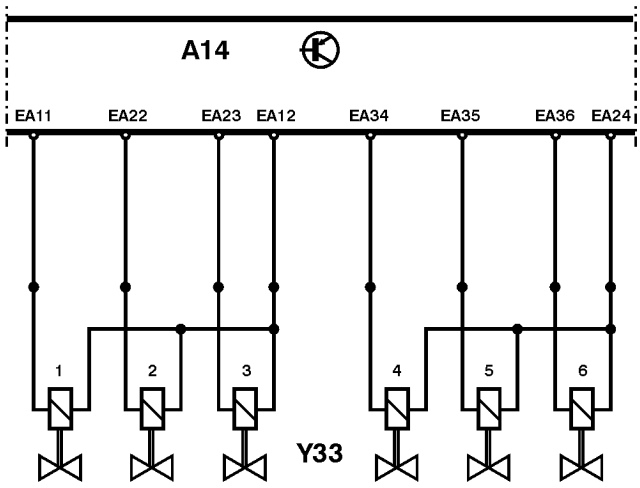
Function check

1
Perform a function check with test 25340-3 “Start and pre-heating function, test” and test 25336-3 “Exhaust brake function, test” in VCADS Pro, after any remedial action.

MID 128 SID 1/2/3/4/5/6 Unit injector



T2018700



T2018701

General information

Fault code	Help
SID 1	Injector 1
SID 2	Injector 2
SID 3	Injector 3
SID 4	Injector 4
SID 5	Injector 5
SID 6	Injector 6

Component: (Y33) Unit injector

Fault code

FMI 2

Short circuit to battery voltage (injector's high voltage side).

Condition for fault code:
- Injector activated.
- Short circuit to battery voltage on EA12 or EA24 (high voltage side of each injector bank, see electrical schema).

Possible cause:
- Short circuit to battery voltage at higher voltage, injector cabling.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The particular injector bank is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Low power output.
- Uneven operation.
- Abnormal noise.
- 3 cylinder operation.

Appropriate check:
- **Active FMI**
  28472–3 "MID 128 SID 1/2/3/4/5/6 Unit injector, check" page 126.
- **Inactive FMI**
  VCADS Pro: 17004–3 "Fault codes, test mode"
  If the fault code becomes active during test "Fault codes, test mode", fault trace according to "Active FMI"
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 3

Short circuit to battery voltage or short-circuited injector (injector's low voltage side).

Condition for fault code:
- Injector activated.
- Short circuit to battery voltage on the pin on each injector's low voltage side (EA11, EA22, EA23, EA34, EA35, EA36).

Possible cause:
- Short circuit between high and low voltage sides.
- Short circuit to battery voltage at low voltage, injector cabling.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The particular injector or the whole of the affected injector bank is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Low power output.
- Uneven operation.
- Abnormal noise.
- 3 or 5 cylinder operation.

Appropriate check:
- **Active FMI**
  28472–3 "MID 128 SID 1/2/3/4/5/6 Unit injector, check" page 126.
- **Inactive FMI**
  VCADS Pro: 17004–3 "Fault codes, test mode"
  *If the fault code becomes active during test "Fault codes, test mode", fault trace according to "Active FMI" If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground (injector's low or high voltage side).

Condition for fault code:
- Injector activated.
- Short circuit to earth on the pin on each injector's low (EA11, EA22, EA23, EA34, EA35, EA36) or high voltage side (EA12, EA24).

Possible cause:
- Short circuit to earth in the cabling for each injector's low or high voltage side.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The particular injector bank is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Low power output.
- Uneven operation.
- Abnormal noise.
- 3 cylinder operation.

Appropriate check:
- **Active FMI**
  28472–3 "MID 128 SID 1/2/3/4/5/6 Unit injector, check" page 126.
- **Inactive FMI**
  VCADS Pro: 17004–3 "Fault codes, test mode"
  *If the fault code becomes active during test "Fault codes, test mode", fault trace according to "Active FMI" If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Break in injector circuit.

Condition for fault code:
- Injector activated.
- Break in injector circuit.

Possible cause:
- Open circuit in cable on low or high voltage side. If 3 fault codes have been set (one bank), the open circuit will be on the high-voltage side. If there is only one fault code, the open circuit will be on the low voltage side of the particular injector.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- One or three injectors are switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Low power output.
- Uneven operation.
- Abnormal noise.
- 3 or 5 cylinder operation.

Appropriate check:
- **Active FMI**
  28472–3 "MID 128 SID 1/2/3/4/5/6 Unit injector, check" page 126.
- **Inactive FMI**
  VCADS Pro: 17004–3 "Fault codes, test mode"
  *If the fault code becomes active during test "Fault codes, test mode", fault trace according to "Active FMI" If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 7

The mechanical system does not respond in the correct way

Condition for fault code:
- Injector activated.
- Too high cylinder balancing data.

Possible cause:
- Injector fault.
- Poor compression.
- Uneven engine load when using PTO.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The particular injector is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Low power output.
- Uneven operation.
- Abnormal noise.

Appropriate action:
- **Active FMI**
  See service information “Cylinder balancing, fault tracing” (Check list F), Diagnosis, group 2111.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 11

Unidentifiable fault

Condition for fault code:
- Injector activated.

Possible cause:
- Intermittent faults.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The particular injector or the whole injector bank is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Low power output.
- Uneven operation.
- Abnormal noise.
- 3 or 5 cylinder operation.

Appropriate check:

Condition for fault code:
- Injector activated.
- Too high cylinder balancing data.

Possible cause:
- Injector fault.
- Poor compression.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The particular injector is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Low power output.
- Uneven operation.
- Abnormal noise.

Appropriate action:
- **Active FMI**
  See service information “Cylinder balancing, fault tracing” (Check list F), Diagnostics, group 2111.
  28472–3 “MID 128 SID 1/2/3/4/5/6 Unit injector, check” page 126.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28472-3
MID 128 SID 1/2/3/4/5/6 Unit injector, check

Special tools: 9998505, 9998699
Other special equipment: 9812519

Fault code information, see “MID 128 SID 1/2/3/4/5/6 Unit injector” page 123

NOTE!

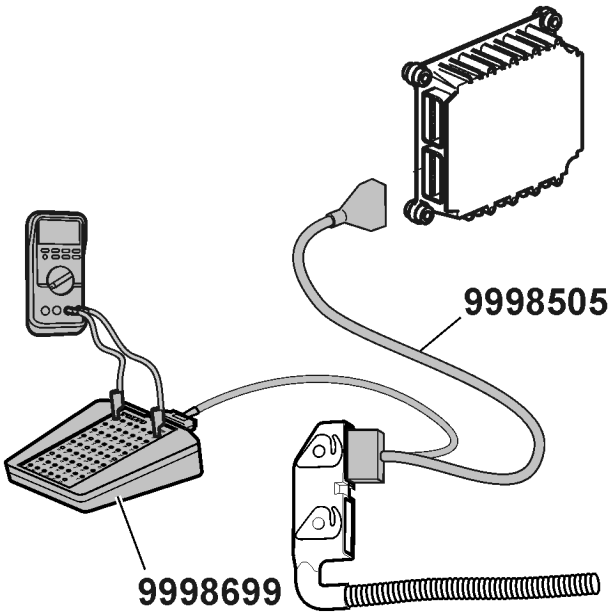
Note that small resistances are difficult to measure. Use the given value as a guide when fault tracing injector circuits.

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.



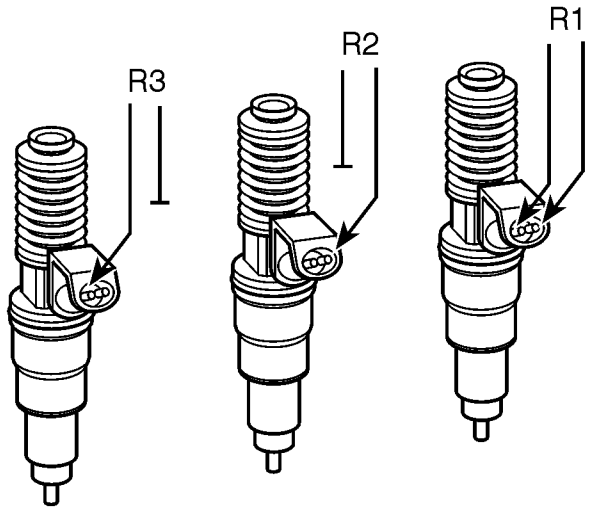
T2020835

Check of wiring

1
Conditions:
- Break-out box with adapter connected to cable harness connector block (EA).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement on component.
- Engine control unit **not** connected.

Measurement points	Expected value
EA11 - EA12	R ≈ 4±0.1 Ω (20 °C) R ≈ 5.6±0.15 Ω (120 °C)
EA22 - EA12	R ≈ 4±0.1 Ω (20 °C) R ≈ 5.6±0.15 Ω (120 °C)
EA23 - EA12	R ≈ 4±0.1 Ω (20 °C) R ≈ 5.6±0.15 Ω (120 °C)
EA34 - EA24	R ≈ 4±0.1 Ω (20 °C) R ≈ 5.6±0.15 Ω (120 °C)
EA35 - EA24	R ≈ 4±0.1 Ω (20 °C) R ≈ 5.6±0.15 Ω (120 °C)
EA36 - EA24	R ≈ 4±0.1 Ω (20 °C) R ≈ 5.6±0.15 Ω (120 °C)
EA11 - Ground	Open circuit
EA22 - Ground	Open circuit
EA23 - Ground	Open circuit
EA34 - Ground	Open circuit
EA35 - Ground	Open circuit
EA36 - Ground	Open circuit

9998505, 9998699
9812519



T2018702

Injectors

2

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

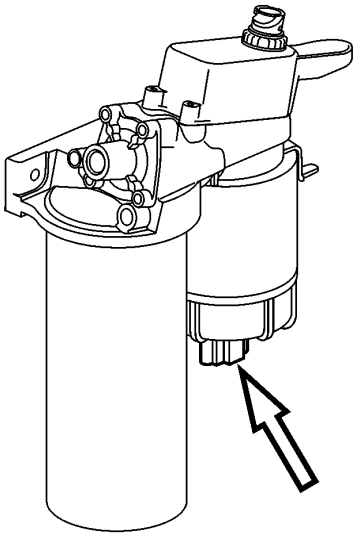
Conditions:

- Component cables disconnected.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

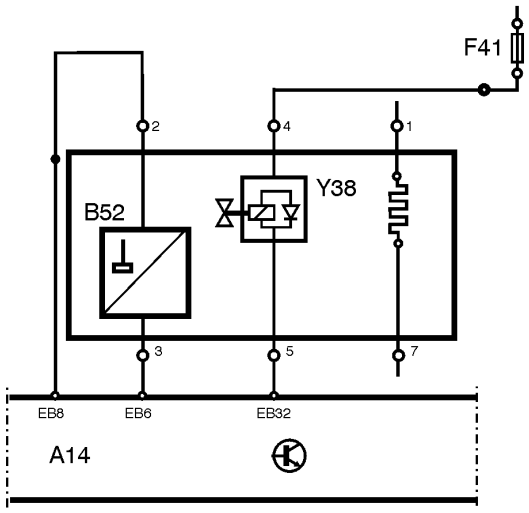
Measurement points	Expected value
R1	R ≈ 4±0.1 Ω (20 °C) R ≈ 5.6±0.15 Ω (120 °C)
R2	Open circuit
R3	Open circuit

9812519

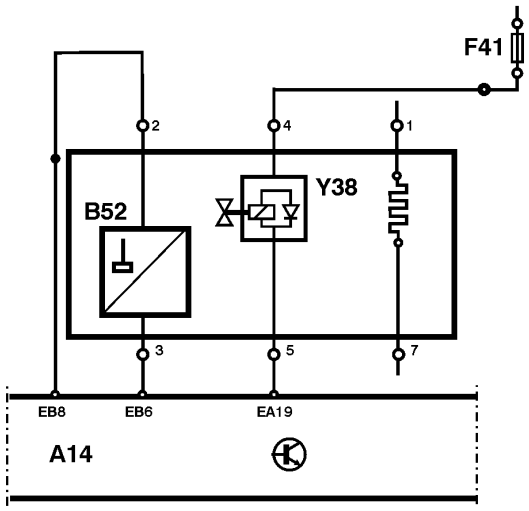
MID 128 SID 18 Drain valve, water separator



Types 1/2



Type 1 with electric fuel pump



Type 2 with manual hand pump

General information

Component: (A45) Solenoid valve, draining water separator

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- Output activated.
- Short circuit to battery voltage on EB32 (type 1) or EA19 (type 2).

Possible cause:
- Short circuit to battery voltage on wiring between the VCB solenoid valve and engine control unit.
- Internal short circuit in the solenoid valve.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The output is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Solenoid valve is switched off.
- Water drainage not possible.

Appropriate check:
- **Active FMI**
  28427–2 “MID 128 SID 18 Drainage valve, water separator, check” page 131.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- Output closed.
- Short circuit to ground on EB32.

Possible cause:
- Short circuit to ground on wiring between the VCB solenoid valve and engine control unit.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Fuel leakage with stationary engine and key in driving position.
- Air in the fuel system.
- Low power output.
- Water drainage not possible.

Appropriate check:
- **Active FMI**
  28427–2 “MID 128 SID 18 Drainage valve, water separator, check” page 131.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Open circuit in water drainage circuit.

Condition for fault code:
- Output closed.
- Break in the water drainage circuit.

Possible cause:
- Break between solenoid valve and engine control unit.
- Break in supply cable to the water drainage valve.
- Break in solenoid valve.
- Blow fuse for drainage valve.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Solenoid valve permanently turned off.
- Water drainage not possible.

Appropriate check:
- **Active FMI**
  28427–2 “MID 128 SID 18 Drainage valve, water separator, check” page 131.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28427-3
MID 128 SID 18 Drainage valve, water separator, check

Special tools: 9998505, 9998567, 9998699
Other special equipment: 9812519

Fault code information, see “MID 128 SID 18 Drain valve, water separator” page 129

NOTE!

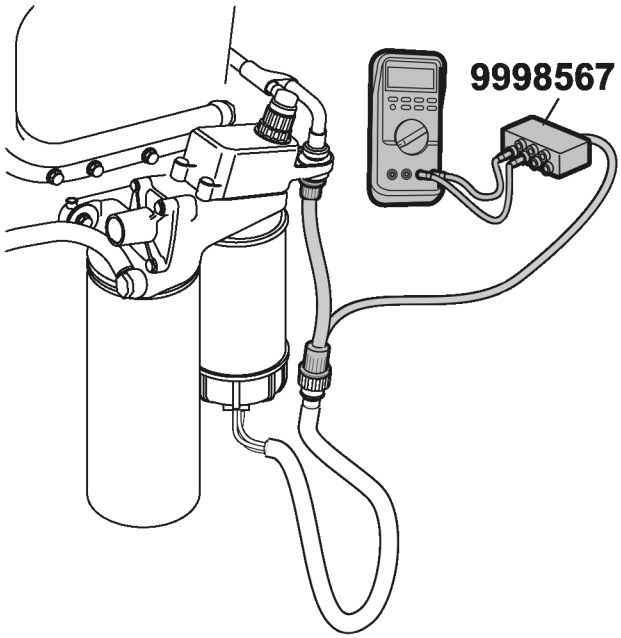
- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

Supply cable:

1
Check the drainage valve fuse (F41).
Note: If neither the drainage valve nor the engine brake work, the fuse is probably blown.



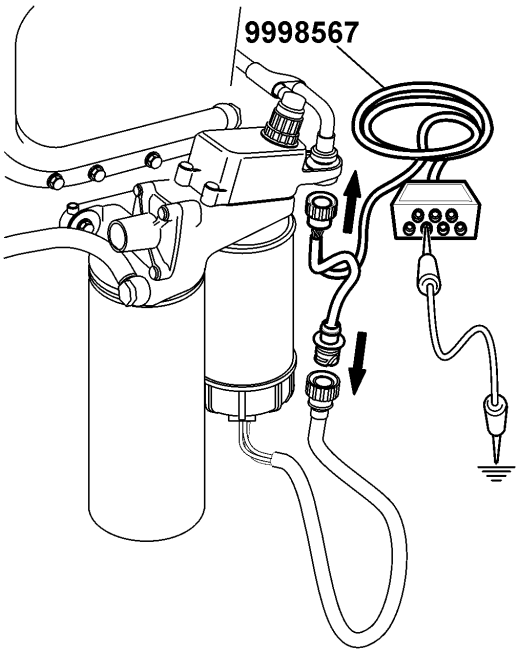
T2020692

2
Conditions:
- 7-pole adapter connected **between** cable harness connector block and component connector block.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
4 - Ground	$U \approx U_{bat}$

If the expected value is not received, then the fault is probably in the cable between the drainage valve and the fuse.

9998567
9812519



C2002726

Control cable

3
Put a receptacle under the water separator.
Check that the drainage valve opens when output 3 in the adapter break-out box is grounded.

"Measurement points"	"Expected value"
3 - Ground	Drainage valve opens

If the valve opens and fuel starts to run out from the water separator filter connector, but this does not occur when the drain button is pressed (and all conditions for the function are fulfilled), the fault lies in either:

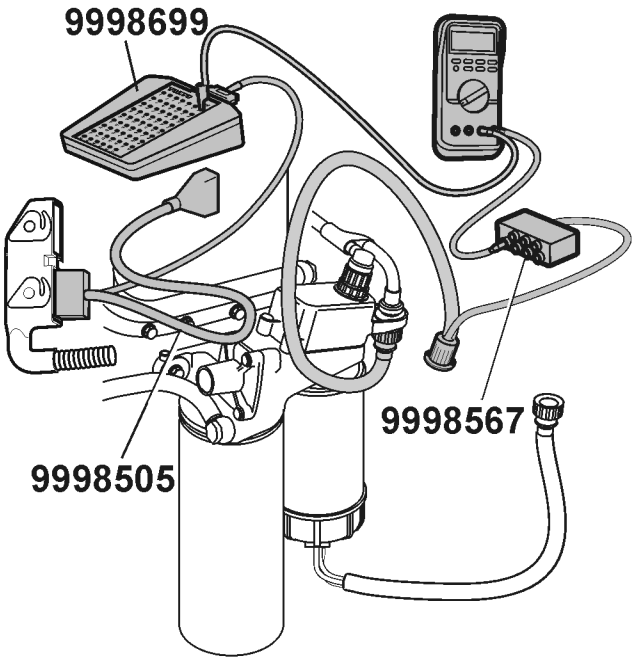
- The wiring between the drain valve and the engine control unit. This is checked in step **5**.

or
- Switch for water separation/priming. This is checked in "Functional check, step **2**".

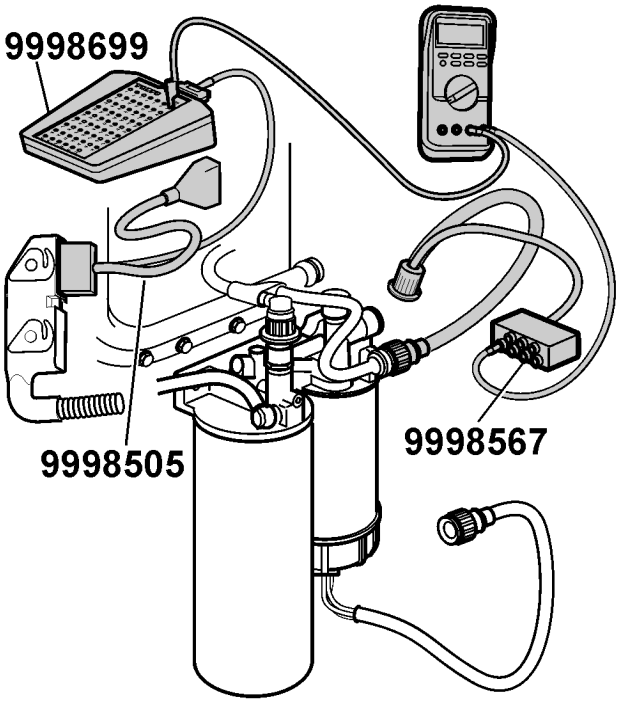
or
- "Water in fuel" indicator. If the switch does not activate water separation. This is checked in "Functional check, step **2**".

9998567

4



Type 1 with electric fuel pump



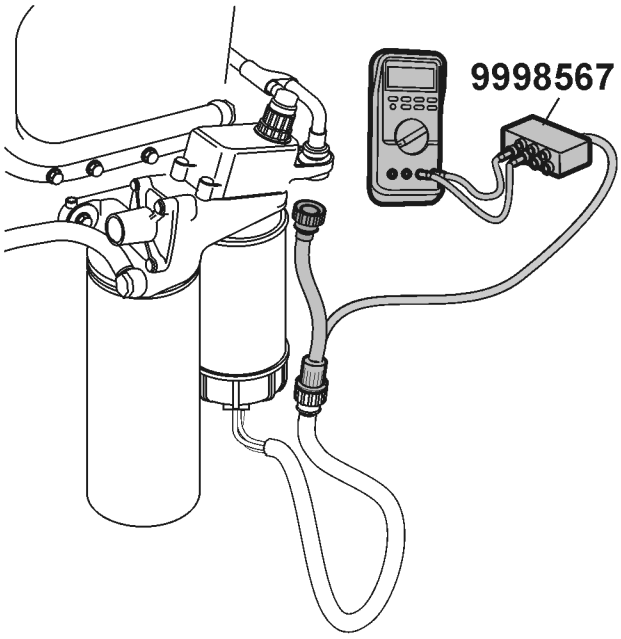
Type 2 with manual hand pump

Conditions:
- 7-pole adapter connected to the cable harness connector block (towards engine control unit) **and** measurement box with adapter connected to cable harness connector block EB (type 1) or EA (type 2).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.

Measurement points	Expected value
Type 1 with electric fuel pump 5 - EB32 Type 2 with manual hand pump 5 - EA19	R ≈ 0 Ω

If a break or other unexpected value is noted, then the fault is probably in the connection between the drainage valve and the engine control unit.

9998505, 9998567, 9998699
9812519



T2020818

Solenoid valve

5
Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- 7-pole adapter connected to component connector block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

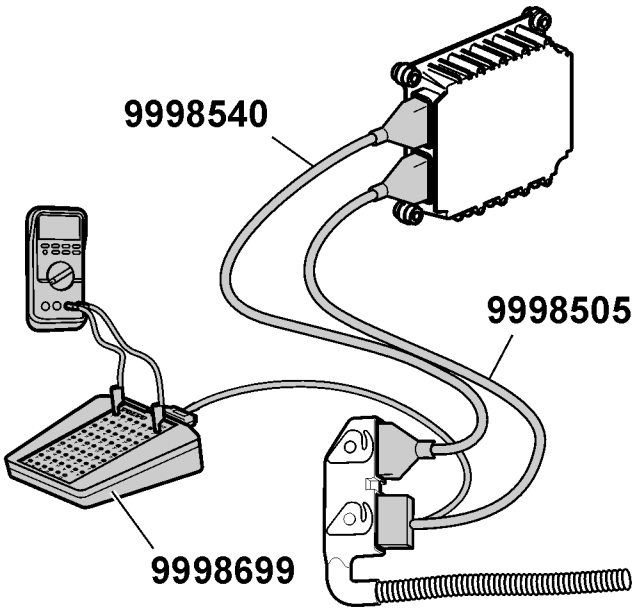
Measurement points	Expected value
4 - 5	5 – 60 Ω

If the expected value is not found, the fault is probably in the drainage valve.

9998567
9812519

6
Check

Function check



T2020695

1
Perform a function check after any remedial actions.

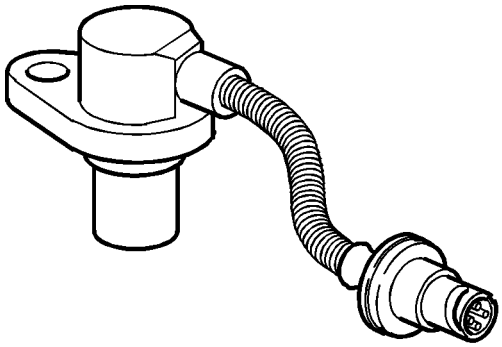
Conditions:
- Measuring box with adapter connected **between** engine control unit and cable harness.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
Type 1 with electric fuel pump EB32 - EB9 Type 2 with manual hand pump: EA19 - EB9	$U \approx U_{bat}$ (not active) U ≈ 0 V (active)

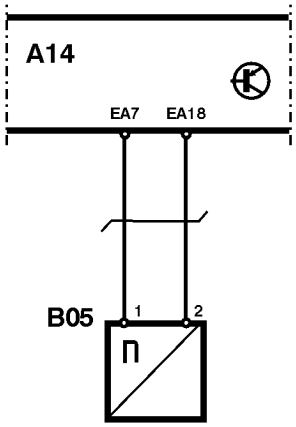
9998505 , 9998699
9812519

2
Check the switch for water separator/purging and the “water in fuel” indicator. See sections “Switch fuel pump/drainage valve, check” and “Water in fuel indicator, check” respectively, in “Drainage of water in fuel, fault tracing” (Check list S), Diagnosis, group 2331.

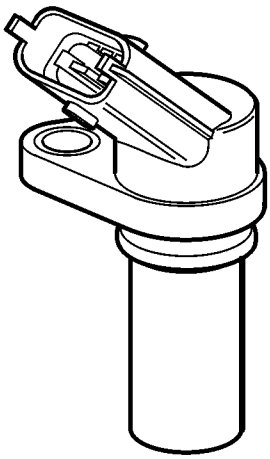
MID 128 SID 21 Engine position timing sensor



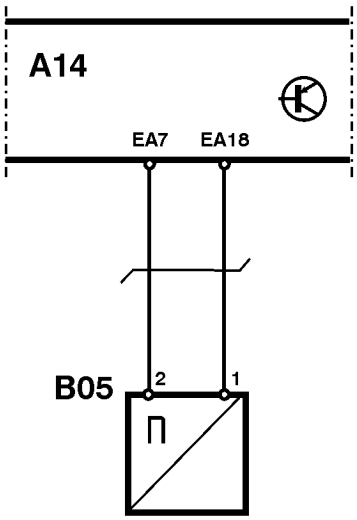
Type 1



Type 1



Type 2



Type 2

General information

Speed, camshaft.

Component: (B05) Sensor, engine speed

Fault code

FMI 3

Short circuit to battery voltage or permanent loss of signal.

Condition for fault code:

- Camshaft speed signal not available.

Possible cause:

- Short circuit to battery voltage, positive cable.
- Short circuit to battery voltage, negative cable.
- Short circuit to earth, positive cable.
- Break in positive cable.
- Break in negative cable.
- An incorrectly fitted sensor (incorrect distance to toothed wheel).
- Reversed polarity on the sensor.
- Fault in sensor.
- Damaged sensor wheel.

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Difficult to start at next start (no symptom about the fault code is set when the engine is running).

Appropriate check:
- **Active FMI**
  28432–3 “MID 128 SID 21 Engine position timing sensor, check” page 137.

Appropriate action:
- See service information “Camshaft and flywheel signals, fault tracing” (Check list H), Diagnosis, group 2846.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 8

Abnormal frequency.

Condition for fault code:
- The control unit detects extra pulses on the engine speed signal.

Possible cause:
- Electrical interference in the engine speed signal.
- Poor insulation or faulty cable harness.
- An incorrectly fitted sensor (incorrect distance to toothed wheel).
- Fault in sensor.
- Damaged sensor wheel.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Difficult to start at next start (no symptom about the fault code is set when the engine is running).

Appropriate action:
- **Active FMI**
  See service information “Camshaft and flywheel signals, fault tracing” (Check list H). Diagnosis, group 2846.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28432-3
MID 128 SID 21 Engine position timing sensor, check

Special tools: 9990216, 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 SID 21 Engine position timing sensor” page 135

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

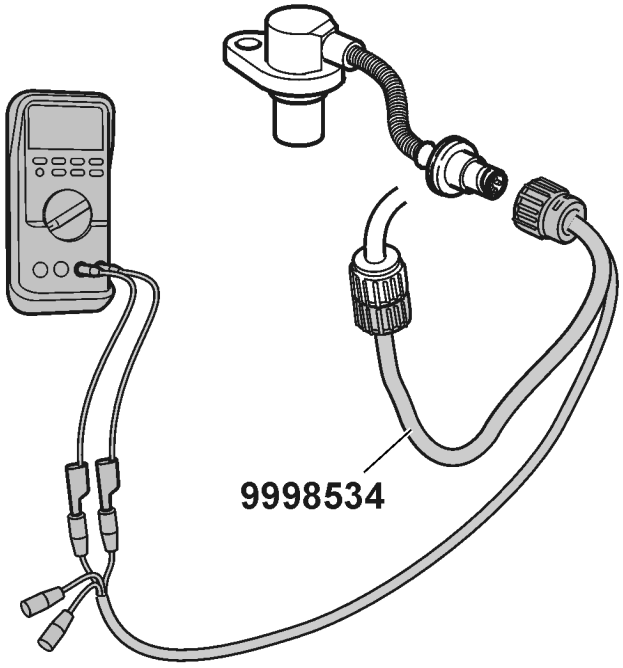
Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

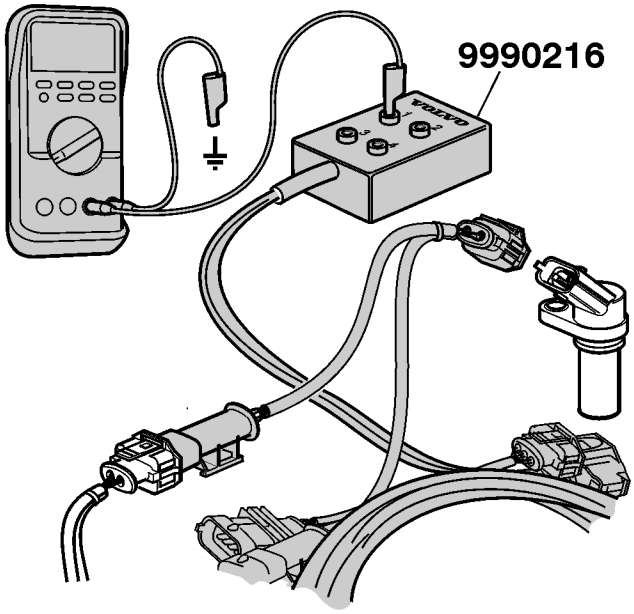
Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

Signal cable:

1



Type 1



Type 2

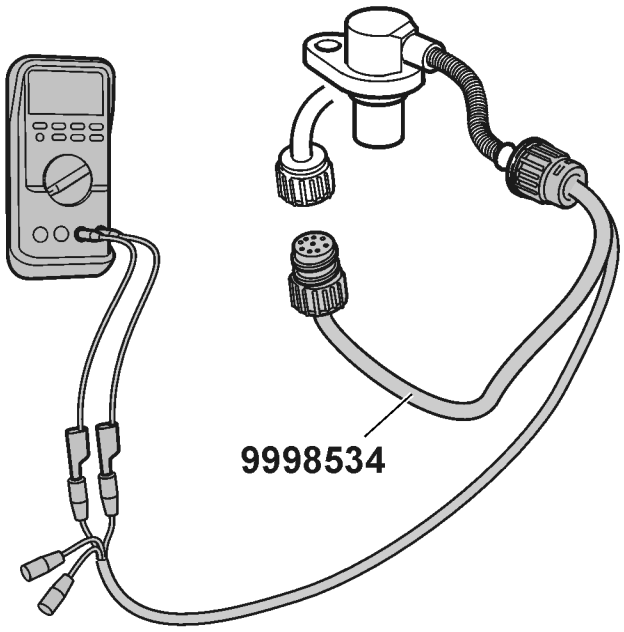
Conditions:
- Component connector removed.
- Adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
1 - Framework 2 - Framework	R ≈ 75 -110 kΩ

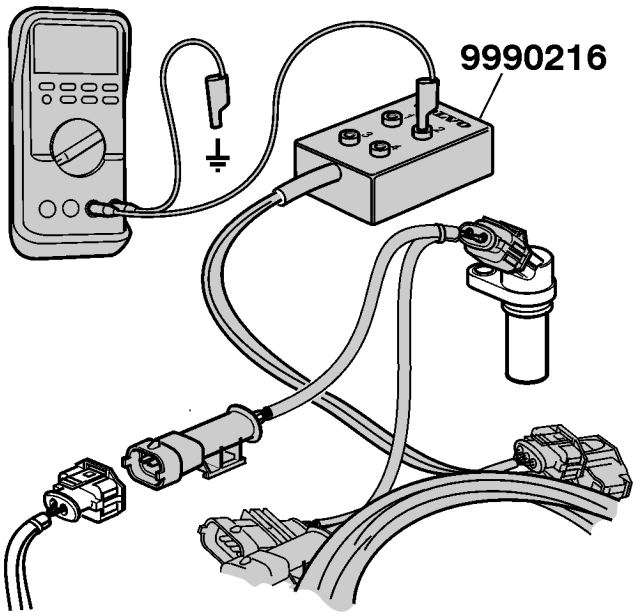
9990216, 9998534
9812519

Camshaft, sensor position

2



Type 1



Type 2

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component connector removed.
- Adaptor connected to the component connecting block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

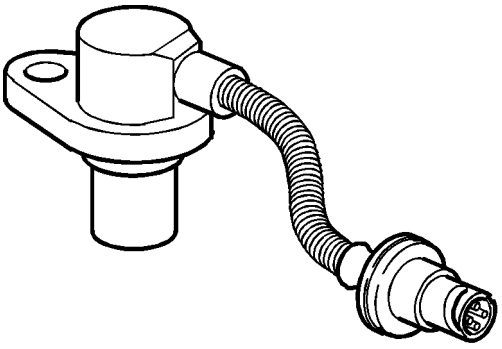
Measurement points	Expected value
1 - 2	R ≈ 775 - 945 Ω
1 - Ground	Open circuit
2 - Ground	Open circuit

9990216, 9998534
9812519

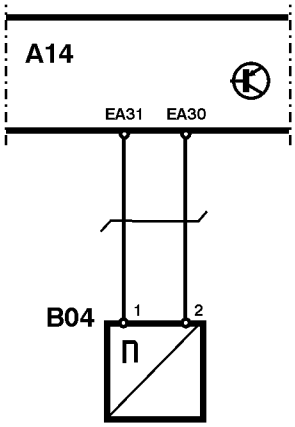
Function check

1
Perform a function check, with test 28420-3 “Flywheel and camshaft signal, test” in VCADS Pro, after any remedial action.

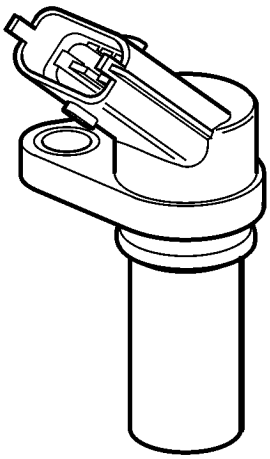
MID 128 SID 22 Engine speed sensor



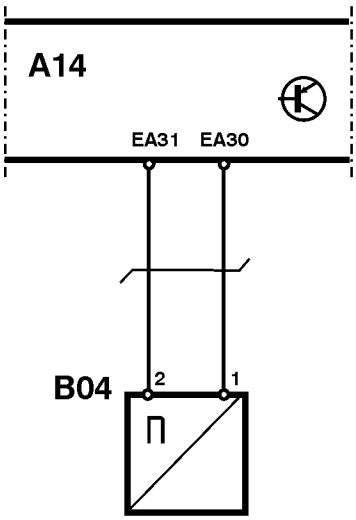
Type 1



Type 1



Type 2



Type 2

General information

Component: (B04) Sensor, engine speed, crankshaft

Fault code

FMI 2

Intermittent loss of signal or incorrect signal.

Condition for fault code:

- Incorrect engine speed signal.

Possible cause:

- Electrical interference in the engine speed signal.
- Loose contact.
- Poor insulation or faulty cable harness.
- An incorrectly fitted sensor (incorrect distance to toothed wheel).
- Fault in sensor.
- Damaged teeth on flywheel.

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.

- The engine control unit uses the camshaft signal instead. If this is also incorrect, the engine stops.

Noticeable external symptoms:
- Yellow lamp lights.
- Uneven operation.
- Engine backfires.
- The engine stops if the camshaft signal also disappears.

Appropriate action:
- **Active FMI**
  See service information “Camshaft and flywheel signals, fault tracing” (Check list H), Diagnosis, group 2846.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 3
Permanent loss of signal.

Condition for fault code:
- Signal not available.

Possible cause:
- Short circuit to battery voltage, positive cable.
- Short circuit to battery voltage, negative cable.
- Short circuit to earth, positive cable.
- Short circuit between the cables or in the sensor.
- Break in positive cable.
- Break in negative cable.
- Loose contact.
- Incorrectly fitted sensor.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit uses the camshaft signal instead. If this is also incorrect, the engine stops.

Noticeable external symptoms:
- Yellow lamp lights.
- Uneven operation.
- Engine backfires.
- The engine stops if the camshaft signal also disappears.

Appropriate action:
- **Active FMI**
  “MID 128 SID 22 Engine speed sensor, check” page 142.
  See separate service information “Camshaft and flywheel signals, fault tracing” (Check list H), Diagnosis, group 2846.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 8
Abnormal frequency.

Condition for fault code:
- The control unit detects extra pulses on the engine speed signal.

Possible cause:
- Electrical interference.
- Incorrectly fitted sensor.
- Fault in sensor.
- Damaged teeth on flywheel.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The engine control unit uses the camshaft signal instead. If this is also incorrect, the engine stops.

Noticeable external symptoms:
- Yellow lamp lights.
- Engine backfires.
- The engine stops if the camshaft signal also disappears.

Appropriate action:
- **Active FMI**
  See service information “Camshaft and flywheel signals, fault tracing” (Check list H), Diagnosis, group 2846.
- **Inactive FMI**
  This FMI is only active when the engine is running. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

MID 128 SID 22 Engine speed sensor, check

Special tools: 9990216, 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 SID 22 Engine speed sensor” page 140

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

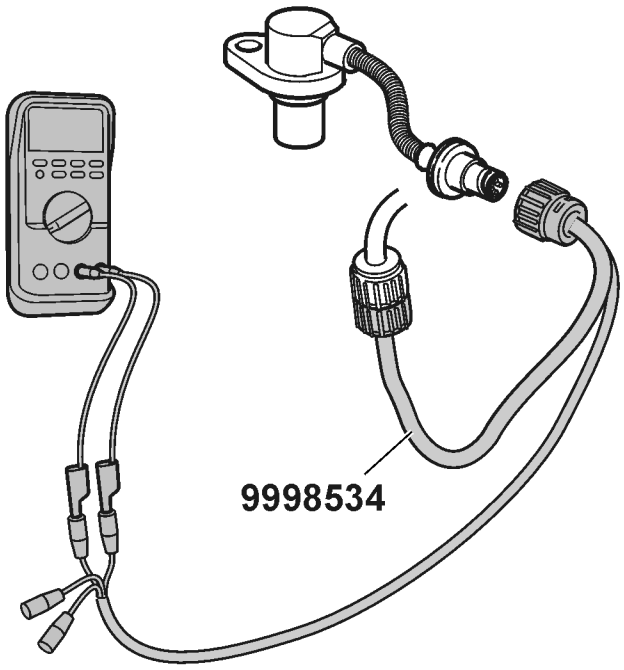
For information about the location and appearance of the sensors, see:

- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

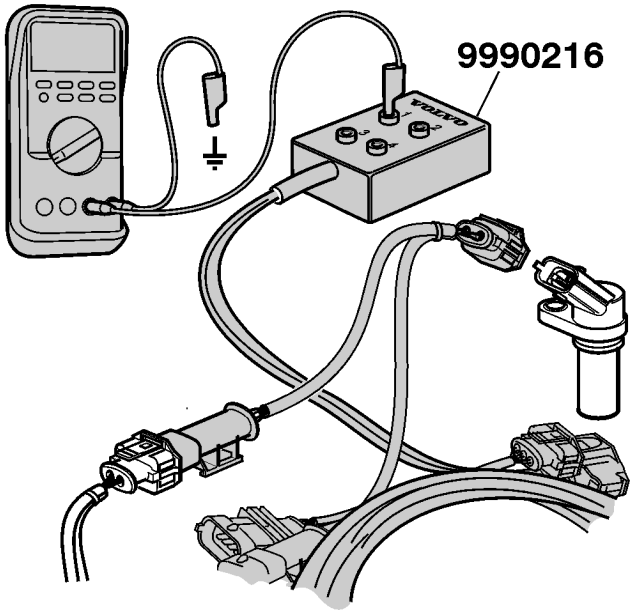
Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.

Signal cable:

1



Type 1



Type 2

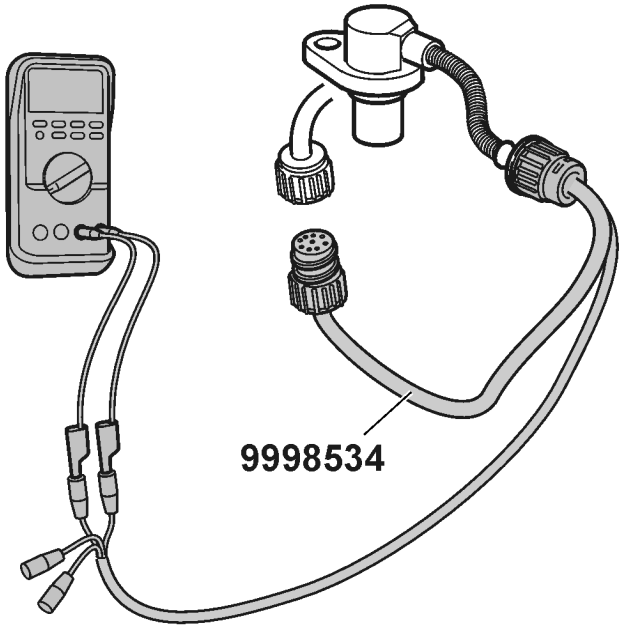
Conditions:
- Component connector removed.
- Adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement at the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
1 - Framework 2 - Framework	R ≈ 75 -110 kΩ

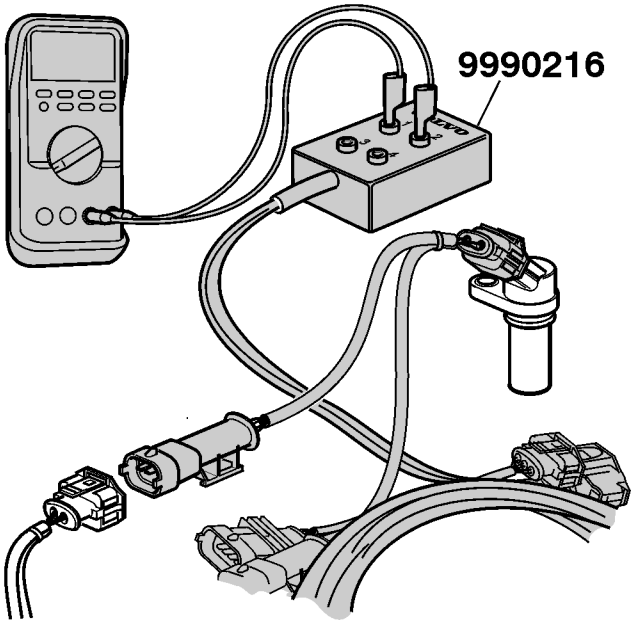
9990216, 9998534
9812519

Camshaft, sensor position

2



Type 1



Type 2

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Conditions:
- Component connector removed.
- Adaptor connected to the component connecting block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

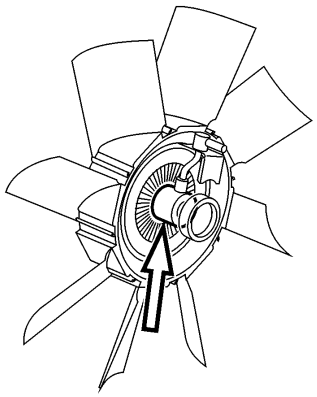
Measurement points	Expected value
1 - 2	R ≈ 775 - 945 Ω
1 - Ground	Open circuit
2 - Ground	Open circuit

9990216, 9998534
9812519

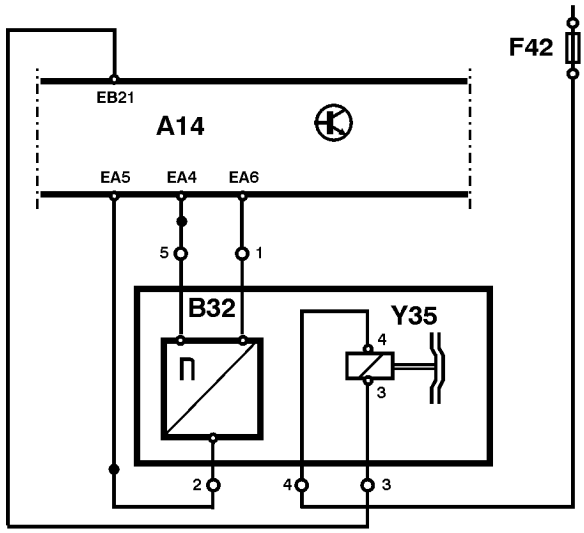
Function check

1
Perform a function check, with test 28420-3 “Flywheel and camshaft signal, test” in VCADS Pro, after any remedial action.

MID 128 SID 33 Fan control



T2018715



T2018716

General information

Component: (Y35) Fan clutch, control valve

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- Activated fan speed control.
- Voltage on EB21 exceeds 65% of battery voltage (0.65 * U_{bat}).

Possible cause:
- Short circuit to battery voltage, control cable.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- Output closed.

Noticeable external symptoms:
- Yellow lamp lights.
- Fan engaged constantly.
- High fuel consumption

Appropriate check:
- **Active FMI**
  28433–3 “MID 128 SID 33 Fan control, check” page 147.
- **Inactive FMI**
  This FMI is only active when the fan speed control is activated. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- Short circuit to ground on EB21.

Possible cause:
- Short circuit to ground, control cable.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Fan disengaged constantly.
- High coolant temperature.

Appropriate check:
- **Active FMI**
  28433–3 “MID 128 SID 33 Fan control, check” page 147.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Circuit interruption.

Condition for fault code:
- Circuit interruption.

Possible cause:
- Defective fuse.
- Break, supply cable or control cable.
- Open circuit in control valve, connection between control valve and cable harness.
- Faulty control valve.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- The fan speed control output is switched off.

Noticeable external symptoms:
- Yellow lamp lights.
- Fan engaged constantly.
- High fuel consumption

Appropriate check:
- **Active FMI**
  28433–3 “MID 128 SID 33 Fan control, check” page 147.
- **Inactive FMI**
  This FMI is only active when the fan speed control is activated. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28433-3
MID 128 SID 33 Fan control, check

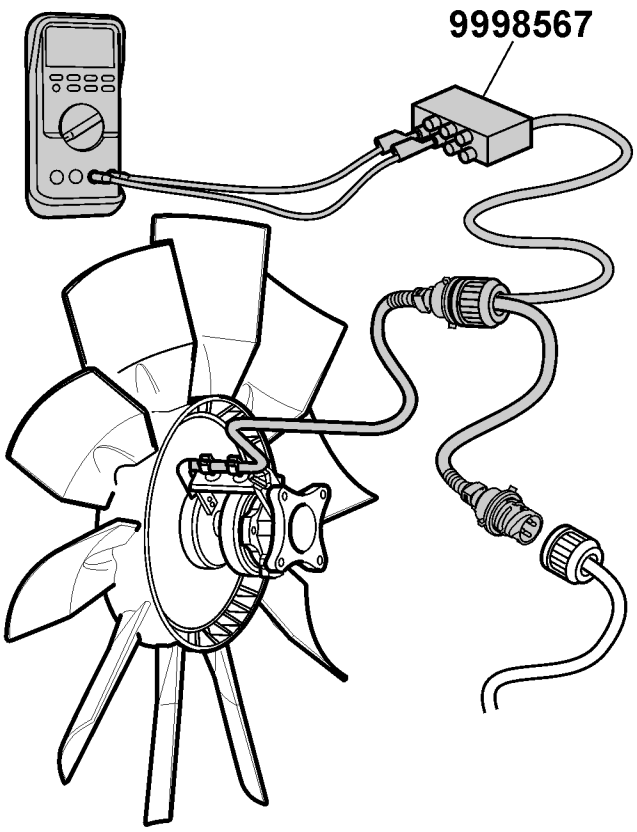
Special tools: 9998567
Other special equipment: 9812519
Fault code information, see “MID 128 SID 33 Fan control” page 145

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Checks

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.



T2019815

Fan clutch

1
Conditions:
- Component connector removed.
- 7–pole adapter connected to fan clutch relay connector block.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement to component.

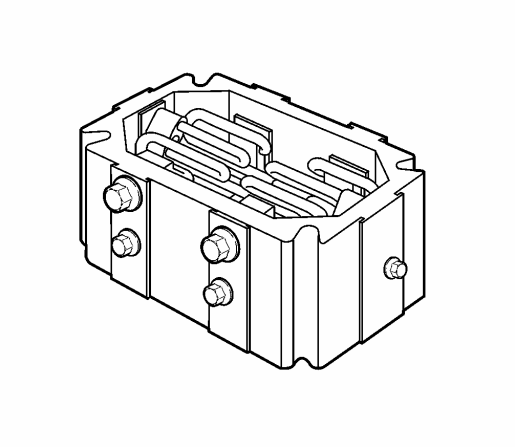
Measurement points	Nominal value
3 - 4	R ≈ 30 Ω

9998567
9812519

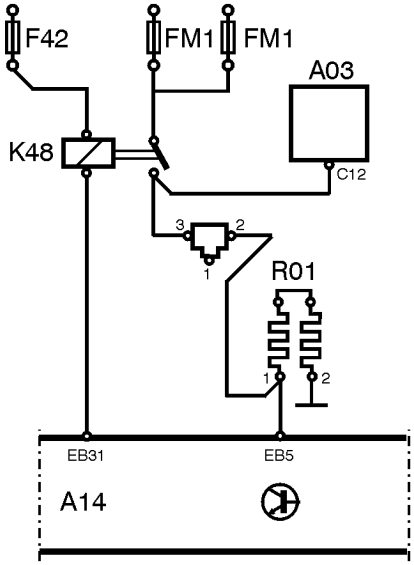
Function check

1
Perform a function check, with test 26325-3 “Electrically controlled cooling fan, test” in VCADS Pro, after any remedial action.

MID 128 SID 70 Preheater element 1



T3015828



T2018686

General information

Diagnostics of starting heater.

Component: (R01) Starting heater

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- Starting heater relay not activated.
- Voltage on EB5 exceeds 65% of battery voltage (0.65 * U_{bat}).

Possible cause:
- Short circuit to battery voltage, signal cable.
- Relay constantly activated.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Pre-heating relay can be constantly active.
- High inlet temperature.
- High current consumption.
- Battery in poor condition.

Appropriate check:
- **Active FMI**
  28480–3 “MID 128 SID 70 Preheater element 1, check” page 151.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Short circuit to ground.

Condition for fault code:
- Preheating requested.
- Voltage on EB5 below 7% of battery voltage (0.07 * U_{bat}).

Possible cause:
- Short circuit to ground, signal cable.
- Damaged pre-heater relay.
- Open circuit in supply cable between relay and heater.
- Fault in pre-heater relay.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- Output for pre-heating relay is shut off.

Noticeable external symptoms:
- Yellow lamp lights.
- Pre-heating does not function.
- White smoke during cold start.
- Difficult to start in extreme cold.

Appropriate check:
- **Active FMI**
  28480–3 “MID 128 SID 70 Preheater element 1, check” page 151.
- **Inactive FMI**
  This FMI is only active when the relay is active. The fault code will be shown as inactive (when the fault code is read out) when the engine is turned off.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Break.

Condition for fault code:

- Voltage on EB5 exceeds 5% of battery voltage (0.05 * U_{bat} and is less than 65% of battery voltage (0.65 * U_{bat}).

Possible cause:

- Break in heating element.
- Break, signal cable.
- Break, ground cable to pre-heater.

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.
- Output for pre-heating relay is shut off.

Noticeable external symptoms:

- Yellow lamp lights.
- Pre-heating does not function.
- Difficult to start in extreme cold.

Appropriate check:

- **Active FMI**
  28480–3 “MID 128 SID 70 Preheater element 1, check” page 151.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28480-3
MID 128 SID 70 Preheater element 1, check

Other special equipment: 9812519

Fault code information, see “MID 128 SID 70 Preheater element 1” page 149

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Checks

Note: Faults in the component may be caused by faults in the cable harness for the engine control unit. Therefore check the cable harness before connecting a new component.

Starting heater

1

Conditions:
- Connection between pre-heating relay and heater (fuse) undone and removed from heater.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.

Measurement points	Expected value
Connection heater - Ground	R ≈ 30 Ω

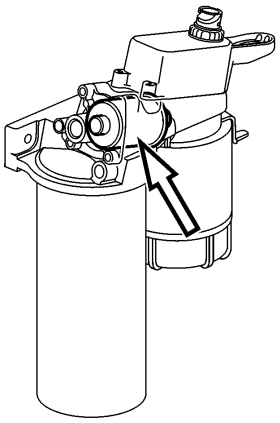
9812519

Function check

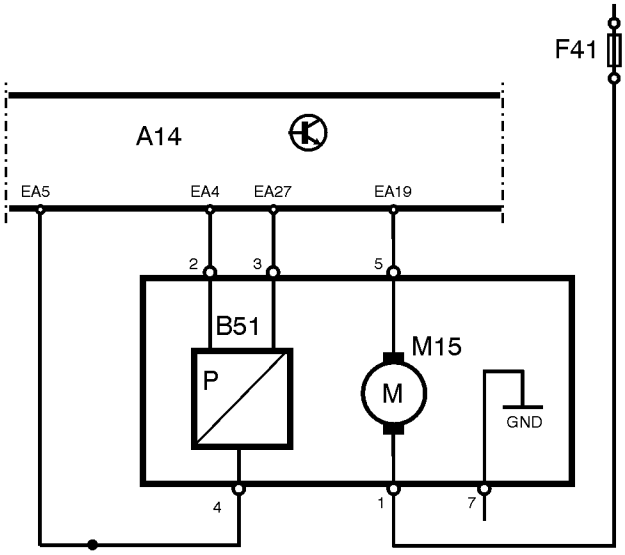
1

Perform a function check, with test 33311-3 “Pre-heating, test” in VCADS Pro, after any remedial action.

MID 128 SID 78 Fuel priming pump



T2018707



T2018689

General information

Component: (M15) Fuel pump

Fault code

FMI 4

Short circuit to ground.

Condition for fault code:
- Short circuit to earth on EA19.
- The fuel pump is not activated.

Possible cause:
- Short circuit to ground, control cable.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- The fuel pump is continuously activated.

Appropriate check:
- **Active FMI**
  28428–2 “MID 128 SID 78 Fuel priming pump, check” page 153.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 5

Circuit interruption.

Condition for fault code:
- Interruption in the fuel pump circuit.

Possible cause:
- Blown fuse for the fuel pump supply.
- Break in the cable between the engine control unit and the fuel pump.
- Interruption in the fuel pump circuit.
- Break in supply cable to fuel pump.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Fuel pump does not function.

Appropriate check:
- **Active FMI**
  28428–2 “MID 128 SID 78 Fuel priming pump, check” page 153.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI”
  *If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28428-3
MID 128 SID 78 Fuel priming pump, check

Special tools: 9998505, 9998567, 9998699
Other special equipment: 9812519

Fault code information, see “MID 128 SID 78 Fuel priming pump” page 152

NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Checks

Supply cable

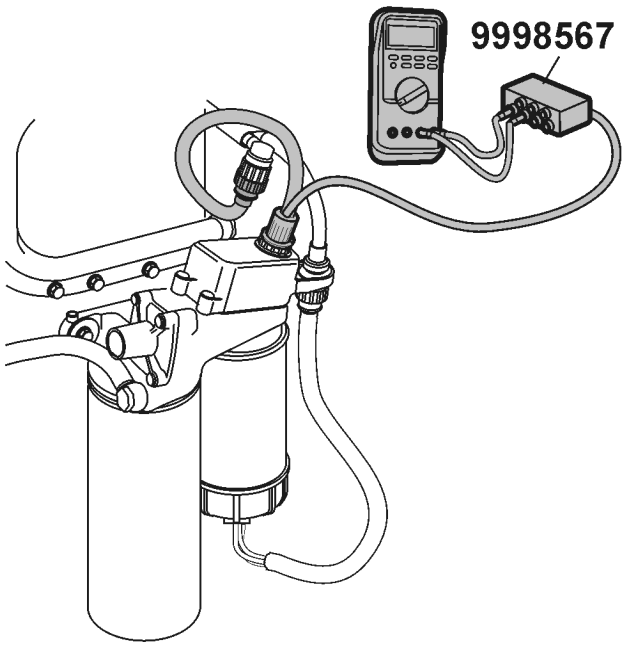
1
Check the electric fuel pump fuse (F41).

2
Conditions:
- 7-pole adapter connected **between** cable harness connector block and connector block on fuel filter housing.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

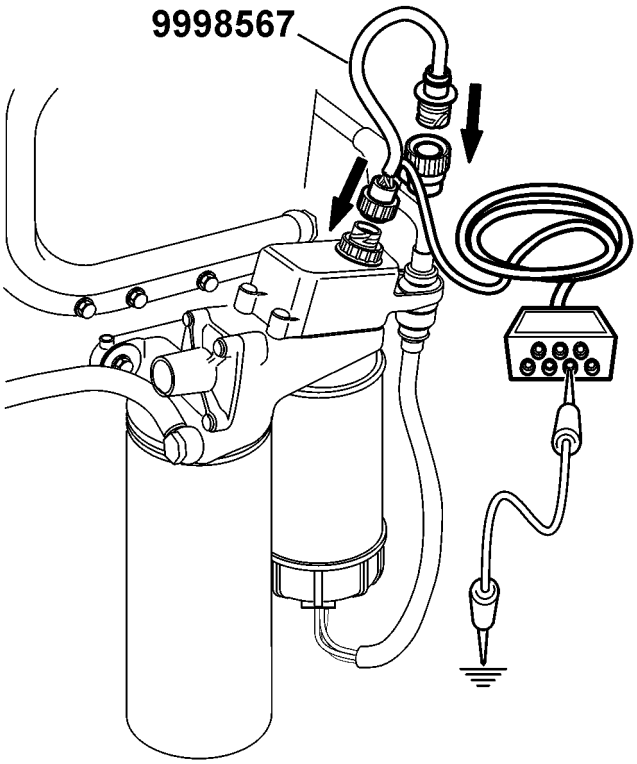
Measurement points	Expected value
1 - Ground	$U \approx U_{bat}$

If the expected value is not received, then the fault is probably in the cable between the connection and the fuse.

9998567 9812519



T2020816



C2002722

Control cable

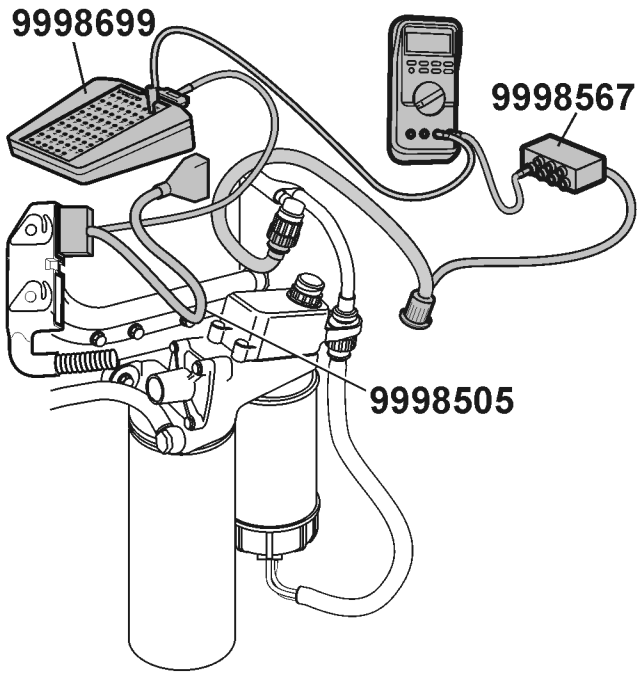
3
Check that the electric fuel pump starts when output 5 in the adapter break-out box is grounded.

“Measurement points”	**“Expected value”**
5 - Ground	The electrical feed pump starts

If the electric fuel pump does **not start** it is probably faulty. If this is the case, replace the electric fuel pump. See 23325–2 “Feed pump electric, replace”, Repair, group 2331.
If the electric fuel pump starts, but does not start when the switch is depressed (and all conditions for operation are fulfilled) the fault is probably in:

- the connection between the electric fuel pump and the engine control unit. This is checked in step **4**

or
- the switch for water separator/purging. This is checked in step **6**



T2021417

4
Conditions:
- 7-pole adapter connected to the cable harness connector block (towards engine control unit) **and** measurement box with adapter connected to cable harness connector block EA.
- Measure resistance using a multimeter.
- Starting key in the **stop position**.

Measurement points	**Expected value**
5 - EA19	R ≈ 0 Ω

If a break or other unexpected value is noted, then the fault is probably in the connection between the electric fuel pump and the engine control unit.

9998567, 9998699, 9998505
9812519

5
Open the feed pressure sensor housing. Check that both cables from the electric fuel pump are properly connected to the cables from pins 1 and 5 on the connector terminal.

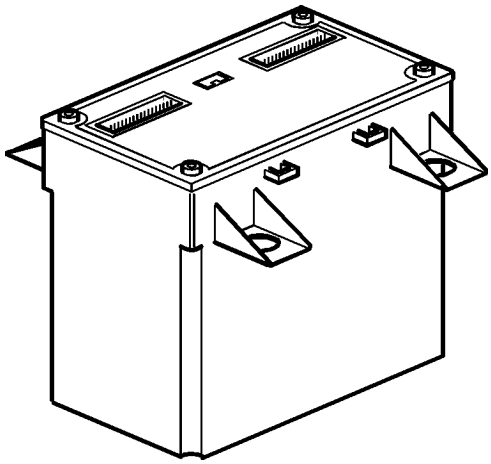
6
Check the water separator/purge switch. See section “Switch fuel pump/drain valve, check” in “Draining water from fuel system, fault tracing” (Check list S), Diagnostics, group 2331

7
If the electric fuel pump still does not start after performing all the steps above, it must be defective and should be replaced. See 23325–2 “Priming pump electric, replace”, Repair, group 2331.

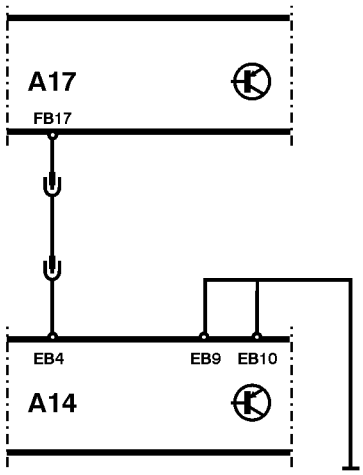
Function check

1
Perform a function check, with test 23321-3 “Drainage of water in fuel system, test” in VCADS Pro, after any remedial action.

MID 128 SID 230 Idle validation switch 1



T2012703



T2018705

General information

Component: (A17) Vehicle control unit

Fault code

FMI 3

Short circuit to battery voltage.

Condition for fault code:
- Accelerator pedal released.
- Voltage on EB4 exceeds 75% of battery voltage (0.75 * U_{bat}).

Possible cause:
- Short circuit to battery voltage on cable between engine control unit and vehicle control unit.
- Fault in accelerator pedal.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Limp home function does not work.

Appropriate action:
- Check the cables between the engine control unit and vehicle control unit.
  If the cables are fault-free, continue fault tracing according to the service information for the vehicle control “MID 144 SID 230 Idle validation switch 1”, group 3649.

FMI 4

Short circuit to earth or break.

Condition for fault code:
- Accelerator pedal pressed down > 50%.
- Voltage on EB4 less than 25% of battery voltage (0.25 * U_{bat}).

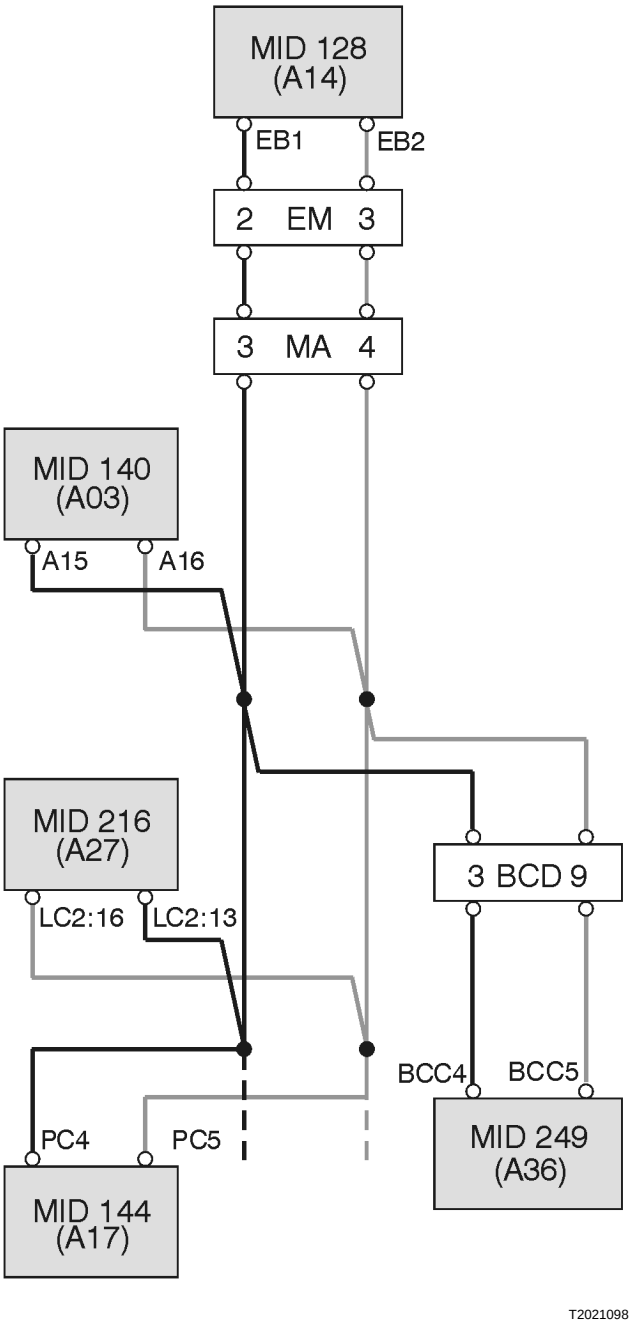
Possible cause:
- Short circuit to ground on cable between engine control unit and vehicle control unit.
- Break in the cables between the engine control unit and the vehicle control unit.
- Error in accelerator pedal.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Limp home function does not work.

Appropriate action:
- Check the cables between the engine control unit and vehicle control unit.
  If the cables are fault-free, continue fault tracing according to the service information for the vehicle control “MID 144 SID 230 Idle validation switch 1”, group 3649.

MID 128 SID 231 SAE J1939 Control link



Fault code

FMI 2

Control link (SAE J1939) does not function.

Condition for fault code:
- There are no messages on the control link (SAE J1939).

Possible cause:
- Short circuit to battery voltage on control link (SAE J1939).
- Short circuit to ground on control link (SAE J1939).
- Cables in control link (SAE J1939) short-circuited to each other.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- Information is read/sent on the information link (SAE J1587/J1708) instead.
- Pre-heating relay does not function.

Noticeable external symptoms:
- Yellow lamp lights.
- The Cruise Control does not function.
- Power take-off does not work.

Appropriate check:
- **Active FMI**

  Fault trace the information link SAE J1939. See separate service information “Data links, fault tracing”: 37104–3 “SAE J1939 Control link, fault tracing”, group 3711.
- **Inactive FMI**
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 11

Unidentifiable fault

Condition for fault code:
- Control link (SAE J1939) does not function internally in engine control unit at start-up.

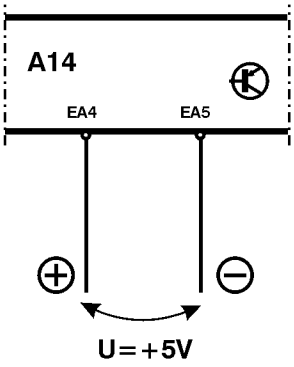
Possible cause:
- Internal fault in the engine control unit.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.
- Information is read/sent on the information link (SAE J1587/J1708) instead.

Noticeable external symptoms:
- Yellow lamp lights.
- The Cruise Control does not function.
- PTO does not function.

Appropriate action:
- Replace the engine control unit (internal fault in the engine control unit).

MID 128 SID 232 5 Volt DC supply sensor



T2018706

Fault code

FMI 3

Abnormally high current or short-circuit to voltage.

Condition for fault code:
- The voltage on EA4 exceeds 5.5 V.

Possible cause:
- Short circuit to battery voltage on the output.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Incorrect values on engine oil pressure sensor and boost pressure sensor.
- Fault code on engine oil pressure sensor and boost pressure sensor.
- Low power output.
- Oil pressure gauge and boost pressure gauge show 0 in the instrument.

Appropriate check:
- **Active FMI**
  28481-3 “MID 128 SID 232 5 Volt DC supply, check” page 159
- **Inactive FMI**
  This fault code cannot be read when it is inactive, since it cannot be stored. Perform test 17004–3 “Fault codes, test mode” i VCADS Pro to check if it is an intermittent fault.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

FMI 4

Abnormally low voltage or short circuit to earth.

Condition for fault code:
- The voltage of EA4 is under 4.5 V.

Possible cause:
- Short circuit to ground.
- Fault in sensor.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Oil pressure gauge and boost pressure gauge show 0 in the instrument.
- Low power output.

Appropriate check:
- **Active FMI**
  28481-3 “MID 128 SID 232 5 Volt DC supply, check” page 159
- **Inactive FMI**
  This fault code cannot be read when it is inactive, since it cannot be stored. Perform test 17004–3 “Fault codes, test mode” i VCADS Pro to check if it is an intermittent fault.
  VCADS Pro: 17004–3 “Fault codes, test mode”
  *If the fault code becomes active during test “Fault codes, test mode”, fault trace according to “Active FMI” If the fault code **does not** become active, try activating it during a test drive. In order to fault trace, the fault code must be active.*

28481-3
MID 128 SID 232 5 Volt DC supply, check

Special tools: 9998505, 9998534
Other special equipment: 9812519

Fault code information, see “MID 128 SID 232 5 Volt DC supply sensor” page 158

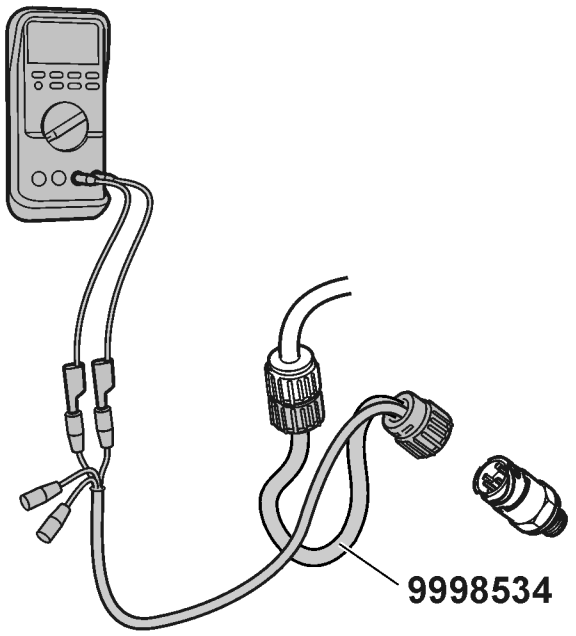
NOTE!

- **Active/inactive fault code**
  Certain fault codes will be inactive when the engine is turned off. Start the engine to check whether the fault code is still inactive when the engine is running.
- **Connector**
  Always check that there is no oxidation and that the connector pins are not damaged. Also check the pin retention force. For more information, see service information group 371.
  If the connector block is undamaged, reconnect it. Check if the fault code is still active. If the fault code is still active, continue fault tracing according to the instructions.
- **After any necessary remedies to the connector block**
  Refit the connector. Check if the fault code has become inactive.
  If the fault code is still active, continue fault tracing according to the instructions.

Test measurements

For information about the location and appearance of the sensors, see:
- “Sensor overview, D9A” page 9
- “Sensor overview, D12D” page 11
- “Sensor overview, D16C” page 12

Note: If any of the measurement values for the following cables are incorrect, this may also have caused the component to fail. Also check if any of the component values are incorrect.



T2020822

Ground cable:

1
Conditions:
- Sensors for fuel, boost air, coolant and oil disconnected.
- 4-pole adapter connected to cable harness connector block (towards engine control unit).
- Measure resistance using a multimeter.
- Starting key in the **stop position**.
- Measurement on all sensor connection blocks, towards the engine control unit.
- Engine control unit connected.

Measurement points	Expected value
2 - Ground	R ≈ 0 Ω (coolant, fan speed)
4 - Ground	R ≈ 0 Ω (fuel, boost air, oil)

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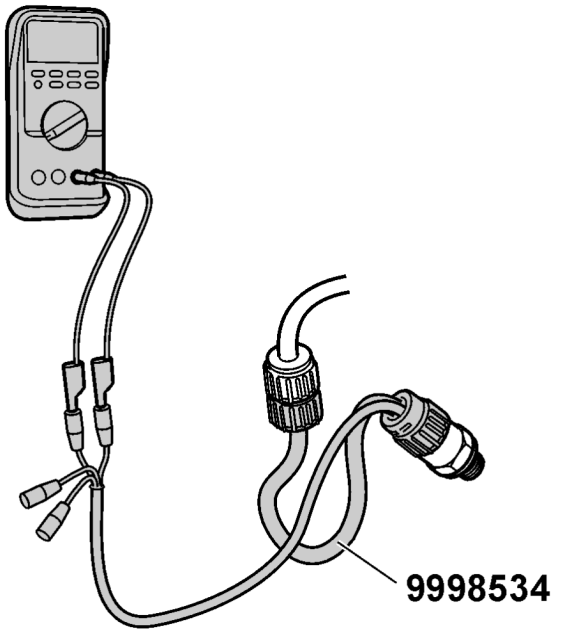


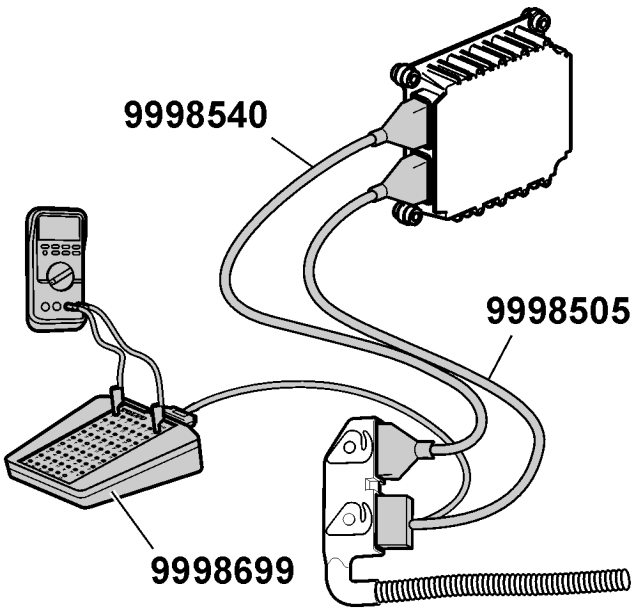
T2019799

Supply cable:

2
Conditions:
- The connectors to the sensors for fuel, boost air, coolant, oil disconnected.
- 4–pole adapter connected **between** the cable harness connector block and the connector block for each sensor in turn.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.
- Engine control unit connected.

Measurement points	Expected value
1 - Ground	U ≈ 5 V (boost air, coolant, oil)
2 - Ground	U ≈ 5 V (fuel)
5 - Ground	U ≈ 5 V (fan speed)

9998534
9812519



T2020695

Function check

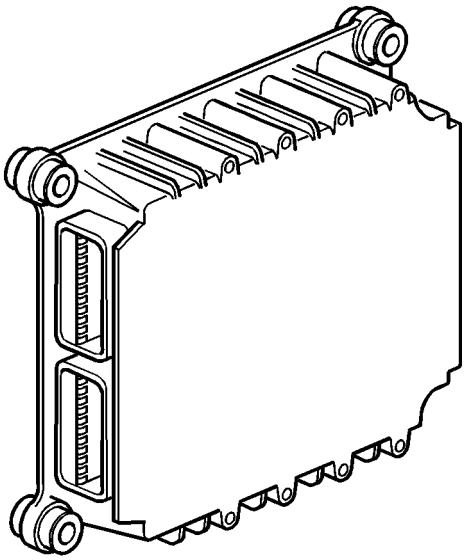
1
Perform a function check after any remedial actions.

Conditions:
- Measuring box with adapter connected **between** engine control unit and cable harness.
- Voltage measuring using a multimeter.
- Starter key in the **drive position**.

Measurement points	Expected value
EA4 - EA5	U ≈ 4.8 - 5.15 V

9998505
9812519

MID 128 SID 250 J1587/1708 Information link



T2012687

General information

Fault code

FMI 12

Internal fault in the engine control unit.

Condition for fault code:

- Information link (SAE J1708) not working because of an internal fault in the engine control unit.

Possible cause:

- Internal fault in the engine control unit.

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.

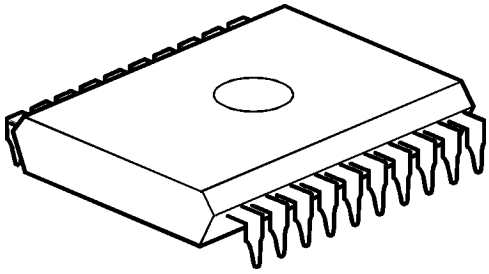
Noticeable external symptoms:

- Yellow lamp lights.
- Information from the engine control unit is not available on the information link (SAE J1708).
- The boost pressure gauge shows 0 in the instrument.
- The oil pressure gauge shows 0 in the instrument.
- The oil temperature gauge shows 0 in the instrument.
- The water temperature gauge shows 0 in the instrument.
- The rev counter shows 0 in the instrument.

Appropriate action:

- Replace the engine control unit (internal fault in the engine control unit).

MID 128 SID 253 Data set memory EEPROM



T2012704

General information

Fault code

FMI 2

Incorrect check sum in data set memory.

Condition for fault code:
- Check sum incorrect.

Possible cause:
- Internal fault in the control unit.
- Fault with the programming.

Reaction from the control unit:
- Fault code is set.
- Red light requested.

Noticeable external symptoms:
- Red lamp lights.
- The engine does not start.

Appropriate action:
- Re-program the engine control unit. If the fault remains, replace the engine control unit (internal fault in the engine control unit).

FMI 12

Incorrect check sum in data set memory.

Condition for fault code:
- Check sum incorrect.

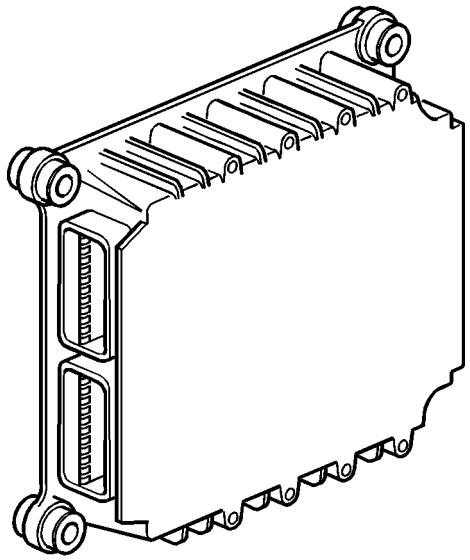
Possible cause:
- Internal fault in the control unit.

Reaction from the control unit:
- Fault code is set.
- Red light requested.

Noticeable external symptoms:
- Red lamp lights.
- The engine does not start.

Appropriate action:
- Replace the engine control unit (internal fault in the engine control unit).

MID 128 SID 254 Engine electronic control unit (EECU)



T2012687

General information

Component: (A14) Engine control unit

Fault code

FMI 2, 8, 9, 11, 12

Internal fault in the control unit.

Condition for fault code:
- Incorrect self test in the engine control unit.

Possible cause:
- Internal fault in the control unit.

Reaction from the control unit:
- Fault code is set.
- Red light requested.

Noticeable external symptoms:
- Red lamp lights.
- The engine does not start.

Appropriate action:
- Replace the engine control unit.

FMI 13

Internal fault in the control unit.

Condition for fault code:
- Incorrect self test in the engine control unit.

Possible cause:
- Internal fault in the control unit.

Reaction from the control unit:
- The engine control unit restarts.
- Error code can be requested, will not automatically be shown in the instrument.

Noticeable external symptoms:
- Engine backfires.

Appropriate action:
- Replace the engine control unit.

MID 128 PSID 161 VIN

General information

Component:

Fault code

FMI 12

Vehicle identification check, no response.

Condition for fault code:

- Engine control unit receives no answer to the question of the vehicle identification number (VIN) from neither the vehicle control unit (VECU) nor the external lighting control unit (LCM).

Possible cause:

- Breakdown or short circuit in link J1587.
- Both vehicle control unit (VECU) *and* external lighting control unit (LCM) faulty.

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.
- Unit injectors closed off, no fuel injection (applies to vehicles with electronic starter inhibitor).

Noticeable external symptoms:

- Yellow lamp lights.
- Engine does not start (applies to vehicles with electronic starter inhibitor).

Appropriate action:

- **Active FMI**
  Check the vehicle identification number (VIN) for the vehicle control unit (VECU), the external lighting control unit (LCM) and the engine control unit (EECU).
  VCADS Pro: 28425-3 “MID 128 Vehicle information, test”
  OK: Breakdown or short circuit in link J1587.
  Not OK: Re-program the vehicle control unit (VECU) and the external lighting control unit (LCM).
- **Inactive FMI**
  Check the vehicle identification number (VIN) for the vehicle control unit (VECU), the external lighting control unit (LCM) and the engine control unit (EECU).
  VCADS Pro: 28425-3 “MID 128 Vehicle information, test”
  OK: Erase fault code.
  Not OK: Re-program the vehicle control unit (VECU) and the external lighting control unit (LCM).

MID 128 PSID 162 VIN

General information

Component:

Fault code

FMI 2

Incorrect vehicle identification number (VIN).

Condition for fault code:

- Incorrect vehicle identification number (VIN) from vehicle control unit (VECU) or external lighting control unit (LCM).

Possible cause:

- Incorrect vehicle identification number (VIN) in the vehicle control unit (VECU).
- Incorrect vehicle identification number (VIN) in the external lighting control unit (LCM).
- Incorrect vehicle identification number (VIN) in the engine control unit (EECU).

Reaction from the control unit:

- Fault code is set.
- Yellow light requested.
- Unit injectors closed off, no fuel injection.

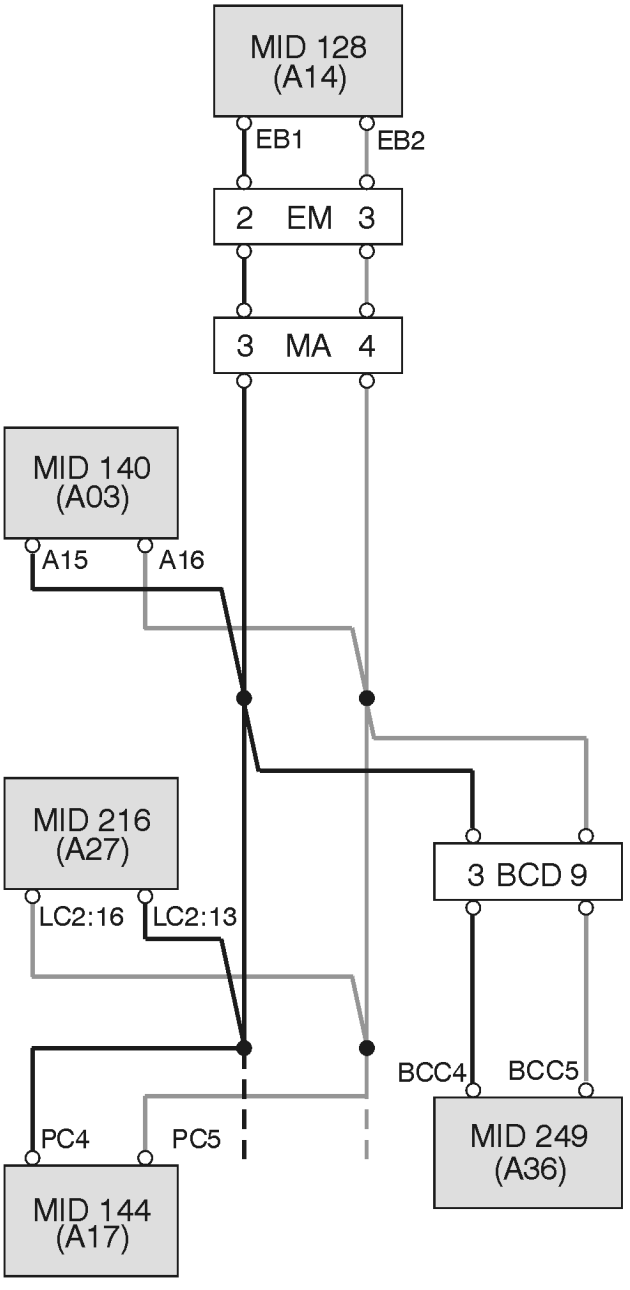
Noticeable external symptoms:

- Yellow lamp lights.
- The engine does not start.

Appropriate action:

- Check the vehicle identification number (VIN) for the vehicle control unit (VECU), the external lighting control unit (LCM) and the engine control unit (EECU). VCADS Pro: 28425-3 “MID 128 Vehicle information, test”
  OK: Erase fault code.
  Not OK: Re-program the vehicle control unit (VECU), external lighting control unit (LCM) or engine control unit (EECU).

MID 128 PSID 201 Communication interference, data link, vehicle control unit



General information

The control units send information on the control link SAE J1939.

If a control unit lacks information from another control unit, the fault code shows which control unit is not sending correct information.

Component: (A14) Engine control unit

Note: When PSID 201 becomes inactive, fault codes are no longer shown on the display.
It is however still possible to read and delete fault codes with the VCADS Pro tool.

Fault code

FMI 9

Abnormal update rate.

Condition for fault code:
- The engine control unit does not accept information from the vehicle control unit on control link SAE J1939 (time out 13 s/150 ms).

Possible cause:
- Break in the SAE J1939 control link between the engine control unit and the vehicle control unit.

Reaction from the control unit:
- Fault code is set.
- Yellow light requested.

Noticeable external symptoms:
- Yellow lamp lights.
- Temporary malfunction of:
  - Cruise control
  - Power take-off
  - Automatic idle shut-off
  - Adjustable idle speed
- Temporary functional disturbances:
  - Accelerator pedal
  - Engine brake
  - Pre-heating

Note: Functional disturbances means that the function is turned off, but functions again once the function has been turned off and then on again.

Appropriate check:
- See “Fault tracing of fault code combinations” page 168
- Fault trace the information link SAE J1939. See separate service information “Data links, fault tracing”: 37104–3 “SAE J1939 Control link, fault tracing”, group 3711.

Fault tracing of fault code combinations

To simplify fault tracing, check other fault codes to get an **indication of where the fault is**.

Fault code combination A

MID 128 PSID 201 in combination with **PSID 200 from all other available control units**, indicates a fault in the cabling between the engine control unit and link junctions in the cable harness (behind the pedals in the cab).

1 Check connector block EB (engine control unit), EM (cable box engine) and MA (cable feed through, cab).
2 Check the cables between the engine control unit and junctions in the cable harness (behind the pedals in the cab).

Fault code combination B

MID 128 PSID 201 in combination with **PSID 200 and PSID 214 from the vehicle control unit**, indicate a fault in the cabling between junctions in the cable harness (in the cab).

1 Check the cables in the cab between connector block MA (cable feed through cab) and PC (connector block vehicle control unit).

Fault code combination C

MID 128 PSID 201 in combination with **PSID 201 from all other available control units**, indicates a fault in the connector block or cabling closest to the vehicle control unit.

1 Check vehicle control unit connector block PC.
2 Check the vehicle control unit.
3 Check cabling between the vehicle control unit connector block MA (cable feed through, cab).

Operation Numbers

The operation numbers used in this manual refer to V.S.T.

VOLVO

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Göteborg, Sweden

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