

# Electronic Diesel Control Repair Manual



*EDC M(S) 5 - D28 V marine engines*





### Dear Customer

These instructions are intended to help you to repair the electronic diesel control system properly.

In writing these instructions, we have assumed that you have the necessary knowledge of control systems for working on and with the electronic diesel control.

Best regards  
MAN Nutzfahrzeuge Aktiengesellschaft  
Nuremberg Plant

Since our products are in continuous development, we reserve the right to make technical modifications.

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## General

Important safety regulations are summarized in this quick-reference overview and arranged by topic to effectively convey the knowledge necessary to avoid accidents causing injury, damage or environmental hazard.

The engine operating manual contains further information.

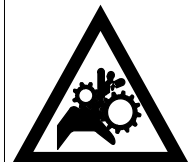
### Important:

Should an accident occur despite all precautionary measures, particularly one involving contact with corrosive acid, penetration of fuel under the skin, scalding by hot oil, anti-freeze splashing into the eyes etc. **you must seek medical assistance immediately.**

### 1. Instructions for avoiding accidents causing injury

**Only authorized and qualified personnel are permitted to carry out inspection, adjustment and repair work**

- Put gearbox of ship into neutral, if necessary unhinging gearshift lever (disconnect via remote control)
- Firmly secure units and assemblies on disassembly
- Only authorized personnel are permitted to start and operate the engine
- Do not stand too close to rotating parts while the engine is running  
Wear close-fitting working clothes
- Do not touch hot engine with bare hands: Danger of injury by burning
- Keep area surrounding engine, ladders and stairways free of oil and grease. Accidents caused by slipping can have serious consequences
- Only work with tools which are in good condition. Damaged or worn spanners and wrenches can slip off: Danger of injury!
- Persons must not stand under an engine suspended on a crane hook. Keep lifting gear in perfect condition



- Only open coolant circuit once the engine has cooled down. Follow the instructions given under “Care and Maintenance” in the Operating Manual exactly if it is not possible to avoid opening the coolant circuit with the engine at operating temperature.
- Do not tighten or undo pipes and hoses under pressure (lubricating oil circuit, coolant circuit and any downstream hydraulic oil circuits).  
Danger of injury caused by liquids escaping under pressure!
- Do not hold hands under the fuel jet when checking injection nozzles.  
Do not inhale fuel mist
- Always disconnect battery when working on the electrical system
- Do not use rapid charger to start the engine. Rapid charging of batteries is only permitted with the positive and negative leads disconnected!
- Disconnect batteries only with the “ignition” turned off
- Observe manufacturer’s instructions for handling batteries.  
**Caution:**  
Battery acid is toxic and corrosive. Battery gasses are explosive



- Only use suitable measuring instruments to **measure voltages!** The minimum input resistance of a measuring instrument should be 10 MΩ
- Only disconnect or connect wiring harness connectors on electronic control units only with the “**ignition**” **turned off!**

Disconnect batteries and connect the positive lead to the negative lead such that they are electrically conductive before carrying out any electric welding work. Earth the welding set as close to the weld as possible. Do not route cable of welding apparatus parallel to electric lines on board the ship.

Refer to the “Welders’ Code of Practice” for further accident prevention measures.

- **When carrying out repaint jobs**, electronic components may be subject to high temperatures (max. 95°C) for only very short periods; a period of up to approx. 2 hours is permissible at a max. temperature of 85°C, disconnect batteries



### **Limitation of liability for parts and accessories**

In your own interest, we strongly recommend you use only accessories and original MAN parts expressly approved by MAN for your MAN engine. The reliability, safety and suitability of these parts and accessories have been tested specially for MAN engines. Despite us keeping a constant eye on the market, we cannot assess and be held responsible for these properties in other products, even if they bear TÜV (German testing and inspection institute) approval or any other official approval in any particular case.

### **Laying-up or storage**

Special measures must be implemented in accordance with MAN Company Standard M 3069 Part 3 if engines are to be laid up or placed into storage for more than 3 months.



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## Electronic diesel control EDC

### General

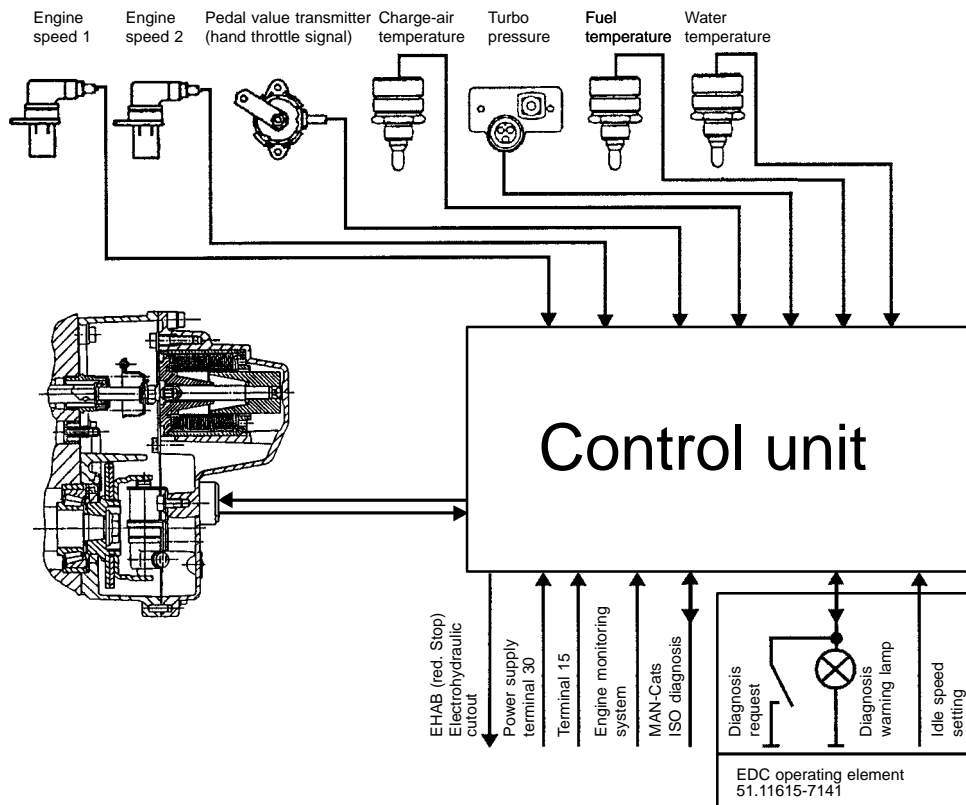
The requirements set by customers and legislation in respect of fuel consumption, exhaust emission and noise characteristics etc. on diesel engines have grown over the years and will be even more stringent in the future.

The fact that conventional mechanical injection systems have reached their capacity limits has made electronically controlled fuel injection systems necessary.

Such systems increase engine efficiency, improve driving comfort and lessen the burden on the environment.

The **E**lectronic **D**iesel **C**ontrol (EDC) fulfils all these requirements.

## System description EDC M(S) 5



The controller contains

- the linear solenoid
- the control rod position transducer

The linear solenoid is driven by the electronic control unit.  
The control unit processes information which it receives via

- the control rod position transducer
- Pedal value transmitter (hand throttle signal)
- turbo pressure sensor
- coolant temperature sensor
- turbo air temperature sensor
- Pedal value transmitters
- Fuel temperature sensor (in injection pump)

The diagnosis request button and the EDC check lamp are used for indicating faults and for the flashcode output device integrated in the terminal box as EDC operating element 51.11615-7141.

Communication with the MAN-Cats checking and diagnostic computer is possible via an ISO interface also integrated in the terminal box.

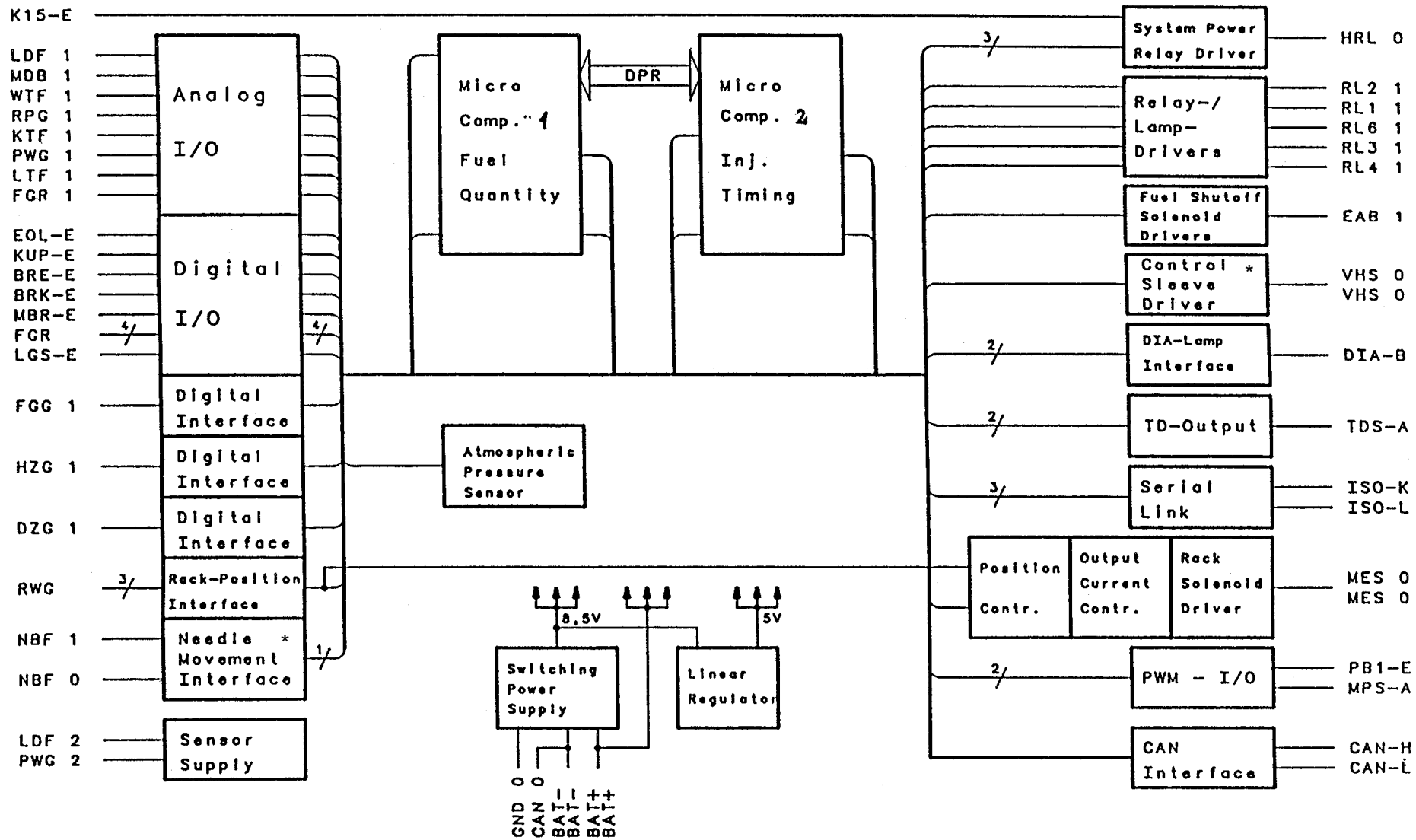
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To ensure the vehicle can still be driven to the nearest workshop in the event of one or several sensors failing, an emergency drive function is integrated in the control unit.

The idle speed is exactly maintained by means of the idle speed governor as long as the engine output is sufficient for this. The regulated idle speed can be altered within certain limits. The idle speed set ex works is 600 rpm. However, it can be varied via the EDC operating element in the range from 600 to 750 rpm.

Starting-fuel delivery is output when either a lower start recognition speed is exceeded. The starting-fuel delivery and cold idle speed are limited as a function of the coolant temperature to avoid impermissible smoke emission and unnecessary revving of the engine after starting.

Block Diagram M(S) 5

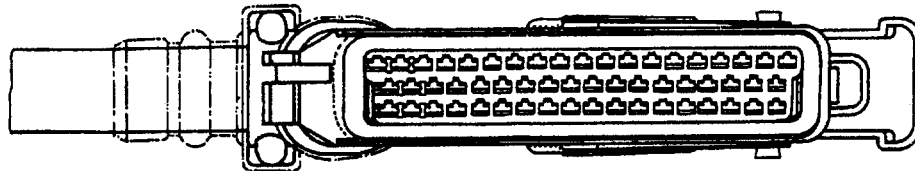


\* for M(S) 5 not connected, not in operation

## Control unit plug connector

### Pin arrangement

19	.....	1
37	.....	20
55	.....	38



### Pin assignments of control unit plug connector

#### EDC Pin Connection to component (O=Output, I=Input)

- |    |  |
|----|--|
| 1  | Injection pump controller pin 8 <b>O</b><br>Jumper to pin 2 (activation of fuel-delivery regulator) <b>O</b>   |
| 2  | Jumper to pin 1 (activation of fuel-delivery regulator) <b>O</b>   |
| 3  | Not used   |
| 4  | Not used   |
| 5  | Not used   |
| 6  | Not used   |
| 7  | Not used   |
| 8  | Not used   |
| 9  | Injection pump controller pin 5 (control rod position transducer, instrument coil)   |
| 10 | Injection pump controller pin 1 (control rod position transducer, reference coil)  |
| 11 | Injection pump controller pin 6 (control rod position transducer, centre pick-off)   |
| 12 | Not used   |
| 13 | Negative from control unit for (Sensor ground)<br>– Speed sensor<br>– boost pressure sensor<br>– pedal value transmitter (hand throttle signal)<br>– boost air temperature sensor<br>– coolant temperature sensor<br>– resistor bank (in the EDC operating element)<br>– Fuel temperature sensor |
| 14 | Electrohydraulic shut-off valve EHAB <b>O</b>  |
| 15 | Control unit power supply batt. + (via main relay and fuse) <b>I</b>   |
| 16 | Control unit power supply batt. + (via main relay and fuse) <b>I</b>   |
| 17 | Ground for auxiliary rpm sensor  |
| 18 | Power supply batt. –   |
| 19 | Power supply batt. –   |
| 20 | EDC indicator lamp and diagnostic lamp <b>O</b>  |
| 21 | RPM sensor (twisted with cable pin 13) <b>I</b>  |
| 22 | Auxiliary rpm sensor (twisted with cable pin 17) <b>I</b>  |
| 23 | Not used   |

### Pin assignments of control unit plug connector

<b>EDC Pin</b>	<b>Connection to component (O=Output, I=Input)</b>
24	Not used
25	Not used
26	Not used
27	Pedal value transmitter (signal) – terminal 7 in the terminal box <b>I</b>
28	Engine speed signal output from control unit (square-wave pulses) <b>O</b>
29	Not used
30	Not used
31	Not used
32	Not used
33	Boost pressure sensor (supply) – Pin 2 on the charge-air pressure sensor <b>O</b>
34	Fuel temperature sensor
35	To the EDC operating element with resistors for reduction in the event of external faults
36	Charge-air pressure sensor (Signal) – pin 1 on the charge-air pressure sensor <b>I</b>
37	Not used
38	Not used
39	Pedal value transmitter (idle speed switch) – terminal 8 in the terminal box
40	Not used
41	Not used
42	Not used
43	Request button (brake) – Pin 7 in the EDC operating element <b>I</b>
44	Idle speed adjustment – pin 4 in the EDC operating element
45	Pedal value transmitter (supply) – terminal 6 in the terminal box
46	Relay for voltage supply (main relay) K1 coil <b>O</b>
47	Ignition system "On", terminal 15
48	Diagnostic connection (K line) for MAN-Cats
49	Diagnostic connection (L line) for MAN-Cats
50	Input for emergency stop
51	Not used
52	Assigned to batt.+ (to enable multiplex signal)
53	Coolant temperature sensor – Pin 3 on temperature sensor <b>I</b>
54	Not used
55	Boost air temperature sensor – Pin 1 on temperature sensor <b>I</b>

## Injection pump

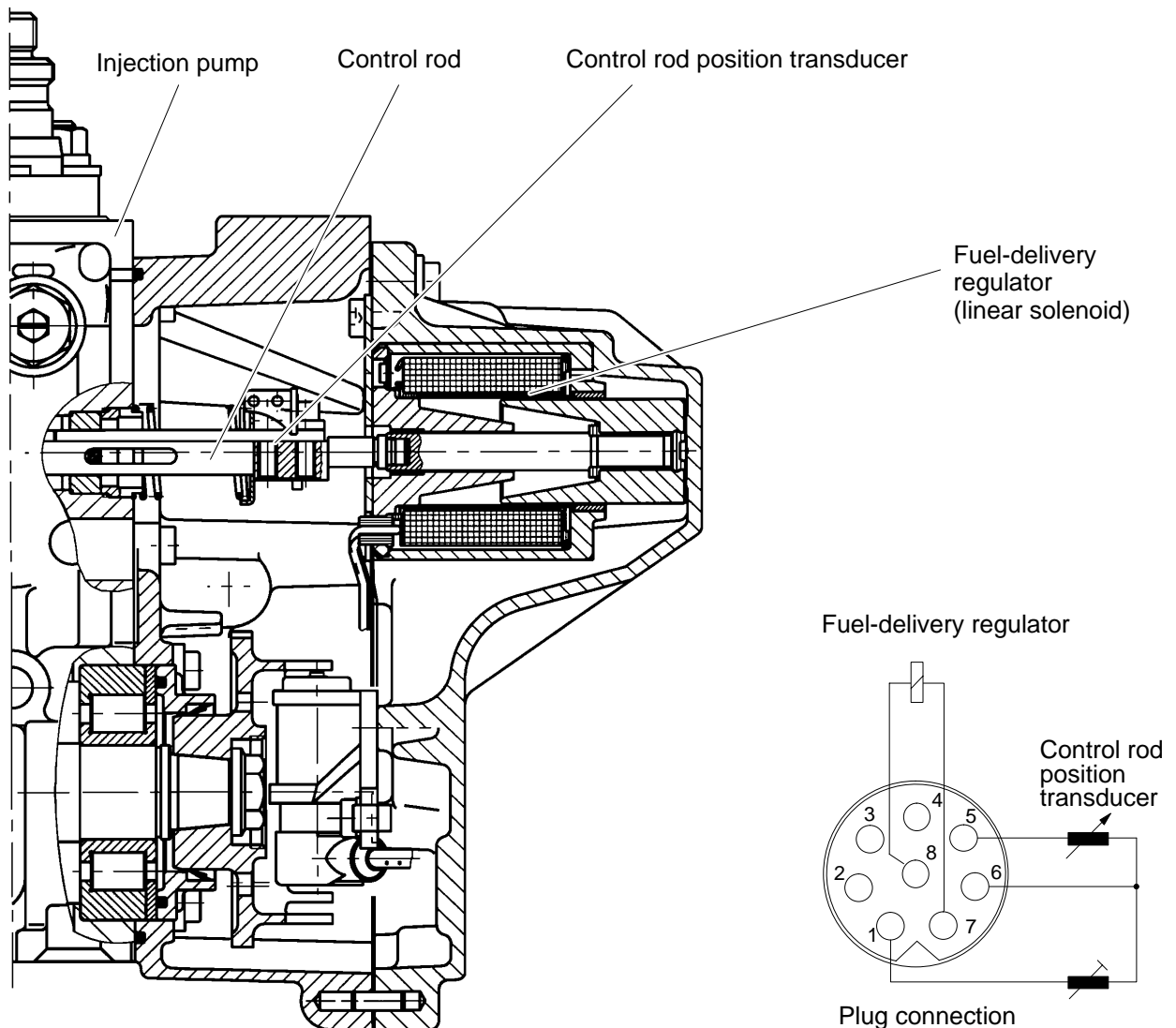
The EDC injection pump consists of a heavy-duty version of a conventional injection stage of the well-known Bosch P-pumps and, instead of the mechanical regulator, a flange-mounted electromagnetic fuel-delivery regulator with a control rod position transducer.

### Electromagnetic fuel-delivery regulator

**Description:**

The fuel-delivery regulator operates in conjunction with the P-pump. The most important component part of the fuel-delivery controller is a linear solenoid in which the armature acts directly on the control rod thus determining the injection volume by means of the control position. When no power is applied, the control rod is held in the stop position by means of a spring.

The other important component in the controller is a control rod position transducer.



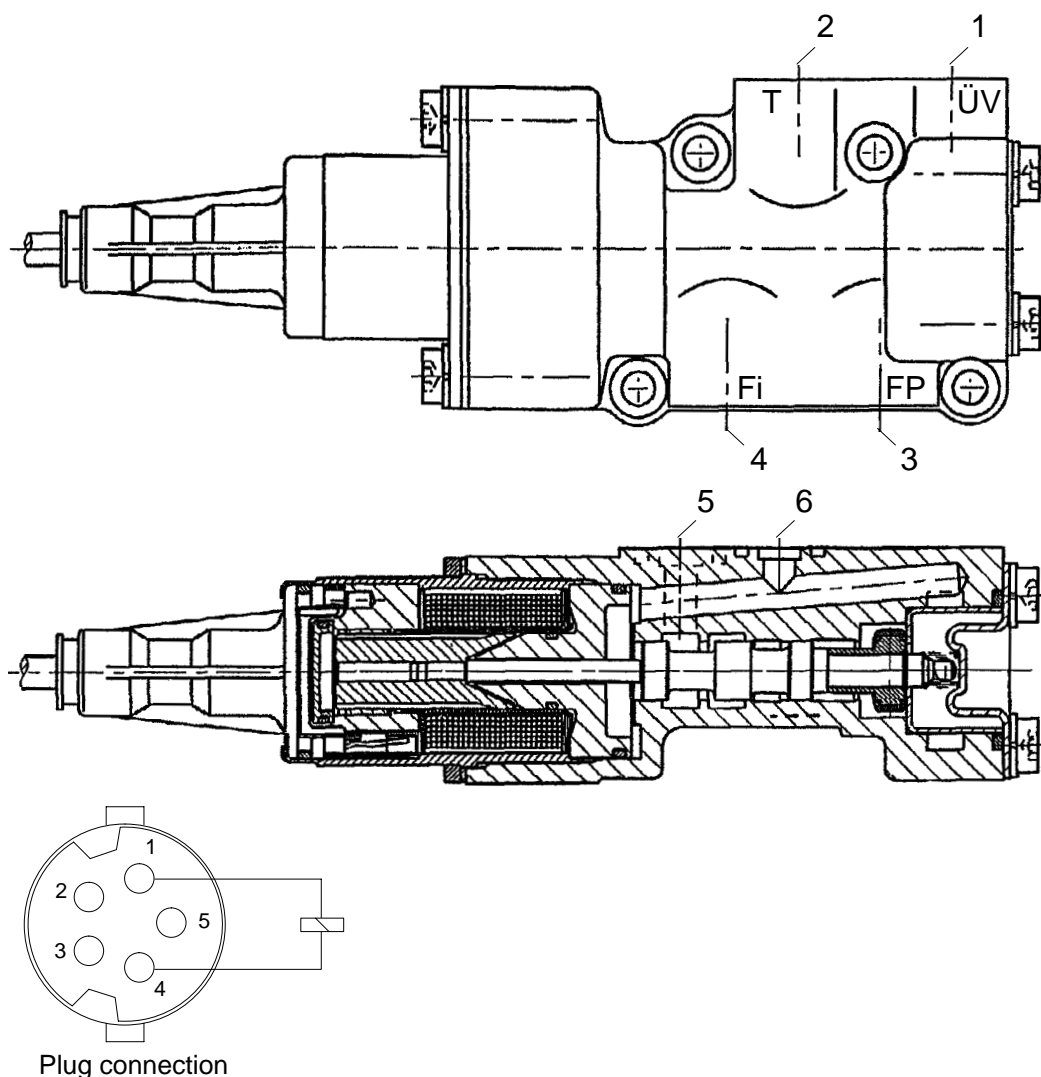
## Electrohydraulic shut-off device EHAB

The EHAB (electrohydraulic shut-off device) is a safety-relevant component.

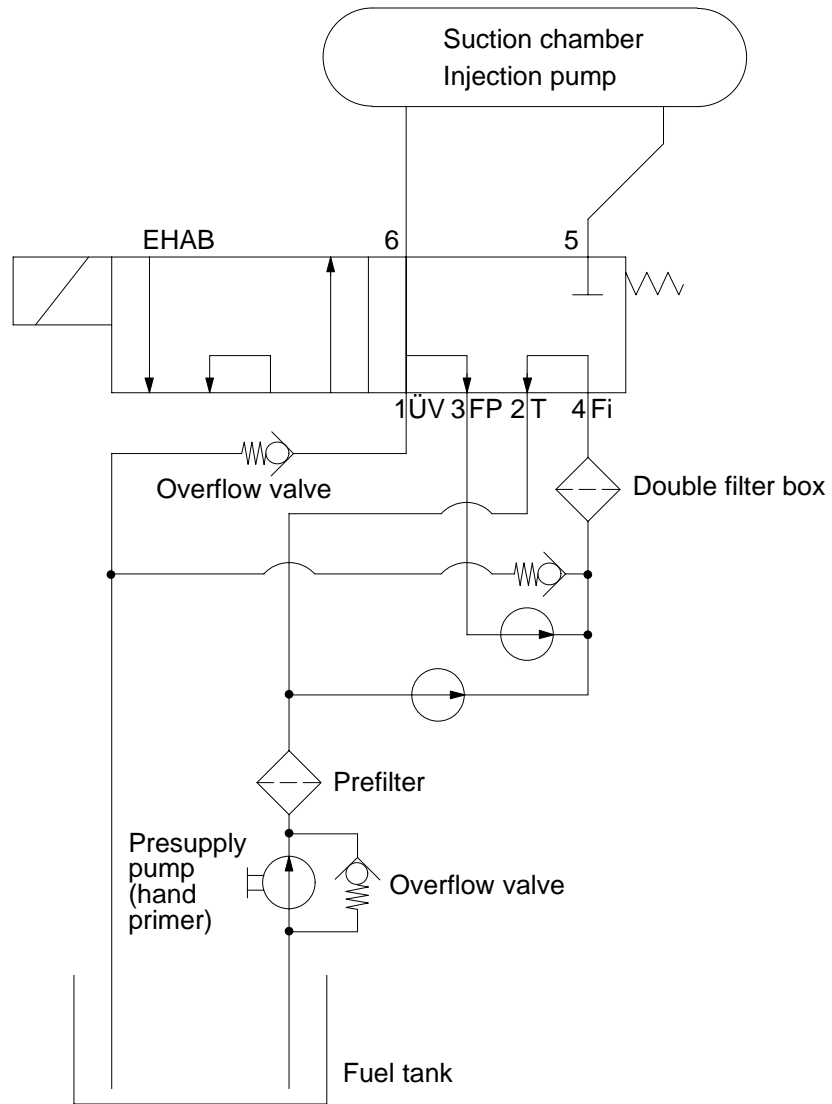
The EHAB shuts off the fuel supply to the injection pump in the event of certain faults occurring in the EDC system. The EHAB is connected in the fuel supply system between the delivery pump and pump suction chamber. The EHAB reverses the delivery direction of the delivery pump so that the pressure in the suction chamber is reduced rapidly thus interrupting the filling procedure.

Power is always applied to the EHAB during operation. The power circuit is interrupted by the EDC control unit in order to activate the EHAB (e.g. for emergency engine shut-down).

For this reason, the **“ignition” must be turned on** when **bleeding the fuel system** by means of the presupply pump.







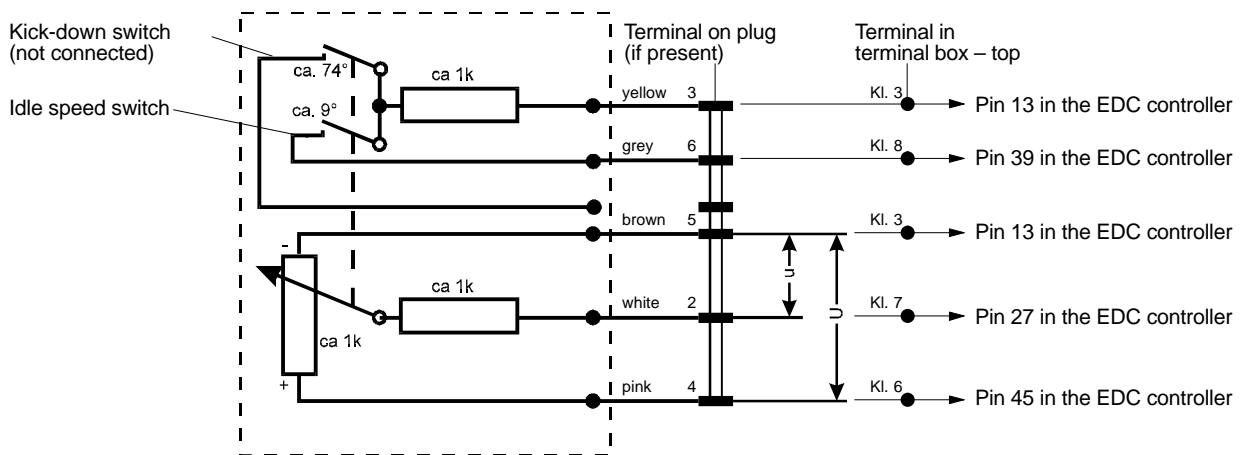
**Caution:**  
 Presupply pump integration in the fuel circuit should be checked according to pump type.

## Pedal value transmitter (hand throttle signal)

### Function

The pedal value transmitter (hand throttle signal) transmits the driver's requirement to the control unit in the form of voltage inputs. Then control unit uses these inputs to calculate the correct injection quantity.

### Block diagram

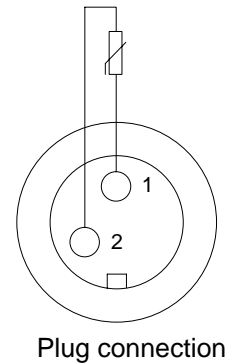
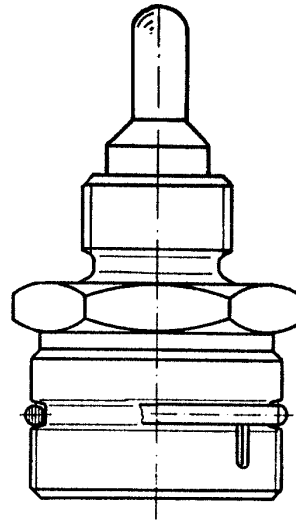
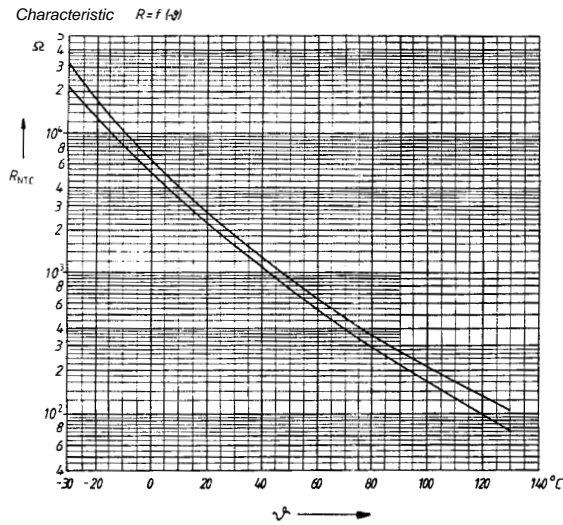


U = Reference voltage, approx. 5 V from the EDC control unit

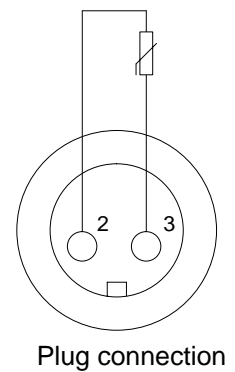
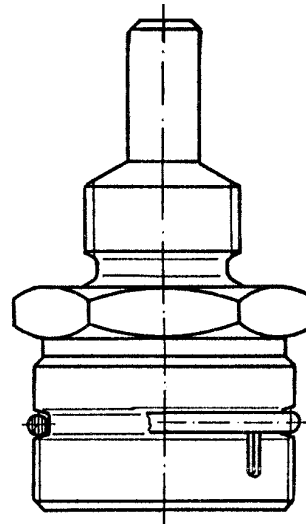
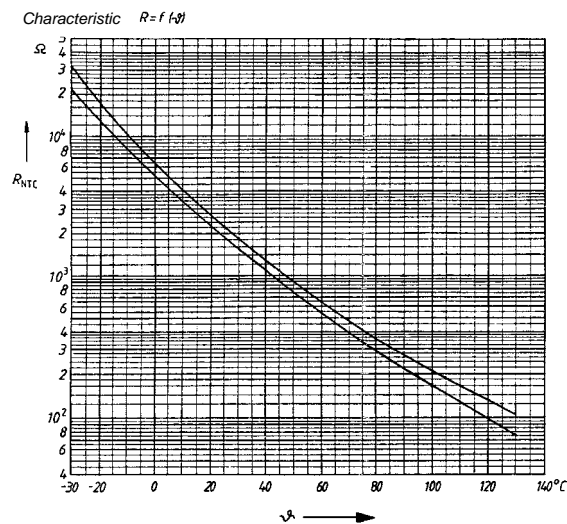
u = Setpoint

## Temperature sensors for charge air, coolant and fuel

### Turbo air



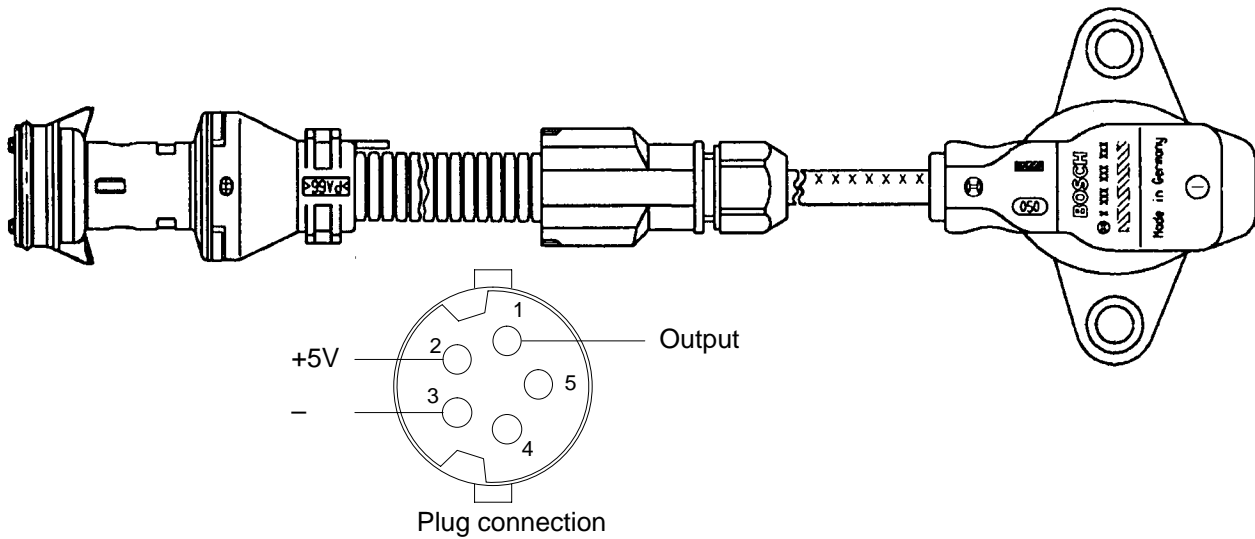
### Coolant temperature sensor, Fuel temperature sensor



### Function

The temperature sensors for charge air, coolant and fuel are NTC resistors. The coolant temperature sensor is located in the coolant circuit, the charge-air temperature sensor is located in the charge-air circuit downstream of the charge-air cooler and the fuel temperature sensor is located in the fuel circuit. They supply the control unit with information on the coolant, fuel and charge-air temperatures.

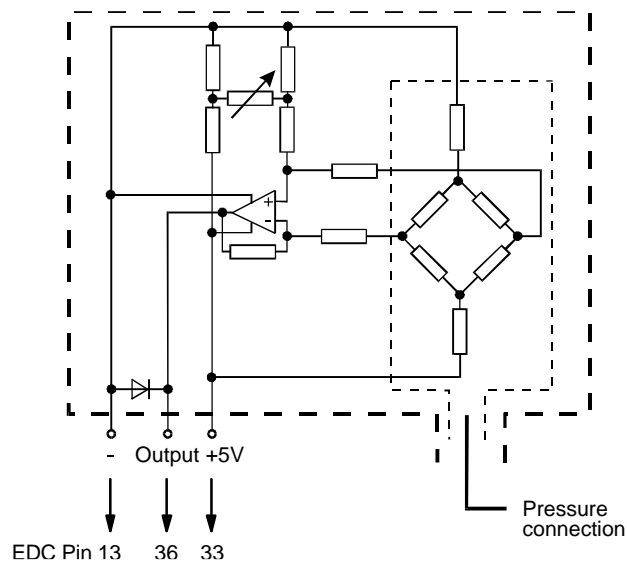
## Turbo pressure sensor



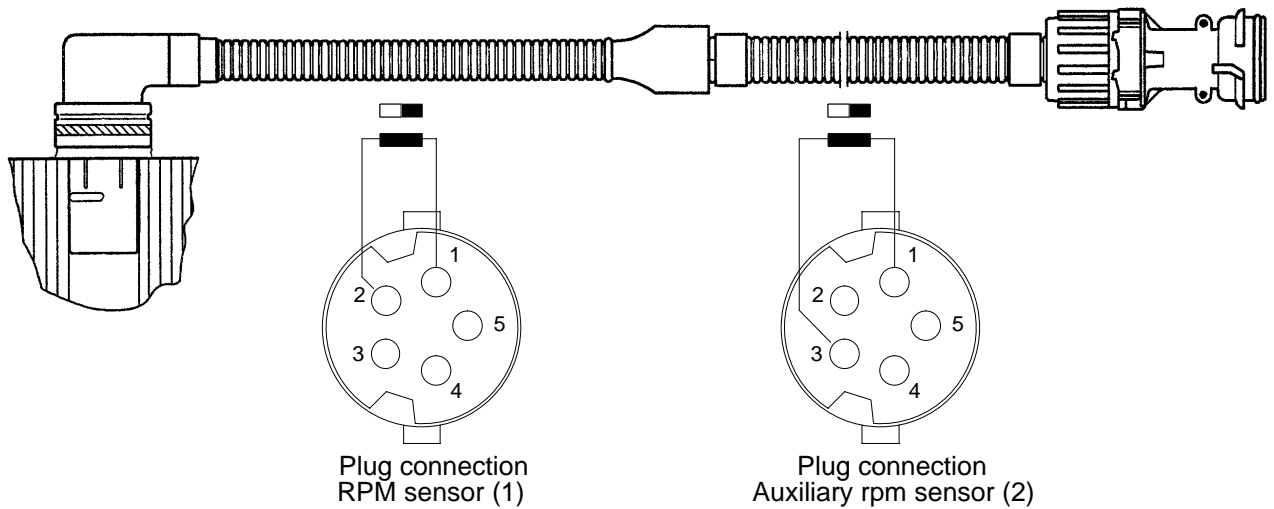
### Function

The pressure sensor element consists of an Si diaphragm which contains several piezo-resistive (pressure-sensitive) semiconductor resistors. The pressure to be measured “deflects” the sprung diaphragms. As a result, extended or compressed zones are created on the surface of the diaphragms. The action of these forces changes the electrical ratings of semiconductor resistor arrays arranged in these zones. These values are a measure for the pressure to be measured.

### Circuit diagram



## RPM sensor



### Function

The rpm sensor consists of a permanent magnet and a coil with a high number of windings. The magnet “touches” the rotating component to be measured, normally a crown gear or grooved ring gear, with its magnetic field.

If the EDC-M(S) 5 system is fitted, the marine engine is provided with 6 rivets on the flywheel.

When a groove moves past the sensor, the magnetic flux increases and, conversely, decreases in the gaps between the grooves. This generates an induction voltage in the sensor coil which is measured by the electronic control. The distance between the sensor and the grooved ring gear is approx. 1 mm.

Two rpm sensors are required to ensure reliable operation of the EDC system. Both rpm sensors are installed in the flywheel housing.

A distinction is made between the rpm sensor and the auxiliary rpm sensor.

The signals of the auxiliary rpm sensor are used only for redundant engine speed sensing.

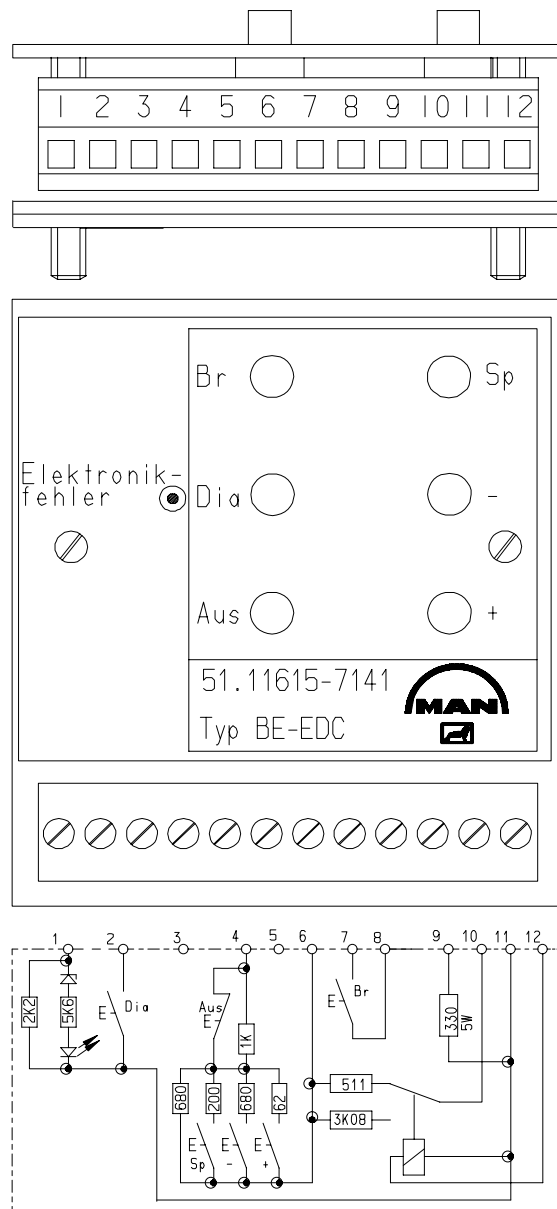
#### Caution:

**Do not confuse installation locations of the rpm sensor (1) and the auxiliary rpm sensor (2), nor the “+” and “-” wires of the sensors.**

## EDC operating element

### Function

The EDC operating element is used for setting the idle speed and for requesting an EDC fault diagnosis. It contains resistors and is the interface to the engine monitoring system.



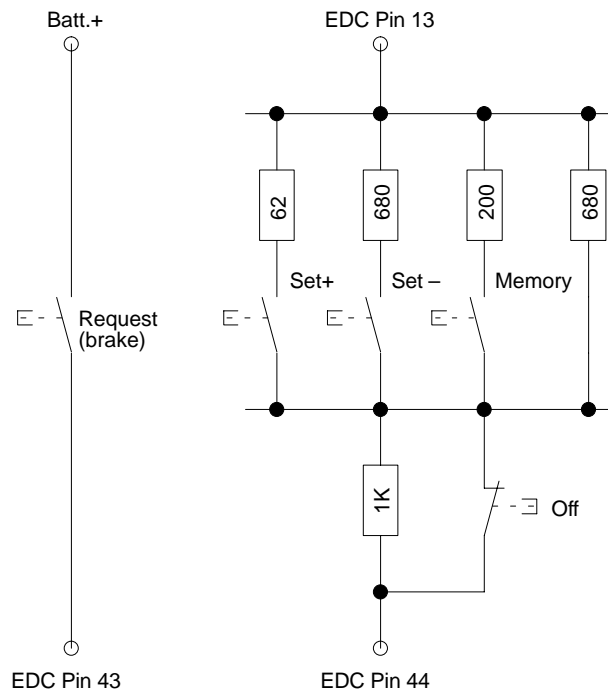
- Dia – Diagnosis request button
- Aus – "OFF"
- Br – "Brake contact"
- Sp – Memory
- + – Button for increasing idle speed
- – Button for reducing idle speed

## Start procedure

No pedal value transmitter input is necessary for starting.

## Changing idle speed – EDC operating element

The idle speed is set to 600 rpm in the works. If necessary, the idle speed can be set anywhere between 600 rpm and 750 rpm with the engine at operating temperature (from approx. 30°C).



### Engine running:

- **Press and hold** request button (Br="brake") **during the entire following procedure**
- Press and hold memory button (Sp) for at least 5 seconds
- Idle speed is dropping to 600 rpm
- Press SET+ button
- The idle speed increases by approx. 10 rpm every time the SET+ button is pressed
- Actuating SET+ six times sets a speed of 660 rpm
- Press and hold memory button (Sp) for 5 seconds once more
- Release Br button

The set idle speed is now retained even after turning off the ignition.



## Notes on operation

---

Proceed as follows to reset the works idle speed of 600 rpm:

After pressing the request button (Br="brake"), press and hold the memory button for approx. 5 seconds.

The idle speed now drops back to 600 rpm.

Then press and hold the memory button for a further 5 seconds while still pressing the request button (BR="brake"). Release Br button.

The works idle speed of 600 rpm is now reset.



## General

The EDC system continuously checks itself by means of a signal-range check. During this check, all signals are scanned for presence and plausibility within a certain time frame (determined by the software).

The control unit itself is also checked during the entire program run. The first check is always carried out when the “ignition” is turned on.

The diagnostic check lamp on the EDC operating element will come on for about 2 seconds.

Any faults occurring during operation are stored for the purpose of subsequent diagnosis. A maximum of 5 faults can be stored simultaneously in the fault code memory. The faults are stored in the same order in which they occurred. If more than 5 faults occur, the least significant fault is deleted.

### Fault storage includes

- allocation of fault priority,
- identification of the type of fault,
- recording of fault frequency.

Sporadic faults are recorded by a frequency counter the first time they occur. This means that a certain frequency number is set which is decremented by one during every start procedure. If the fault no longer occurs, it is deleted when the counter reaches zero.

The diagnostic lamp lights steadily or goes out depending on the fault significance for the purpose of fault signalling. If several faults are stored, the **steady light** has priority over **OFF**.

Only faults currently present are indicated. Faults which are stored but are not currently present are not indicated.

### **There are two fault code memories:**

- Fault code memory for diagnosis via ISO interface. This memory can be read and deleted with MAN-Cats
- Fault code memory for diagnosis via flash code. The flash code memory can be read out and deleted with the aid of the diagnosis button

Faults are always entered in both fault code memories simultaneously and persist after the ignition has been switched off and on again.

### **Indicator lamp check:**

The EDC indicator lamp lights for approx. 2 seconds after turning on the ignition as a lamp test.

The following measures are implemented automatically depending on the significance of the fault:

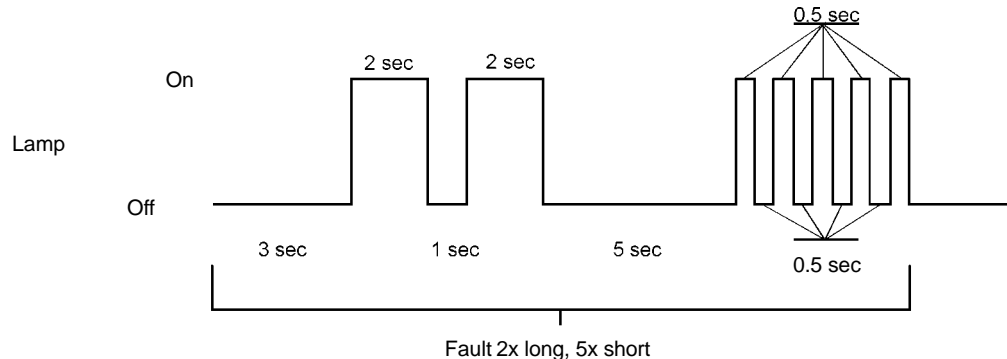
- Switching over to suitable replacement function for continued but restricted engine operation, ie engine speed reduced to approx. 1,500 – 1,700 rpm
- Reduction of engine speed to idle speed
- Immediate shutdown of the engine if required for safety reasons. Depending on the type of fault, engine shutdown takes place by reducing the fuel delivery volume to zero or by way of emergency shutdown with EHAB.

## Flash code

### To read out fault code memory

- If engine is stationary or running and "ignition system" is switched on, press diagnosis request button (Dia button on the EDC operating element) for at least 2 seconds. Diagnosis lamp does not come on
- The flash procedure starts after a pause of approx. 3 seconds. The flash code is divided into long and short pulses
- The diagnostic system always outputs only one fault at a time. In order to check whether several faults are stored, the fault scanning procedure must be repeated until the fault last indicated reappears

### Example of flash code outputs



OFF phase before output:	3 seconds
ON duration of a long pulse:	2 seconds
OFF phase between two long pulses:	1 second
OFF phase between long and short pulses:	5 seconds
ON duration of a short pulse:	0.5 seconds
OFF phase between two short pulses:	0.5 seconds

### To delete fault code memory

1. Press and keep request button depressed
2. Turn on "ignition"
3. Keep request button depressed for another 3 seconds, but not longer than 10 seconds

Now only the fault memory of the flashcode diagnosis is deleted.

The second fault memory can be read and deleted only with MAN-Cats.

## Fault code output MAN M(S)5 EDC

Overview of flashcodes				
Number of flashes		Description	Steady light fault	See Page
Long	Short			
0	0	No fault stored		
	1	Pedal value transmitter (hand throttle signal)	yes	33
	3	Boost air temperature sensing	no	34
	4	Engine speed sensing (rpm sensor, DZG, 1)	yes	35
	5	Boost pressure sensing	yes	36
	6	Control rod position sensing	yes	37
	7	Coolant temperature sensing	yes	38
	10	Fuel-delivery regulator monitoring	yes	39
	14	Engine speed sensing (auxiliary rpm sensor, HZG, 2)	yes	40
1	1	Fuel temperature reader	no	41
1	3	Undervoltage	no	42
1	4	Request button (brake)	no	43
1	6	Control unit (Computer coupling)	yes	44
1	7	Overrevving	yes	45
1	12	Multistage switch for engine speed	yes	46
1	13	EDC operating element for idle speed setting	no	47
2	5	Main relay sticking	no	48
2	8	Atmospheric pressure sensing	yes	49
3	1	Redundant cutout device (EHAB)	yes	50
3	2	Control unit EEPROM computer, 1 fault	yes	51
3	3	Control unit EEPROM computer, 2 faults	yes	52
3	4	Externer Stop-Schalter	no	53
3	8	Afterrunning not completed	yes	54
3	9	Control unit, after-running watchdog fault	yes	55
3	10	Control rod travel transmitter – loose contact	no	56

## List of checking procedures for EDC M(S) 5 stage 3

### 1. Checks while engine is stationary (Ignition off, control unit not connected)

- Engine temperature approx. 25°C
- Control unit not (!!!) connected, cable harness adapter connected
- Measure resistance between PIN+ and PIN– with multimeter

	PIN+	PIN–	Set-point value	Measured value	
Control rod position transducer <sup>1)</sup> (Rack travel sensor)	11	9	18 – 25 Ω	..... Ω	
	11	10	18 – 25 Ω	..... Ω	
	18	9	>10 MΩ	..... MΩ	
	18	10	>10 M Ω	..... MΩ	
RPM sensor (DZG) <sup>3)</sup>	-0005 -0008	21	13	0.5 – 0,7 kΩ	..... kΩ
				0.8 – 1,0 kΩ	..... kΩ
Auxiliary rpm sensor <sup>3)</sup> (HZG)	-0006 -0009	22	17	0.5 – 0,7 kΩ	..... kΩ
				0.8 – 1,0 kΩ	..... kΩ
Fuel-delivery regulator	15	1	0,7 – 1,3 Ω	..... Ω	
	18	1	>10MΩ	..... MΩ	
	16	2	0,7 – 1,3 Ω	..... Ω	
Ground	13	18	>10 MΩ	..... MΩ	
	17	19	>10 MΩ	..... MΩ	
EHAB	14	19	30 – 70 Ω	..... Ω	
The following checks may be carried out in addition to the voltage measurements (see below).					
Coolant temperature sensor	53	13	1,3 – 3,6 kΩ <sup>2)</sup>	..... kΩ	
Fuel temperature sensor	34	13	1,3 – 3,6 kΩ	..... kΩ	
Boost air temperature sensor	55	13	1,3 – 3,6 kΩ	..... kΩ	
Boost pressure sensor	33, 36	13	Resistance measurement not appropriate		
Multistage switch	35	13			
No reduction active			500 – 520 Ω	..... Ω	
Operating element for idle speed adjustment	44	13			
Non-actuated			550 – 700 Ω	..... Ω	
"Sp" button actuated			125 – 160 Ω	..... Ω	
"SET+" button actuated			50 – 70 Ω	..... Ω	
"SET–" button actuated			280 – 350 Ω	..... Ω	
"OFF" button actuated			930 – 1940 Ω	..... Ω	

- 1) Exact measurements are possible only at defined temperatures.
- 2) Resistance approx. 230 – 460 W with engine at operating temperature (approx. 80 °C)
- 3) Since August 97 new speed pick-ups DG6 (51.27120-0008/ -0009) have been installed. Their electrical resistance differs from that of the old speed pick-ups DG2 (51.27120-0005/-0006), but they are otherwise identical in function.

## 2. Checks while engine is running and ship is stationary (not coupled)

- Engine temperature approx. 30°C
- Cable harness adapter is connected up to control unit
- Measure speed at the following operating points
- Check with MAN-Cats Monitoring 2

	Set-point value	Measured value	Remark	MAN-Cats
RPM sensor (DZG)	n lower idle speed	n=.....1/min	PWG Min (u.LL)	Engine speed
	n top idle speed	n=.....1/min	PWG Max (o.LL)	(Monitoring 2)
Auxiliary rpm sensor (HZG)	n lower idle speed	n=.....1/min	PWG Min (u.LL)	Engine speed
	n top idle speed	n=.....1/min	PWG Max (o.LL)	(Monitoring 2)

- Measure voltage between PIN+ and PIN– with multimeter

	PIN+	PIN–	Set-point value [V]	Measured value [V]	Remark	Engine speed	MAN-Cats (Monitoring)
Supply of control unit (U-Batt)	15	18	U <sub>BAT</sub>	.....		idle speed	
	47	19	U <sub>BAT</sub>	.....			
Reference voltage (Uref)	45	13	4,75 - 5,25	.....		idle speed	
	33	13	4,75 - 5,25	.....			
Pedal value transmitter (PWG, hand throttle signal)	27	13	0,30 - 0,42	.....	PWG Min	idle speed	0%
			2,90 - 4,50	.....	PWG Max	Top idle s.	100%
Idle speed switch (LGS, normally open)	39	13	4,75 - 5,25	.....	PWG Min	idle speed	open
			0 - 2,00	.....	PWG Max	Top idle s.	closed
Fuel temperature sensor (KTF)	34	13	4,17 - 2,62	.....	10 - 50°C	idle speed	10 - 50°C
Water temperature sensor (WTF)	53	13	3,46 - 1,22	.....	30 - 90°C	idle speed	30 - 90°C
Charge-air temperature sensor (LTF)	55	13	4,17 - 2,62	.....	10 - 50°C	idle speed	10 - 50°C
Charge-air pressure sensor (LDF)	36	13	0,94 - 1,20	.....	PWG Min	idle speed	0 - 100 mbar
			1,10 - 1,70	.....	PWG Max	Top idle s.	300 - 600 mbar
Multistage switch (MSS) No reduction active Speed reduction active Speed reduction active	35	13	0,75 - 1,25	.....	Pos 0	idle speed	Cruising characteristic Multistage switch pos1 Multistage switch pos2 Multistage switch pos3
			1,75 - 2,25	.....	Pos 1		
			2,75 - 3,25	.....	Pos 2		
			3,75 - 4,25	.....	Pos 3		
Brake contact switch (normally open) *	43	19	0,0 - 2,0 U-Batt	.....	non-act. actuated	idle speed	open closed
Operating unit for setting idle speed	44	13	3,15 - 3,55	.....	Sp act.	idle speed	Neutral Memory SET+ SET- Off
			1,41 - 1,80	.....	SET+ act.		
			0,65 - 0,97	.....	SET- act.		
			2,30 - 2,75	.....	SET- act.		
			3,72 - 4,33	.....	Aus act.		
Engine stop (keep stop button depressed)	50	18	0,0 - 2,0 U-Batt	.....	non-act. actuated		

\* "Br" button on EDC operating element for idle engine speed adjustment

– Check main relay

	PIN+	PIN–	Set-point value [V]	Measured value [V]	Remark
Main relay *	47	18	U-Batt	.....	Ignition sys. on
			0 V	.....	Ignition sys. off
	46	18	0 V	.....	Ignition sys. on
	–	–	U-Batt	.....	Ignition sys. off

\* Pin 46 (main relay activation) must switch to  $U_{batt}$  with a delay of 0.5 to 5 seconds after “ignition” is switched off.

– **EHAB check**

- PWG max, engine running at upper idle speed
- Interrupt voltage supply to EHAB (EDC pin 14), engine stops (max. 10 secs.)

– **Check flashcode diagnosis:**

- Engine at idle speed; connect EDC pins 21 and 13 (short-circuit speed pickup)
- EDC check lamp must come on (permanently illuminated); engine continues to run
- Query flashcode (connect EDC pins 49 and 19 for at least 2 secs. or actuate diagnosis button for at least 2 secs. but not longer than 10 secs.)
- Flashcode for “pickup defective” must be indicated (4 x brief flashes) **or**
- Read out fault memory with MAN-Cats (defect in speed pickup momentarily present)
- Disconnect pins 21 and 13 again
- Delete fault memory: switch off ignition system, actuate diagnosis button, switch on ignition system, actuate button for at least 3 secs. but not longer than 10 secs

– **Checking of capacity reserve of resonant circuit of control rod travel transmitter: (Check only if the engine has general difficulties in starting)**

- Connect decade capacitor between pins 11 and 13 (on cable harness adapter)
- Add auxiliary capacity until engine no longer starts and note down value
- The capacity reserve of the resonant circuit of the control rod travel transmitter is to be at least 400 pF. If a Bosch cable harness adapter with approx. 100 pF is used, the set-point value of the additional capacity is to be > 300 pF.

– **Deleting of fault memory**

After completion of the checks the fault memory must be deleted with MAN-Cats. Once the ignition system has been switched on again there must be no fault stored; otherwise the fault must be traced and eliminated according to the troubleshooting plan.

# Troubleshooting chart



1. EDC self-diagnosis or flash code output										
2. Starter turns over engine only slowly or not at all										
3. Starter turns, engine does not start, engine does not start/difficult to start when cold										
4. Engine stalls (dies) during operation, no longer starts (starter turns), engine does not start/starts with difficulty when hot										
5. Sudden, temporary engine shutdown, engine does not reach full revs										
6. Engine only runs at idle speed, no throttle response										
7. Engine only runs at increased idle speed, no throttle response										
8. Rated engine speed distinctly reduced (even under no load)										
9. Reduced output in all ranges										
10. Irregular engine operation, traction loss										
11. Unstable idle speed, engine hunting, misfiring, knocking in engine										
12. Engine judder										
13. Unusual combustion noise										
14. Excessive smoke emission: White smoke/blue smoke										
15. Excessive smoke emission: Black smoke										
16. Engine temperature too high (coolant loss)										
17. Fuel consumption too high										
18. Lubricating oil pressure too low										
19. Lubricating oil pressure too high										
20. Lubricating oil consumption too high										
21. Engine too "loud"/mechanical noise										
22. Idle speed cannot be adjusted with idle speed operating unit										
<b>Possible causes</b>										
x	x									Batteries discharged, battery lead connections loose or corroded, break in power circuit
	x									Crank gear blocked
x	x									Starter solenoid switch sticks (clicks)/defective, cable connection loose or damaged
x	x									Starter/starter interlock relay defective (carbon brushes worked loose/worn, winding defective, short to ground)
						x	x	x		Engine oil viscosity unsuitable, not suitable for ambient temperature, lubricating oil quality does not correspond to specifications
									x	Oil level in sump too high
									x	Oil level in sump too low, oil in sump too thin (mixed with condensate or fuel)
									x	Engine temperature too high
									x	Oil filter clogged
									x x	Oil pressure gauge defective
									x	Safety valve in oil circuit defective (does not close, spring fatigued or broken)
									x	Bearing wear
									x	Oil pump gears worn
									x	Crankshaft timing gears worn, tooth flank backlash too great
									x	Engine cold
									x	Lubricating oil entering combustion chamber (piston rings worn, piston rings broken) – valve stem guide worn – overpressure in crankcase (crankcase vent clogged)
									x	Relief valve in oil circuit defective (does not open), oil lines/oil galleries clogged
									x	Leaks in lubricating oil circuit, particularly at turbocharger and oil cooler
									x	Piston rings heavily worn, broken
									x	Piston pin or crankshaft bearing loose
									x	Valve stems worn, bent
									x	Valve clearance not correct
									x	Valves jam
									x	Compression deficient, or more than 3 – 4 bar pressure difference between individual cylinders
									x	Valve seats leaking
									x	Increased power intake due to defective secondary consumers such as hydraulic pumps, fan etc., power take-off engaged
									x	Air cleaner soiled or clogged, turbo air system leaking, air inlet/exhaust line clogged/leaking
									x	Fuel low pressure system: Fuel tank, prefilter, water trap faulty/clogged/mould/fungal attack, fuel unsuitable/contaminated (paraffin added)

x = Possible  
o = Probable



# Troubleshooting chart

1.	EDC self-diagnosis or flash code output				
2.	Starter turns over engine only slowly or not at all				
3.	Starter turns, engine does not start, engine does not start/difficult to start when cold				
4.	Engine stalls (dies) during operation, no longer starts (starter turns), engine does not start/starts with difficulty when hot				
5.	Sudden, temporary engine shutdown, engine does not reach full revs				
6.	Engine only runs at idle speed, no throttle response				
7.	Engine only runs at increased idle speed, no throttle response				
8.	Rated engine speed distinctly reduced (even under no load)				
9.	Reduced output in all ranges				
10.	Irregular engine operation, traction loss				
11.	Unstable idle speed, engine hunting, misfiring, knocking in engine				
12.	Engine judder				
13.	Unusual combustion noise				
14.	Excessive smoke emission: White smoke/blue smoke				
15.	Excessive smoke emission: Black smoke				
16.	Engine temperature too high (coolant loss)				
17.	Fuel consumption too high				
18.	Lubricating oil pressure too low				
19.	Lubricating oil pressure too high				
20.	Lubricating oil consumption too high				
21.	Engine too "loud"/mechanical noise				
22.	Idle speed cannot be adjusted with idle speed operating unit				
					<b>Possible causes</b>
x x x	x x x	x	x		Fuel low pressure system: Fuel lines leaking, broken, clogged
x x x	x x x x				Fuel low pressure system: Air in system (turn on ignition when bleeding system)
x x x	x x x x x	x	x		Fuel low pressure system: Fuel pump, overflow valve, main filter
x	x x x x o x	x			Fuel high pressure system: Jets defective/clogged/leaking/coked
	x x x x		o		Fuel high pressure system: Pressure lines – constriction, cavitation, leaking
x	x o x x x x		o		Fuel high pressure system: Injection pump worn/set incorrectly
	o x o		o		Fuel high pressure system: Injection pump constant-pressure control valve/return flow restrictor defective
x x x	x o x				EHAB defective, drive faulty
o o	o x o x x	x			Injection pump-engine allocation: Start of delivery incorrect (basic installation), start of delivery set incorrectly
x x x x	o x o				Injection pump – controller: Stiff movement – fuel delivery controller (control deviation)
x x x x	o				Control rod position transducer in controller: Connection lines, break, short-circuit
o	o		o		Control rod position transducer in controller: Set incorrectly
x x o					Control rod position transducer in controller: Capacitance reserve of wiring harness too low (e.g. water penetrated wiring harness)
	x o x o o				Injection pump: Delivery set incorrectly/uniform delivery, lower idle speed set too low
x o x x				x	Delivery actuating solenoid in controller: Connection lines, break, short-circuit
x	x x x x o				Pedal value transmitter (hand throttle signal) defective: Connection lines, short-circuit, break
x	x				EDC rpm sensor defective, implausible with auxiliary rpm sensor, line defective
	x x o				EDC rpm sensor, polarity reversed
x	x				EDC auxiliary rpm sensor defective, implausible with rpm sensor, line defective
x x x x o	o o		o		EDC detects incorrect engine speed (interference signal on rpm sensor line)
x x x x		o			Both rpm sensors defective, line defective
x	x		x		EDC turbo pressure sensor: Defective, incorrect, implausible with atmospheric pressure sensor, line defective
	x x o x				Exhaust turbocharger leaking or defective
				x	Turbine and compressor rotor in turbocharger dirty (out-of-balance, irregular running)
				x	Intercooler leaking, defective
x			x		Charge-air preheater defective
x o	x x	o	x		EDC coolant temperature sensor: Defective, line defective
x	x x				EDC turbo air temperature sensor: Defective, line defective
o	x		x		Radiator dirty or failure of cooling system (temperatures too high)
			x		Coolant level too low, air in coolant circuit

x = Possible  
o = Probable



# Troubleshooting chart



1.	EDC self-diagnosis or flash code output							
2.	Starter turns over engine only slowly or not at all							
3.	Starter turns, engine does not start, engine does not start/difficult to start when cold							
4.	Engine stalls (dies) during operation, no longer starts (starter turns), engine does not start/starts with difficulty when hot							
5.	Sudden, temporary engine shutdown, engine does not reach full revs							
6.	Engine only runs at idle speed, no throttle response							
7.	Engine only runs at increased idle speed, no throttle response							
8.	Rated engine speed distinctly reduced (even under no load)							
9.	Reduced output in all ranges							
10.	Irregular engine operation, traction loss							
11.	Unstable idle speed, engine hunting, misfiring, knocking in engine							
12.	Engine judder							
13.	Unusual combustion noise							
14.	Excessive smoke emission: White smoke/blue smoke							
15.	Excessive smoke emission: Black smoke							
16.	Engine temperature too high (coolant loss)							
17.	Fuel consumption too high							
18.	Lubricating oil pressure too low							
19.	Lubricating oil pressure too high							
20.	Lubricating oil consumption too high							
21.	Engine too "loud"/mechanical noise							
22.	Idle speed cannot be adjusted with idle speed operating unit							
				<b>Possible causes</b>				
			x	V-belt for water pump drive not tensioned correctly				
			x	x	Incorrect V-belt tension			
			x		Water pump leaking, defective/thermostat defective, does not open			
			x		Coolant lines leaking, clogged or twisted			
			x		Coolant entering combustion chamber (cylinder head/gasket leaking)			
		x	x	x	o	Resistor bank EDC control unit pin 35		
x	x	x	o		o	Power supply to EDC control unit interrupted or battery voltage too low		
	x	x	o		o	Line terminal 15 to EDC control unit pin 47 interrupted/loose contact		
x						x	Operating unit for setting idle speed/resistor bank pin 44: Voltage values incorrect/implausible, operating unit switched off	
x	o	o	o				EDC control unit defective (internal fault)	
	x		x	x	o	o	x	Incorrect EDC control unit (check MAN part number)
	x							EOL programming terminated/voltage interrupt
x								Afterrunning not completed
							x	EOL programming: Configuration incorrect
		x					x	Thermostat defective
				x				Engine bearings worn

x = Possible  
o = Probable

The following troubleshooting program contains all faults which can be recognised by EDC diagnosis.

The order corresponds to the numerical sequence of the flash code, irrespective of the significance of the fault.

It is therefore not arranged on the basis of “fault is indicated by EDC indicator lamp” or “fault is not indicated by EDC indicator lamp”.

The entire fault code memory should always be read out and all stored fault codes noted down before starting the engine test.

**This is important because lines or components need to be disconnected during troubleshooting in the system this can cause the corresponding fault codes to be set and stored.**

**For this reason, the fault code memory should always be deleted after intermediate checks.**

The “check lines” test step must always be worked through as follows:

- Break or contact resistance  
Setpoint: approx. 0  $\Omega$
- Short to negative  
Setpoint:  $\infty \Omega$
- Short to positive  
Setpoint:  $\infty \Omega$
- Short to adjacent lines  
Setpoint:  $\infty \Omega$
- Loose contacts

After rectifying faults and checking, repeat test and delete fault code memory.

All checks which refer to the control unit plug connector are conducted with the aid of the socket box. The pin designations at the control unit plug connector are identical to those of the test sockets on the socket box.

**Note:**

**The connection to the control unit must be disconnected at the socket box when conducting resistance measurements.**

**Pedal value transmitter (PWG, hand throttle signal)**

- Flash code:** 1x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Pedal value transmitter (PWG, hand throttle signal)
- Signal too high
  - Signal too low
  - Signal implausible with idle speed switch (in pedal value transmitter)
- Effect of fault:** Engine assumes lower idle speed  
Driving with idle speed switch:
- Hand throttle in idle speed position: idle speed
  - Hand throttle in full-load position slow increase in engine speed to approx. 1,500 – 1,700 rpm.
- Possible cause:** Line break, short-circuit, power supply interrupted, Pedal value transmitter defective, control unit defective
- Test precondition:** EDC control unit connected  
Socket box connected  
“Ignition” switched on

Test	Measurement	Corrective measures
Power supply	Measure voltage at socket box across pin 45 (+) and pin 13 (–)  <b>Setpoint:</b> 4,75 – 5,25 V	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– If no fault found, replace control unit</li> </ul>
Potentiometer signal  PWG Min. 0 % PWG Max. 100 %	Measure voltage at socket box across pin 27 (+) and pin 13 (–)  <b>Setpoints:</b> Idle speed setting: 0,3 – 0,42 V Full load setting: 2,9 – 4,5 V	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– Check mechanical connection between hand throttle and pedal value transmitter</li> <li>– Check idle-speed and full-load stops of the pedal value transmitters</li> <li>– Exchange pedal value transmitter</li> </ul>
Idle speed switch  PWG Min. 0 % PWG Max. 100 %	Measure voltage at socket box across pin 39 (+) and pin 13 (–)  <b>Setpoints:</b> Idle speed setting: 4,75 – 5,25 V Full load setting: 0,0 – 2,0 V	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– Check mechanical connection between hand throttle and pedal value transmitter</li> <li>– Check idle-speed and full-load stops of the pedal value transmitters</li> <li>– Exchange pedal value transmitter</li> </ul> <p>Switch open Switch closed</p>

## Boost air temperature sensor

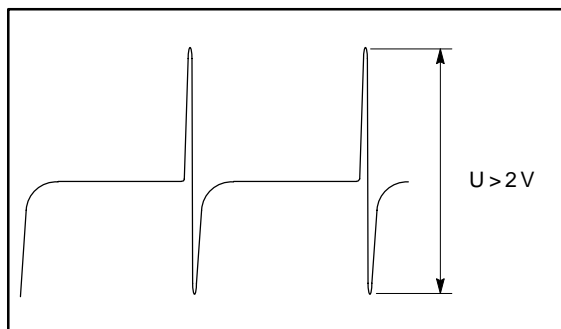
- Flash code:** 3x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Turbo air temperature sensor
- Effect of fault:** This fault has no direct effect.  
The substitute value specified for such instances in the control unit may lead to a slight reduction in output
- Possible cause:** Line break, short-circuit, turbo air temperature sensor defective, control unit defective, failure or contamination of cooling system.
- Test precondition:** EDC control unit disconnected/connected  
Socket box connected

Test	Measurement	Corrective measures
Sensor resistance	Measure resistance at socket box across pin 55 and pin 13  <b>Setpoint:</b> 3,8 – 0,8 kΩ at 10-50°C	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– Replace temperature sensor</li> <li>– If no fault found, replace control unit</li> </ul>
Sensor voltage	Measure voltage at socket box across pin 55 and pin 13  <b>Setpoint:</b> 4,17 – 2,62 V at 10-50°C	

### Speed sensor

- Flash code:** 4x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** RPM sensor  
 – Statically implausible  
 – Dynamically implausible  
 – Implausible with auxiliary rpm sensor
- Effect of fault:** Reduced full load delivery volume  
 Reduced final engine speed  $n = 2,000 \dots 2,100$  rpm  
 If the auxiliary rpm sensor also fails, the engine will be shut down by EHAB
- Possible cause:** Line break, short to ground, rpm sensor defective, control unit defective
- Test precondition:** Disconnect EDC control unit to ensure the engine cannot start up  
 Socket box connected

Test	Measurement	Corrective measures
Resistance	Measure resistance at socket box across pin 21 and pin 13  <b>Setpoint:</b> 500 – 700 $\Omega$	– Check lines – Check plug connections – If no fault found, replace rpm sensor
Engine speed signal	Check signal at socket box at starting speed across pin 21 (+) and pin 13 (–) with oscilloscope  <b>Setpoint:</b> See figure	



## Boost pressure sensor

- Flash code:** 5x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Turbo pressure sensor
- Signal too high
  - Signal too low
  - Signal implausible with atmospheric pressure sensor (in control unit)
- Effect of fault:** Reduced full load delivery volume (engine runs only with intake delivery volume)
- Possible cause:** Line break, short-circuit, boost pressure sensor defective, control unit defective
- Test precondition:** EDC control unit connected  
Socket box connected  
“Ignition” switched on

Test	Measurement	Corrective measures
Power supply	Measure voltage at socket box across pin 36 (+) and pin 13 (–)  <b>Setpoint:</b> 4.95 – 5.05 V	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– If no fault found, replace control unit</li> </ul>
Signal voltage	Measure voltage at socket box across pin 36 (+) and pin 13 (–)  <b>Setpoints:</b> Lower idle speed: 0.94 – 1.20 V Upper idle speed: 1.10 – 1.40 V	
	If all values are OK, the atmospheric pressure sensor in the control unit may be defective	<ul style="list-style-type: none"> <li>– Replace control unit</li> </ul>

### Control rod position transducer

(Rack travel sensor)

- Flash code:** 6x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Control rod position transducer  
 – Signal too high  
 – Signal too low
- Effect of fault:** This fault results in the engine being shut down by setting the control travel to 0. The engine cannot be started if this fault is currently present (EDC control lamp permanently on)
- Possible cause:** Line break, short-circuit, too little capacitance reserve (see page 28), control rod position transducer set incorrectly, injection pump defective
- Test precondition:** EDC control unit disconnected  
 Socket box connected

Test	Measurement	Corrective measures
Test coil	Measure resistance at socket box across pin 11 and pin 9  <b>Setpoint:</b> 18 – 25 Ω	– Check lines – Check plug connections – If no fault found, repair injection pump
Reference coil	Measure resistance at socket box across pin 11 and pin 10  <b>Setpoint:</b> 18 – 25 Ω	
	Measure resistance at socket box across pin 18 and pin 9  <b>Setpoint:</b> > 10 MΩ	
	Measure resistance at socket box across pin 18 and pin 10  <b>Setpoint:</b> > 10 MΩ	
	In addition to the possibility of an electrical fault, the fault described here may also be caused by incorrect setting of the control rod position transducer	– Remove injection pump – Adjust control rod position transducer

## Coolant temperature sensor

- Flash code:** 7x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Coolant temperature sensor
- Effect of fault:** The substitute value provided in the control unit for such cases results in a reduction in power output  
An increased quantity of white smoke may be discharged during cold start
- Possible cause:** Line break, short-circuit, temperature sensor defective, control unit defective, failure or contamination of cooling system
- Test precondition:** EDC control unit disconnected/connected  
Socket box connected

Test	Measurement	Corrective measures
Sensor resistance (control unit disconnected)	Measure resistance at socket box across pin 53 and pin 13  <b>Setpoints:</b> 1.3 – 3.6 K $\Omega$ at 15 – 30°C 230 – 460 $\Omega$ at 75 – 80°C	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– Replace temperature sensor</li> <li>– If no fault found, replace control unit</li> </ul>
Sensor voltage (control unit connected)	Measure voltage at socket box across pin 53 and pin 13  <b>Setpoint:</b> 3.46 – 1.22 V at 30 – 90°C	



### Fuel-delivery regulator

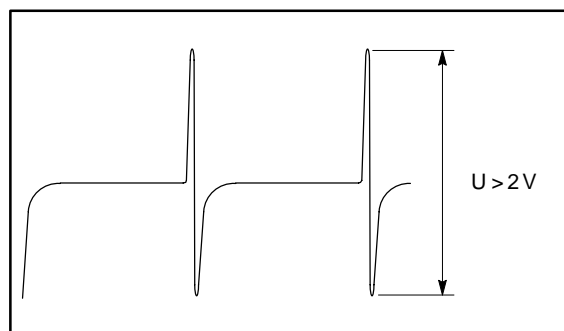
- Flash code:** 10x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Fuel delivery controller control deviation
- Effect of fault:** The setpoint – actual value comparison for activating the fuel delivery regulator has resulted in a control deviation which has exceeded a specified time threshold. This fault results in the engine being shut down. The engine can only be restarted when the fault is no longer present and the “ignition” is switched off and on again once
- Possible cause:** Line break, short-circuit, injection pump defective (internal fault in control unit or stiff movement), capacitance reserve of line leading to control rod position transducer too low (see page 28)
- Test precondition:** EDC control unit disconnected  
Socket box connected

Test	Measurement	Corrective measures
Actuating solenoid	Measure resistance at socket box across pin 15 and pin 1 and pin 16 and pin 2  <b>Setpoints:</b> 0.7 – 1.3 Ω  Measure resistance at socket box across pin 18 and pin 1 <b>Setpoint:</b> > 10 MΩ	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– If no fault found, replace injection pump</li> </ul>

## Auxiliary rpm sensor

- Flash code:** 14x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Auxiliary rpm sensor  
 – Statically implausible  
 – Dynamically implausible  
 – Implausible with rpm sensor
- Effect of fault:** Reduced full load delivery volume  
 Reduced final engine speed  $n = 2,000 \dots 2,100$  rpm  
 If the rpm sensor also fails, the engine will be shut down
- Possible cause:** Line break, short to ground, auxiliary rpm sensor defective, control unit defective
- Test precondition:** Disconnect EDC control unit to ensure the engine cannot start up  
 Socket box connected

Test	Measurement	Corrective measures
Resistance	Measure resistance at socket box across in 22 and pin 17  <b>Setpoint:</b> 500 – 700 $\Omega$	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– If no fault found, replace auxiliary rpm sensor</li> </ul>
Engine speed signal	Check signal at socket box at starting speed across pin 22 (+) and pin 17 (–) with oscilloscope  <b>Setpoint:</b> See figure	



### Fuel temperature sensor

- Flash code:** 1x long, 1x short
- Fault indication:** Fault is not indicated by EDC indicator lamp
- Fault path:** Fuel temperature sensor
- Effect of fault:** This fault has no direct effect.  
The substitute value specified for such instances in the control unit may lead to a slight reduction in output
- Possible cause:** Line break, short-circuit, Fuel temperature sensor defective, control unit defective, failure or contamination of cooling system
- Test precondition:** EDC control unit disconnected/connected  
Socket box connected

Test	Measurement	Corrective measures
Sensor resistance (control unit disconnected)	Measure resistance at socket box across pin 34 and pin 13  <b>Setpoint:</b> 1.3 – 3.6 K $\Omega$ at 15 – 30°C	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– Replace temperature sensor</li> <li>– If no fault found, replace control unit</li> </ul>
Sensor voltage (control unit connected)	Measure voltage at socket box across pin 34 and pin 13  <b>Setpoint:</b> 4.17 – 2.62 V at 10 – 50°C	

## Undervoltage

- Flash code:** 1x long, 3x short
- Fault indication:** Fault is not indicated by EDC indicator lamp
- Fault path:** Control unit power supply (battery voltage too low)
- Effect of fault:** The EDC system or the engine can behave in various ways depending on the magnitude of the voltage drop:
- No power
  - Highly irregular engine operation
  - No engine operation
  - Excessive smoke emission
  - Contradictory fault code memory entries
- Possible cause:** Battery discharged or defective, alternator defective, line break, short-circuit, main relay defective
- Test precondition:** EDC control unit disconnected  
Socket box connected  
“Ignition” switched on

Test	Measurement	Corrective measures
Power supply	<p>To activate the main relay, connect jumper across pin 46 and pin 19</p> <p>Measure voltage at socket box across pin 15/16 (+) and pin 18/19 (-)</p> <p><b>Setpoint:</b> 24 – 28 V</p>	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– Replace main relay</li> <li>– Check battery, generator and circuit breaker F1 on engine</li> </ul>

**Request button (brake)**

“Br” button on EDC operating element

- Flash code:** 1x long, 4x short
- Fault indication:** Fault is not indicated by EDC indicator lamp
- Fault path:** Request button
- Effect of fault:** Idle speed adjustment cannot be activated
- Possible cause:** Line break, request button defective
- Test precondition:** EDC control unit connected  
Socket box connected  
“Ignition” switched on

Test	Measurement	Corrective measures
Request button (brake)	Measure voltage at socket box across pin 43 (+) and pin 19 (-)  Button depressed: $U_{batt}$ Button not depressed: 0	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– Replace button</li> </ul>

## Control unit

- Flash code:** 1x long, 6x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Control unit defective (processor coupling)
- Effect of fault:** Engine is shut down by “no power applied to fuel delivery output stage” and control position 0.  
If this fault occurs only temporarily, the engine can be restarted by switching the “ignition” off and on again
- Possible cause:** Undervoltage (loose contact), control unit defective
- Test precondition:** EDC control unit connected

Test	Measurement	Corrective measures
Control unit	<p>This fault signal can also occur in the event of extremely low power supply (loose contacts or undervoltage)!</p> <p>Internal fault in control unit</p>	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– Replace control unit</li> </ul>

**Engine overspeed**

- Flash code:** 1x long, 7x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Engine overspeed
- Effect of fault:** Fuel delivery is interrupted. EHAB is deactivated.  
If no other fault is applicable, fuel delivery is continued on exiting engine overspeed
- Possible cause:** Control rod moves stiffly. Injection pump defective, control unit defective, wiring harness defective

Test	Measurement	Corrective measures
Injection pump	If no other faults exist, no further action is necessary	– Delete fault code memory
	If the fault occurs frequently, check injection pump, control unit and lines	– Replace lines – Replace control unit – Replace injection pump

## Multistage switch for engine speed

- Flash code:** 1x long, 12x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Multistage switch for engine speed reduction  
 – Voltage too high  
 – Voltage too low  
 – Wrong voltage
- Effect of fault:** No engine speed reduction possible
- Function:** Voltage signals are ascertained via the multistage input (control unit pin 35); their values are determined by external resistor interrupters in the EDC operating element
- Possible cause:** Line interruption, short circuit, resistor group in the EDC operating element defective (eg cold junction)
- Test precondition:** EDC control unit disconnected  
 Socket box connected

Test	Measurement	Corrective measures
Resistor bank	Measure resistance at socket box across pin 35 and pin 13  <b>Setpoint:</b> No engine speed reduction activated: 0,4 – 0,7 kΩ Engine speed reduction activated: 6,2 – 11,6 kΩ  The fault occurs even if the resistance is 0 Ω or ∞ Ω	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– Exchange EDC operating element</li> </ul>



### EDC operating element for idle speed setting

- Flash code:** 1x long, 13x short
- Fault indication:** Fault is not indicated by EDC indicator lamp
- Fault path:** Operating unit defective  
– Voltage values incorrect or implausible
- Effect of fault:** Idle speed control can no longer be activated.  
If the fault was only temporary (e.g. operating unit activated several times) the system will be ready for operation after switching the “ignition” off and on again.
- The operating unit is resistor-coded, i.e. the control unit recognizes each switching state according to the voltage level supplied. Faults are detected when incorrect values are output over a certain period of time; e.g. electrical fault or multiple operation (incorrect operation) of the operating unit
- Possible cause:** Line break, short-circuit, operating unit defective, incorrect operation
- Test precondition:** EDC control unit connected  
Socket box connected  
“Ignition” switched on

Test	Measurement	Corrective measures
Operating unit	<p>Measure voltage at socket box across pin 44 and pin 13</p> <p>Switch through all settings of the operating unit and determine relevant voltage value</p> <p><b>Setpoints:</b></p> <p>SET+: 0.65 – 0.97 V</p> <p>SET–: 2.31 – 2.75 V</p> <p>MEMORY: 1.41 – 1.81 V</p> <p>OFF: 4.00 – 4.32 V</p> <p>Not activated: 3.15 – 3.55 V</p>	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– Replace operating unit</li> <li>– If no fault found, replace control unit as a check</li> </ul>

## Main relay

- Flash code:** 2x long, 5x short
- Fault indication:** Fault is not indicated by EDC indicator lamp
- Fault path:** Main relay  
Contact sticks or jams (does not open)
- Effect of fault:** Under certain conditions this fault may not be detected
- Function:** The negative pole of the main relay is addressed by the EDC control unit through the control unit output pin 46. The main relay K1 switch off is delayed after the “ignition” is switched off (afterrunning).  
During the afterrunning phase, various processor functions are checked and any faults stored in the fault code memory
- Possible cause:** Short to ground, main relay K1 defective
- Test precondition:** EDC control unit connected  
Socket box connected

Test	Measurement	Corrective measures
Main relay	Measure voltage at socket box across pin 47 and pin 18  <b>Setpoints:</b> 0 V at “ignition” off $U_{batt}$ at “ignition” on  Measure voltage at socket box across pin 46 and pin 18  <b>Setpoints:</b> $U_{batt}$ at “ignition” off 0 V at “ignition” on	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– If line OK, replace main K1 relay</li> </ul>

**Note:** Pin 46 must switch to  $U_{batt}$  with a delay of up to 5 seconds after turning off the “ignition” (processor afterrunning)

**Atmospheric pressure sensor (in control unit)**

- Flash code:** 2x long, 8x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Atmospheric pressure sensor in control unit defective
- Effect of fault:** No direct effect  
In some cases, this may be accompanied by a turbo pressure sensor fault being signalled
- Possible cause:** Control unit defective

Test	Measurement	Corrective measures
Control unit	<p>If only this fault code is stored in the memory, testing is not possible as the sensor is located in the control unit.</p> <p>If, however, a faulty turbo pressure sensor is also detected, it should be checked first in accordance with the turbo pressure sensor test (page 36).</p>	<ul style="list-style-type: none"> <li>– Replace control unit</li> </ul>

## Electrohydraulic shut-off device EHAB

- Flash code:** 3x long, 1x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** EHAB function
- Effect of fault:** Engine is shut down  
Engine will not start  
(In this case, it is assumed that the fuel supply is OK)
- Function:** The EHAB performs an important safety function in its capacity as an independent, higher-ranking (redundant) engine shut-off device. The EHAB is activated in certain emergency situations when the engine can no longer be shut off by controlling fuel delivery to zero – e.g. control rod jammed. The EHAB reduces the pressure in the suction chamber of the injection pump thus interrupting filling.
- Possible cause:** Line break, short-circuit, EHAB defective, faulty activation from control unit (control unit defective)
- Test precondition:** EDC control unit connected  
Socket box connected

Test	Measurement	Corrective measures
Coil resistance	"Ignition" switched off Control unit disconnected Measure resistance at socket box across pin 14 and pin 19  <b>Setpoint:</b> 30 – 70 Ω	<ul style="list-style-type: none"> <li>– Check line</li> <li>– Check plug connection</li> <li>– Replace EHAB</li> </ul>
Power supply	Turn on "ignition" Measure voltage at socket box across pin 14 (+) and pin 19 (–)  <b>Setpoint:</b> U <sub>batt</sub>	<ul style="list-style-type: none"> <li>– Check line</li> <li>– Check plug connection</li> <li>– Replace EHAB</li> <li style="padding-left: 20px;">If no fault is found:</li> <li>– Replace control unit</li> </ul>

**Note:**

Power must be applied to the EHAB when bleeding the fuel system by means of presupply pump, i.e. **the fuel system cannot be bled without the "ignition" being switched on!**

See page 28 for function test.

**Control unit EEPROM computer, 1 fault**

- Flash code:** 3x long, 2x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Processor 1 in control unit defective
- Possible cause:** Control unit defective, EOL programming not completed (voltage supply interrupted)
- Effect of fault:** Engine is shut down  
Engine will not start

Test	Measurement	Corrective measures
Power supply	No further test necessary	– Complete EOL programming, delete fault code – Replace control unit
Control unit		

**Important:**

Do not change the control unit if the entries in the fault memory occurred in the following way:

1. Entry made when ignition is switched off.  
When the ignition is switched on again the fault which caused this entry to be made is cancelled again and therefore has no effect on operation.
2. Entry after use of MAN-Cats (EOL programming)  
If this entry in the fault memory was generated through use of MAN-Cats, the engine can no longer be started. In this case do not change the control unit but repeat the previous work with MAN-Cats.

**Note:**

If one of these entries in the fault memory occurs together with the entry

**Main relay** (flashcode: 2x long, 5x short)

the reason for this is to be sought not in the control unit but in the main relay (power supply to control unit).

## Control unit EEPROM computer, 2 faults

<b>Flash code:</b>	3x long, 3x short
<b>Fault indication:</b>	Fault indicated by steady light EDC indicator lamp
<b>Fault path:</b>	Processor 2 in control unit defective
<b>Possible cause:</b>	Control unit defective, EOL programming not completed (voltage supply interrupted)
<b>Effect of fault:</b>	Engine is shut down Engine will not start

Test	Measurement	Corrective measures
Power supply	No further test necessary	<ul style="list-style-type: none"> <li>– Complete EOL programming, delete fault code</li> <li>– Replace control unit</li> </ul>
Control unit		

### Important:

Do not change the control unit if the entries in the fault memory occurred in the following way:

1. Entry made when ignition is switched off.  
When the ignition is switched on again the fault which caused this entry to be made is cancelled again and therefore has no effect on operation.
2. Entry after use of MAN-Cats (EOL programming)  
If this entry in the fault memory was generated through use of MAN-Cats, the engine can no longer be started. In this case do not change the control unit but repeat the previous work with MAN-Cats.

### Note:

If one of these entries in the fault memory occurs together with the entry

**Main relay** (flashcode: 2x long, 5x short)

the reason for this is to be sought not in the control unit but in the main relay (power supply to control unit).

---

## External stop switch

<b>Flash code:</b>	3x long, 4x short
<b>Fault indication:</b>	Fault is not indicated by EDC indicator lamp
<b>Fault path:</b>	External stop switch (control unit pin 50)
<b>Possible cause:</b>	This fault is used only for recording stops using external switches
<b>Effect of fault:</b>	The external stop switch switches the engine off

## Control unit (processor afterrunning)

- Flash code:** 3x long, 8x short
- Fault indication:** Fault is not indicated by EDC indicator lamp
- Fault path:** Control unit  
– Processor afterrunning did not take place
- Effect of fault:** Reduced full load delivery volume  
Reduced final engine speed  $n = 2,000 \dots 2,100$  rpm
- Function** Every time the engine is turned off, afterrunning takes place automatically for the purpose of checking the various processor functions
- Possible cause:** Control unit defective, main relay defective, battery voltage switched off before “ignition” off
- Test precondition:** EDC control unit disconnected  
Socket box connected

Test	Measurement	Corrective measures
Control unit	Test same as for undervoltage (page 42) and main relay (page 48)	<ul style="list-style-type: none"> <li>– Switch “ignition” on and off again, delete fault code</li> <li>– Same as pages 42 and 48</li> <li>– Replace control unit</li> </ul>

### Other possible causes

- Engine was shut down via battery + (e.g. by disconnecting the battery or removing the fuse)
- Power supply fault (e.g. undervoltage, main relay K1 defective, loose contact)



**Control unit, after-running watchdog fault**

- Flash code:** 3x long, 9x short
- Fault indication:** Fault indicated by steady light at EDC indicator lamp
- Fault path:** Control unit defective (watchdog test)
- Effect of fault:** Reduced full load delivery volume  
Reduced final engine speed n = 2,000 ... 2,100 rpm

Test	Measurement	Corrective measures
Control unit	No further test necessary	– Replace control unit

## Control rod travel transmitter – loose contact

- Flash code:** 3x long, 10x short
- Fault indication:** Fault is not indicated by EDC indicator lamp
- Fault path:** Control rod position transducer  
 – Signal too high  
 – Signal too low
- Effect of fault:** This check is designed to recognise a loose contact in the connection to the control rod travel transmitter
- Possible cause:** Line break, short-circuit, too little capacitance reserve (see page 28), control rod position transducer set incorrectly, injection pump defective
- Test precondition:** EDC control unit disconnected  
 Socket box connected

Test	Measurement	Corrective measures
Test coil	Measure resistance at socket box across pin 11 and pin 9  <b>Setpoint:</b> 18 – 25 Ω	<ul style="list-style-type: none"> <li>– Check lines</li> <li>– Check plug connections</li> <li>– If no fault found, repair injection pump</li> </ul>
Reference coil	Measure resistance at socket box across pin 11 and pin 10  <b>Setpoint:</b> 18 – 25 Ω	
	Measure resistance at socket box across pin 18 and pin 9  <b>Setpoint:</b> > 10 MΩ	
	Measure resistance at socket box across pin 18 and pin 10  <b>Setpoint:</b> > 10 MΩ	
	In addition to the possibility of an electrical fault, the fault described here may also be caused by incorrect setting of the control rod position transducer	<ul style="list-style-type: none"> <li>– Remove injection pump</li> <li>– Adjust control rod position transducer</li> </ul>

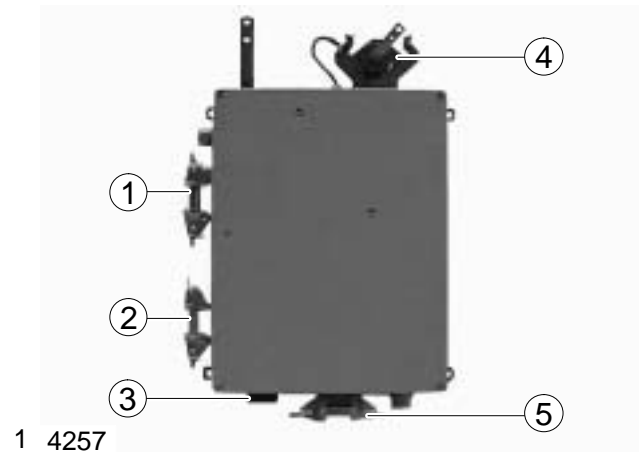
EDC Pin No.	Abbreviation	Description	Description	
1	MES O	Activation for fuel-delivery actuator	Output, fuel-delivery control circuit	$I_{\max}$ 11 A temporarily, on average 4.5 A, against batt.+, pulsed f=variable, pulse-width modulated
2	MES O	Activation for fuel-delivery actuator	Output, fuel-delivery control circuit	
3		Not used		
4		Not used		
5		Not used		
6		Not used		
7		Not used		
8		Not used		
9	RWG M	Control rod position transducer measuring coil (RWG 2)	Control rod position evaluator circuit	
10	RWG R	Control rod position transducer reference coil (RWG O)	Control rod position evaluator circuit	
11	RWG Y	Control rod position transducer centre pick-off (RWG 1)	Control rod position evaluator circuit	
12		Not used		
13	GND-A	Sensor ground		
14	EAB 1	Electrical shut-down	Output (switch)	$I_{\max}$ 1 A, $U_{\text{batt.}}$ against batt. -, I with engine stationary 0.9 A, idle speed 1.5 A, operation 4.5 A, temporarily 16 A
15	Batt +	Batt.+ via main relay	Input battery +	
16	Batt +	Batt.+ via main relay	Input battery +	
17	NBF	Sensor ground HZG	Reference ground	
18	Batt.-	Battery negative	Input battery -	Same as batt.+ (EDC Pin 15 and 16)
19	Batt.-	Battery negative	Input battery -	
20	DIA-B	Diagnosis lamp	Output (switch)	$I_{\max}$ 1 A, $U_{\text{batt.}}$ against batt. -, Alternating voltage $U_{\text{pp}}$ idle speed approx. 2 V, max. 80 V, $f=6 \times \text{engine speed sec.}^{-1}$ Alternating voltage $U_{\text{pp}}$ idle speed approx. 2 V, max. 80 V, $f=6 \times \text{engine speed sec.}^{-1}$
21	DZG 1	RPM sensor signal	Input, dynamic	
22	HZG 1	Auxiliary rpm sensor signal	Input, dynamic	
23		Not used		
24		Not used		
25		Not used		
26		Not used		
27	PWG 1	Pedal position sensor signal	Input, analog	Direct voltage, U approx. 0.4 to 4 V $U_{\text{batt.}}$ against batt. -, square-wave signal, $f=6 \times \text{engine speed sec.}^{-1}$
28	TDS-A	Engine speed signal	Output	
29		Not used		
30		Not used		
31		Not used		
32		Not used		
33	LDF 2	Turbo pressure sensor (supply)	Output, supply	Controlled direct voltage, U approx. 5 V
34	KTF 1	Fuel temperature sensor	Input, analog	
35	MDB 1	Multi-stage input (torque limitation)	Input, analog	Circuit of various resistors for external faults (integrated in EDC operating element)
36	LDF 1	Boost pressure sensor signal	Input, analog	
37		Not used		
38		Not used		
39	LGS-E	Idle speed switch signal (Pedal value transmitter)	Input, static	against GND-O (EDC-Pin 13)

EDC Pin No.	Abbreviation	Description	Description
40		Not used	
41		Not used	
42		Not used	
43	BRE-E	Brake switch signal	Input, static
44	FGR 1	Analog operating element for idle speed adjustment	Input Input by change in resistance
45	PWG 2	Pedal position sensor	Output, supply Controlled direct voltage, U approx. 5 V
46	HRL O	Main relay	Output (switch) $I_{max}$ 0.3 A, batt. – against batt.+
47	K15-E	Terminal 15, digit. Data for control unit	Input, static Batt. +
48	ISO-K	ISO-K link to ISO protocol	Interfaces Diagnostic connection for MAN-Cats
49	ISO-L	ISO-L link to ISO protocol	Interfaces Diagnostic connection for MAN-Cats
50	TKS-E	STOP	Input, static Batt. +, Input for engine stop
51		Not used	
52	PB1-E	Pulse-width modulated input signal 1	Interface Batt. +
53	WTF 1	Coolant temperature sensor	Input, analog
54		Not used	
55	LTF	Turbo air temperature sensor	Input, analog

## Engine terminal box with connections

Fig. 1

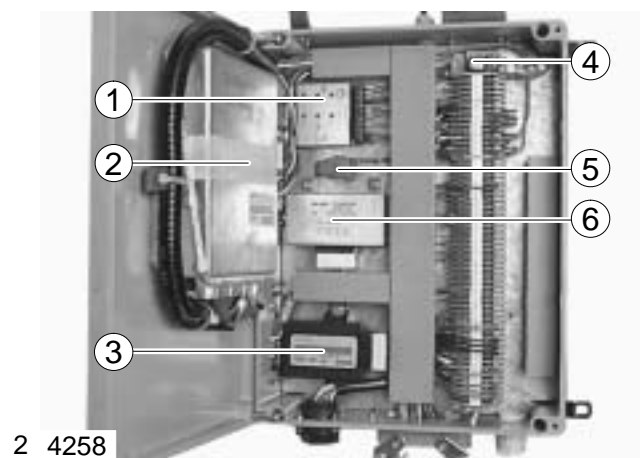
- ① Connection plug for EDC from engine
- ② Connection plug for alarm system to BE1 station (main station)
- ③ Connection plug for engine room instrument panel
- ④ Pedal value sensor, item no. 81.25970-6072
- ⑤ Connection plug for engine electric and alarm system



## Engine terminal box with components

Fig. 2

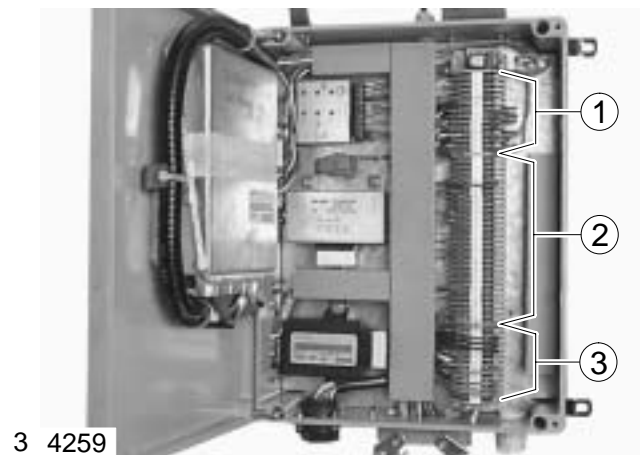
- ① EDC operating element item no. 51.11615-7141
- ② EDC-control unit (ECU, ordering with engine no. only)
- ③ Starter interlock relays item no. 81.25902-0454
- ④ EDC-relais (K1), item no. 51.25902-7008
- ⑤ MAN-cats diagnose plug
- ⑥ Option: Glow plug timer control unit for electrical boost air preheating system, item no. 51.26802-0003



## Engine terminal box with clamps

Fig. 3

- ① Clamps for EDC
- ② Clamps for instruments
- ③ Clamps for main power supply

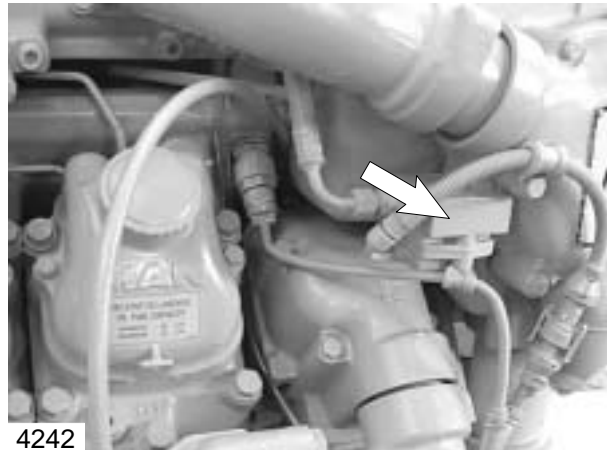


## Boost air pressure sensor for EDC-system

Fig. 1

Item no. 51.27421-0102

Location: right engine side,  
heatexchanger / cylinder no. 1 area



1 4242

## Boost air temperature sensor for EDC-system

Fig. 2

Item no. 51.27421-0077

Location: right engine side,  
heatexchanger / cylinder no. 1 area



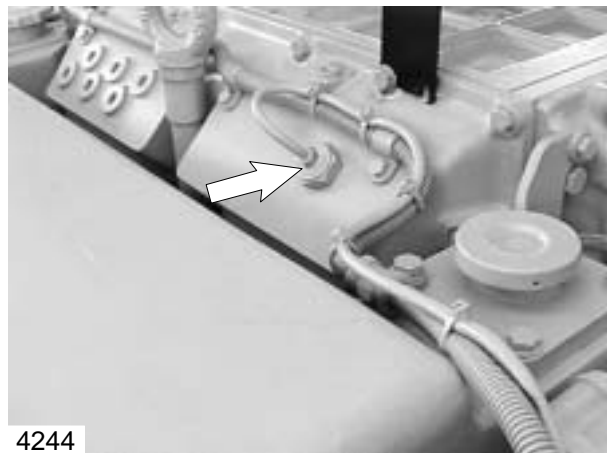
2 4240

## Boost air temperature sensor for alarm system

Fig. 3

Item no. 51.27421-0103

Location: Intercooler elbow (after intercooler),  
left engine side



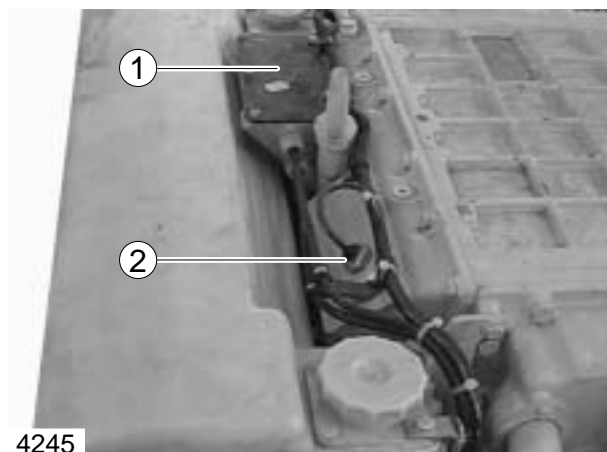
3 4244

## Boost air temperature sensor for alarm system (Boost air preheating installed)

Fig. 4

① Glow plug box for electrical charge air preheating

② Boost air temperature sensor  
Item no. 51.27421-0103



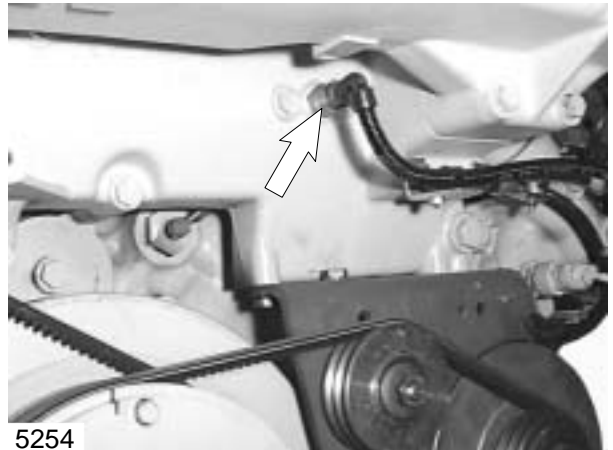
4 4245

## Temperature switch for electrical boost air pre-heating system

Fig. 5

Item no. 51.27420-0054

Location: engine front side below heatexchanger  
opens above 45 deg. C



5 5254

## Coolant temperature sensor (WTF1) for EDC-system (old position)

Fig. 1

Item no. 51.27421-0113

Location: left engine side,  
front cover of watercooled exhaust manifold



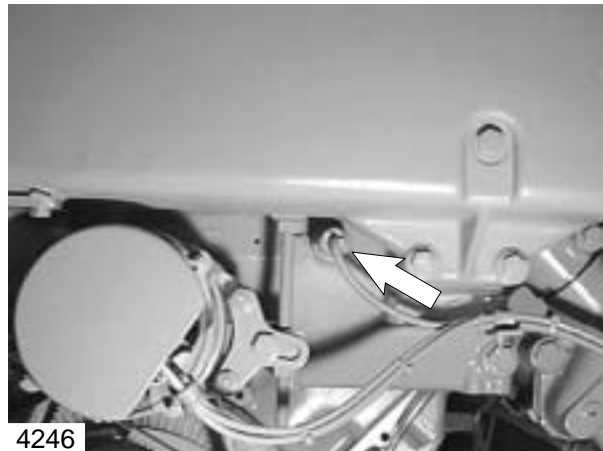
1 4247

## Coolant temperature sensor (WTF1) for EDC-system (new position)

Fig. 2

Item no. 51.27421-0113

Location: engine front side below heatexchanger



2 4246

## Coolant temperature sensors for instruments and for alarm system (old)

Fig. 3

Location: left engine side,  
front cover of watercooled exhaust manifold

- ① Coolant temperature sensor for instruments  
Double sensor: Item no. 50.61344-1000  
Single sensor: Item no. 50.27421-0034
- ② Coolant temperature sensor for alarm system (old)  
Item no. 51.27421-0119  
wrench size: 17 / 19 mm



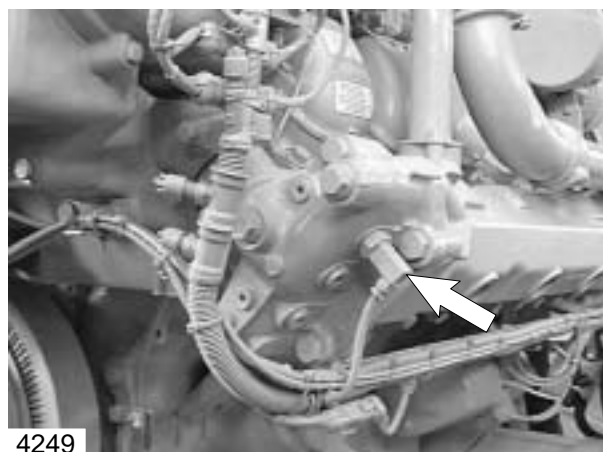
3 4248

## Coolant temperature sensors for alarm system (new)

Fig. 4

Location: left engine side,  
front cover of watercooled exhaust manifold

Item no. 51.27421-0138  
wrench size: 24 mm



4 4249

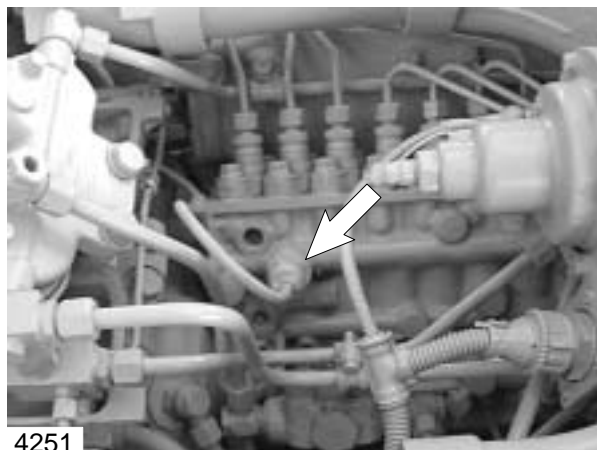


## Fuel temperature sensor for EDC-system

Fig. 1

Item no. 51.27421-0113

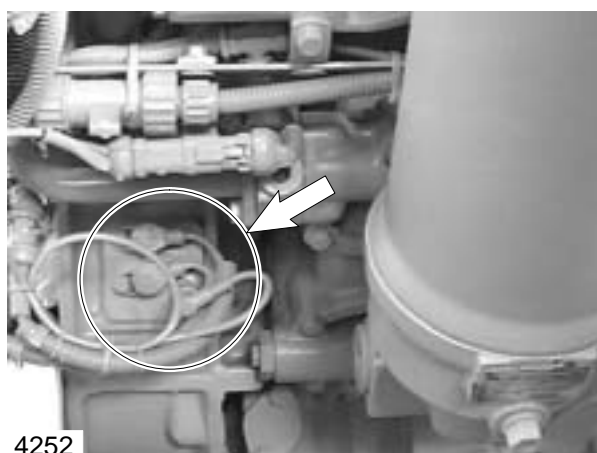
Location: injection pump



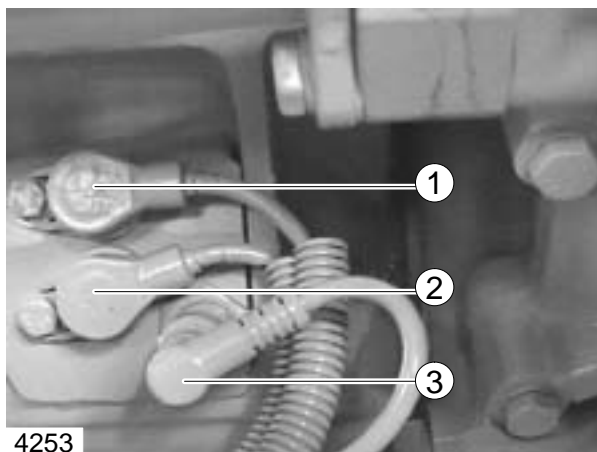
## Speed pickup sensors for EDC and alarm system

Figs. 2 and 3

Location: right engine side, flywheel housing, approx. 4 o'clock by view from engine back side



- ① Engine speed sensor DZG1 for EDC-system  
Item no. 51.27120-0008, Cable no. (1)
- ② Engine auxiliary speed sensor HZG1 for EDC-system  
Item no. 51.27120-0009, Cable no. (2)
- ③ Engine speed sensor for alarm system,  
Item no. 51.27120-0010

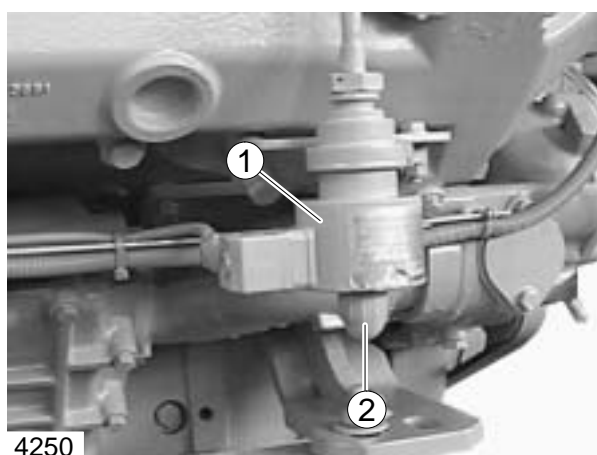


## Engine speed monitor for instruments

Fig. 4

Location: right engine side, underneath water-cooled exhaust manifold

- ① engine speed monitor for instruments  
Item no. 51.27120-7030
- ② Connection for mechanical drive  
(E2 - M 22 x 1.5)

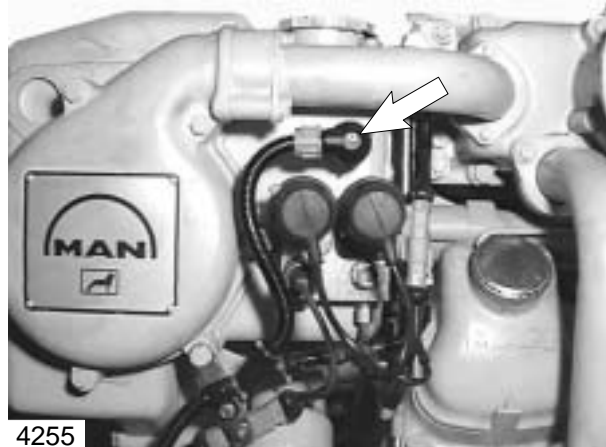


## Coolant level sensor

Fig. 1

Item no. 51.27421-0116

Location: on both sides of the expansion tank



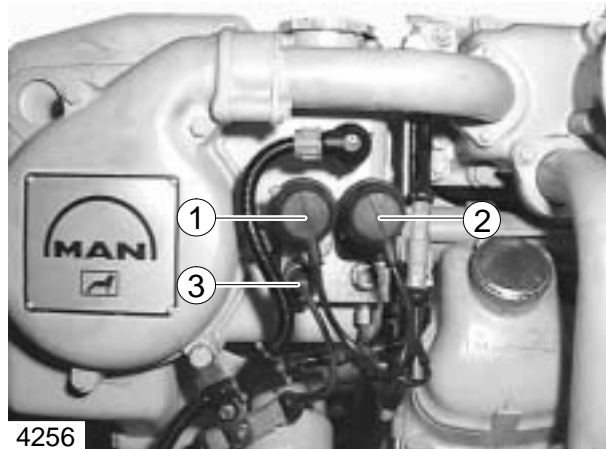
1 4255

## Oil pressure sensors for instruments and alarm system

Fig. 2

Location: left engine side between heatexchanger and intercooler

- ① Oil pressure sensor (M10x1) for engine room control panel  
Item no. 51.76034-0007
- ② Oil pressure sensor for instruments  
Single (M10x1): Item no. 50.76034-0007  
Double (M18x1.5): Item no. 50.27421-0033
- ③ Oil pressure sensor for alarm system  
Item no. 51.27421-0107



2 4256

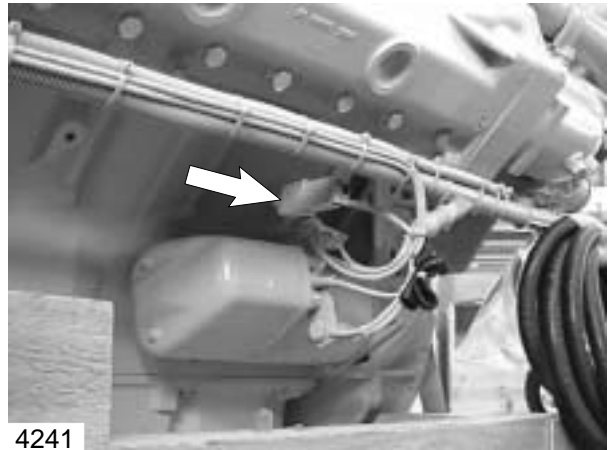
## Main automatic fuse switch (F1) for engine terminal box

Fig. 1

F1, automatic fuse device 16A (switch)

Item no. 51.25437-0002

Location: left engine side, starter motor area

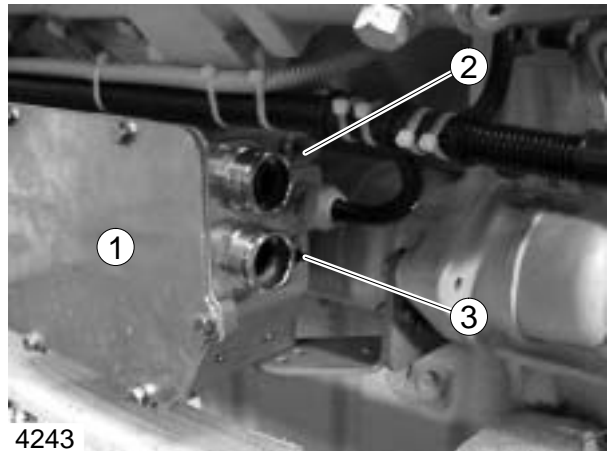


## Main fuse switch for boost air preheating system (option)

Fig. 2

Location: left engine side, starter motor

- ① Fuse box, see drawing 51.25431-6115
- ② Automatic fuse switch, plus line
- ③ Automatic fuse switch, minus line

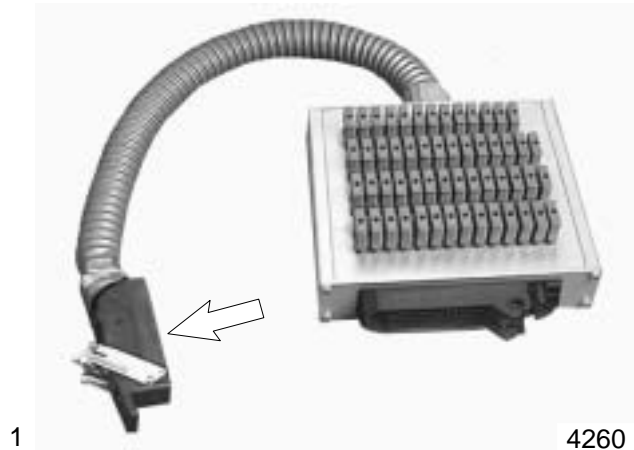


## Bosch pin adapterbox

Fig. 1

Connection between control unit and EDC cable to control unit in terminal box for test purposes

Arrow: Control unit plug



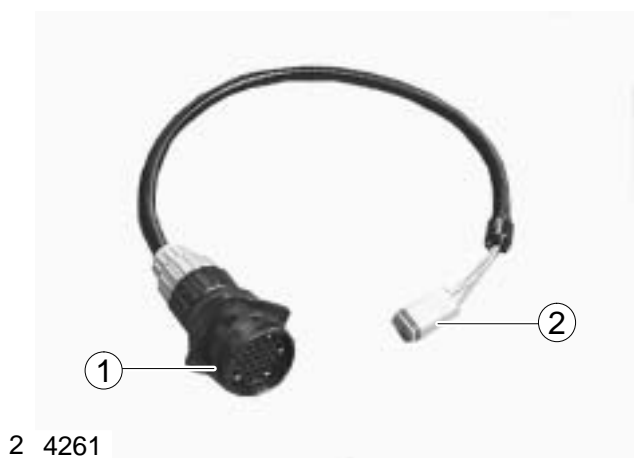
## MAN-Cats diagnose system

### Adapter cable

(Connection between diagnose plug in terminal box and ISO-interface)

Fig. 2

- ① Connection plug for plug ① in fig. 3
- ② Connection plug for terminal box

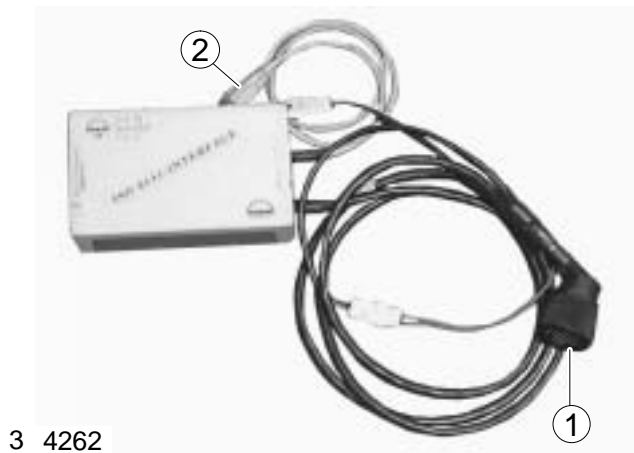


### MAN-CATS interface

(Connection between adapter cable and note book)

Fig. 3

- ① Connection plug for plug ① in fig. 2
- ② Connection plug for note book computer



### Note book computer

minimum equipment:

Fig. 4

- 386 processor
- 4 MB RAM
- RS 232 Com 1 interface
- MS-DOS 5.0



An engine electronic diagnostic system, which works with a laptop computer and is called MAN-Cats.

The following functions are possible:

1. Reading EDC errors in text format
2. Deletion of stored errors
3. Monitoring the following operational parameters:
  - Boost pressure
  - Rack Travel
  - Engine speed
  - Coolant temperature
  - Charge air intake temperature
  - Fuel temperature
  - Throttle position
  - Battery voltage
  - Additional EDC-parameters

However, the monitoring data cannot be stored or printed.

The following equipment is necessary to work with the laptop:

- **Interface, white**  
MAN Item no. 93.09000-6015
- **Adapter cable for Interface**  
(Connection between diagnostic plug in terminal box and interface)  
MAN Item no. 51.25435-8002
- **Software MAN-Cats**  
Operating System Disc D1 DM  
MAN Item no.           81.99298-8130 German  
                              81.99298-8071 French  
                              81.99298-8082 English  
                              81.99298-8033 Spanish  
                              81.99298-8014 Italian
- **Diagnostic software**  
EDC Bosch M (S) 5, Disc D 12  
MAN Item no.           81.99298-8300 German  
                              81.99298-8231 French  
                              81.99298-8222 English  
                              81.99298-8193 Spanish  
                              81.99298-8134 Italian



### **Please note!**

An existing laptop should, as minimum, fulfil the following criteria for EDC:

- 386er processor
- 4 MB RAM memory
- Serial port

Operating the MAN-CATS software is only possible using MS-DOS 5.0 or higher.

With regard to the future diagnostic system, a suitable laptop must be acquired at the appropriate time.

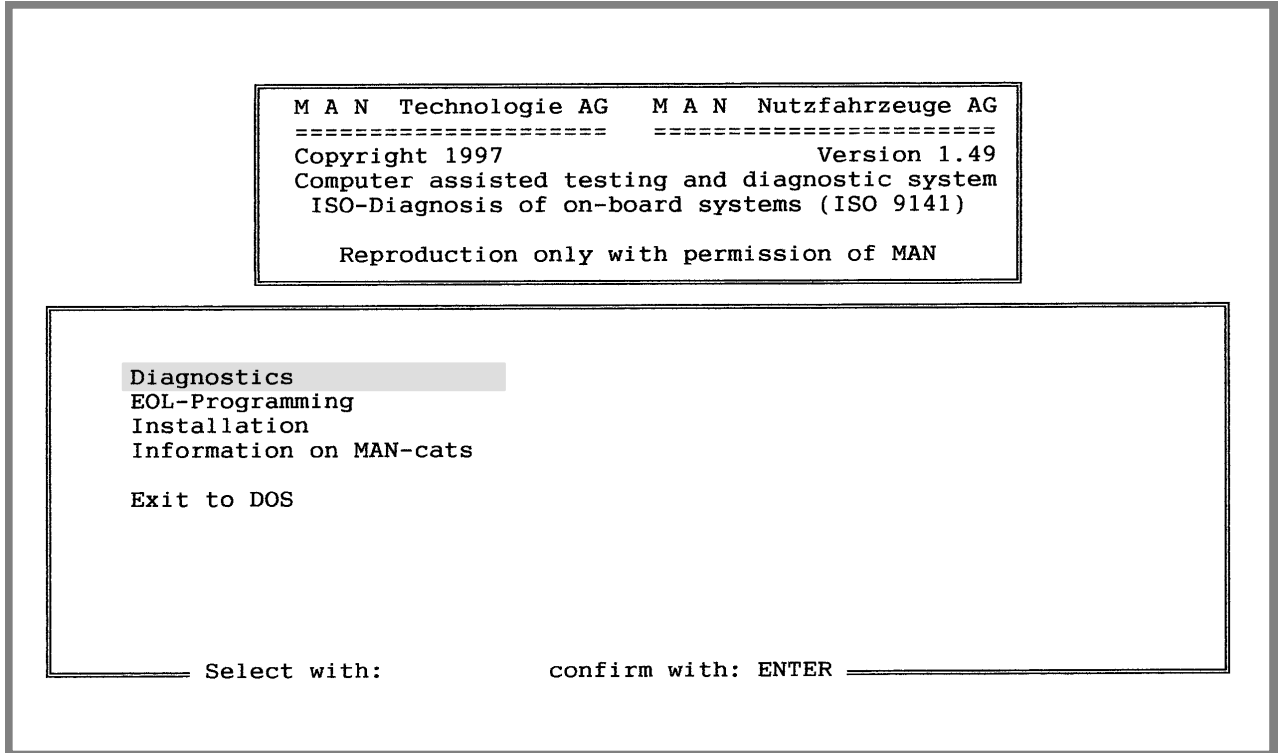
### **Laptop with the following features**

Suitable for the proposed diagnostic system BE 3 for MAN marine engines:

- Processor Intel Pentium 133
- Memory 32 MB RAM
- Hard drive min. 1.0 G Byte
- Disc drive
- Lithium battery charger (without memory effect)
- Media Slot: Input alternatively for charger or CD ROM drive
- Track ball or touch pad
- Second serial port RS 232 for cable input (not infrared)
- TFT Display (active matrix), resolution 800 x 600 (width x height), min. 256 color

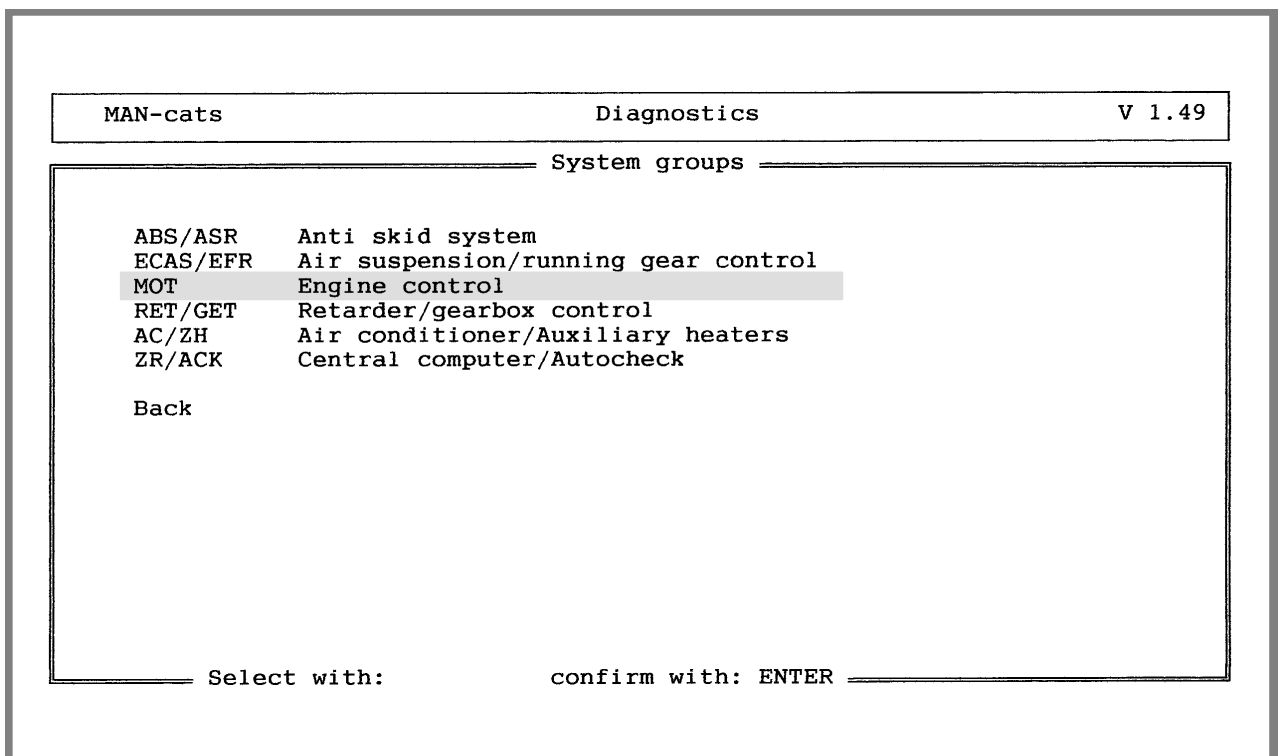
To install the software DOS (version 5.0) or Windows can be used. As an independent program the software will be on the harddrive "C:". To get to it enter "C:man\_cats diagnostics".

On the screen you'll see:



Use arrow key to go to "Diagnostics" and press "Enter".

The following text you'll find on your screen:

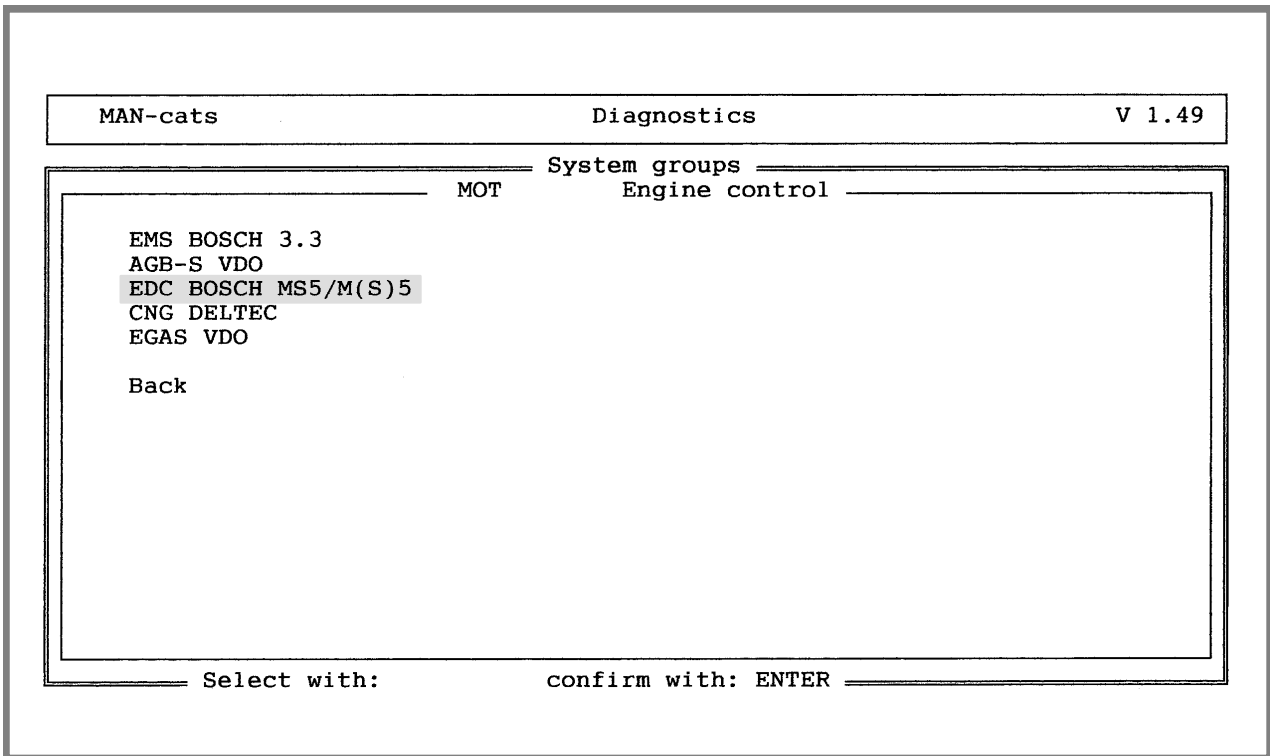




# MAN-Cats – Software Description

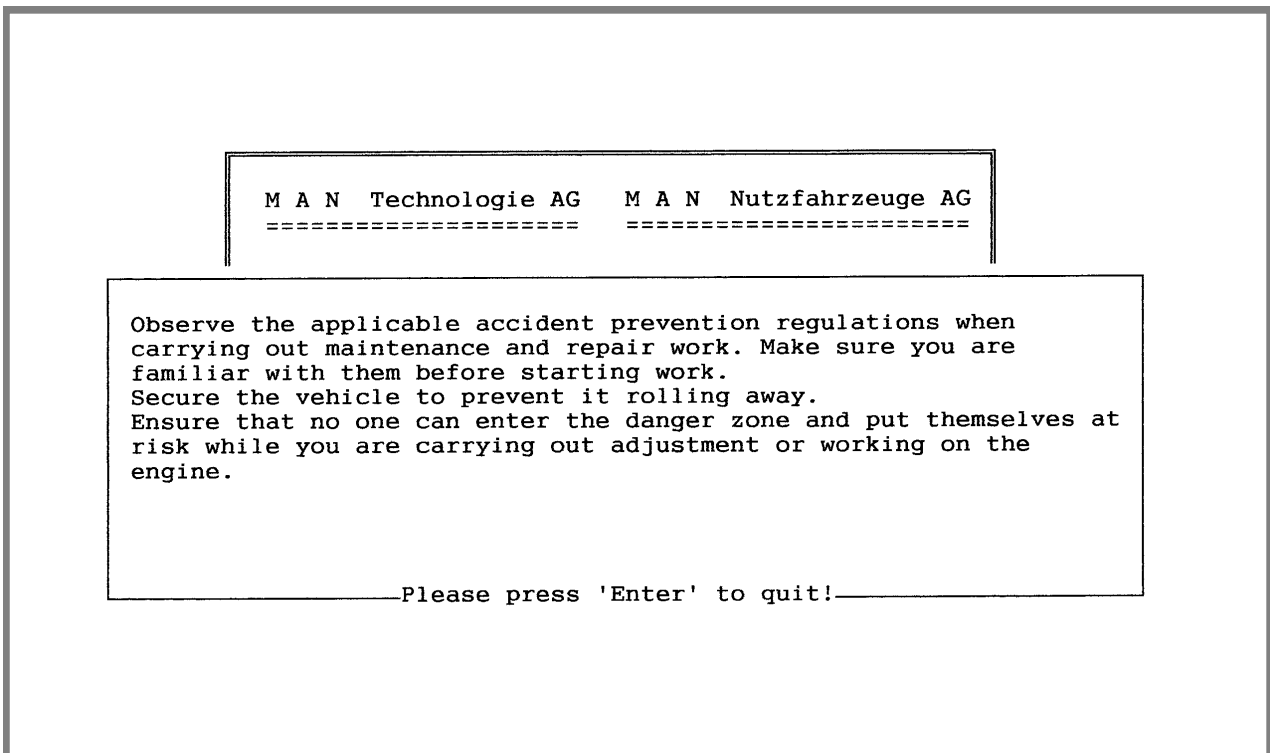
Use arrow key to go to “Mot” engine control.

You’ll see:



Use arrow key to go to “EDC Bosch MS5/M(S)5.

You will see:





```
M A N Technologie AG   M A N Nutzfahrzeuge AG
=====
```

Diagnosis can be simplified and speeded up by using a breakout box. If you do not use a breakout box, communication with the control unit may get broken off while diagnosis/repair is in progress.

Do not unplug the diagnostics connector until you have completed the test routine.

\_\_\_\_\_Please press 'Enter' to quit!\_\_\_\_\_

```
M A N Technologie AG   M A N Nutzfahrzeuge AG
=====
```

Please connect up an ammeter in place of fuse F35(F90), F132 (bus) or F163 (F2000).  
The fuse is located on the side, adjacent to the central electrical unit.  
Using a multimeter, determine which end of the fuse connects to the battery.  
The red cable of the adapter must connect to the battery.  
Insert a 15A fuse in the adapter provided.  
Please connect up carefully, otherwise diagnosis will be incorrect.

\_\_\_\_\_Please press 'Enter' to quit!\_\_\_\_\_



# MAN-Cats – Software Description

```
M A N Technologie AG   M A N Nutzfahrzeuge AG  
=====
```

IMPORTANT: PLEASE REMEMBER:

FIRST: SWITCH ON IGNITION,  
THEN: HOOK UP ADAPTER!

Do not unplug diagnostics connector until test has been completed.

Please press 'Enter' to quit!

```
M A N Technologie AG   M A N Nutzfahrzeuge AG  
=====
```

Copyright 1997

Bosch EDC MS5 diagnostics      Version 2.26  
Vehicles: F90, M90, F2000, M2000, buses  
Reproduction only with permission of  
M A N

Please wait! EDC is being stimulated!.

First the contents of the fault memory will be shown (e.g. see list below).

```

MAN-cats ----- Bosch EDC MS5 diagnostics - Control unit data -----
Part number:      51.11615-7xxx                                     Stufe3 V15

----- Instructions/questions -----
** Fault memory content **

Code Description/Type of fault      Peripheral conditions      Frequency
87  Water temperature sensor        Engine speed: 0 1/min      2
   ↓
1D  Control lever                    Engine speed: 0 1/min      1
   ?
1C  Resistor array SG Pin 35         Engine speed: 0 1/min      1
   ↑
                                     Voltage: 4922 mV
                                     Voltage: 4961 mV

↑: too large           ↓: too small           -: no signal
?: implausible        #: saved              |: present
~: sporadic

Please press 'Enter' to quit!
    
```

Fault description:

- ↑ : too large            △    measured value too high
- ↓ : too small           △    measured value too low
- : no signal            △    possible wire interruption, sensor fault
- ? : implausible         △    unknown fault
- : saved                △    fault is recorded
- ✓ : present              △    fault is still existing
- ~ : sporadic             △    momentary fault

Frequency: Depending on the channel the EDC ist recording the faults from 1 to 40 or 1 to 210. If alter a new start a fault doesn't exist any more the incidence will be set back I x.

Perripheral conditiong: Showing other, important channels to get more informations; e.g. at what RPM a fault at what value existed.

After checking and recording the fault memory press "Enter" to come to a submenu where you choose the function "Bus".



# MAN-Cats – Software Description

MAN-cats — Bosch EDC MS5 diagnostics - Control unit data —  
Part number: 51.11615-7xxx Stufe3 V15

## Instructions/questions

\* N.B.: \*

The control unit is able to recognize and store all faults, including temporary faults. If plug connections are momentarily broken while the ignition is switched on, these will be entered in the fault memory. These entries are not actual faults. Please check the system after the fault memory has been emptied and then restart diagnosis!

Please press 'Enter' to quit!

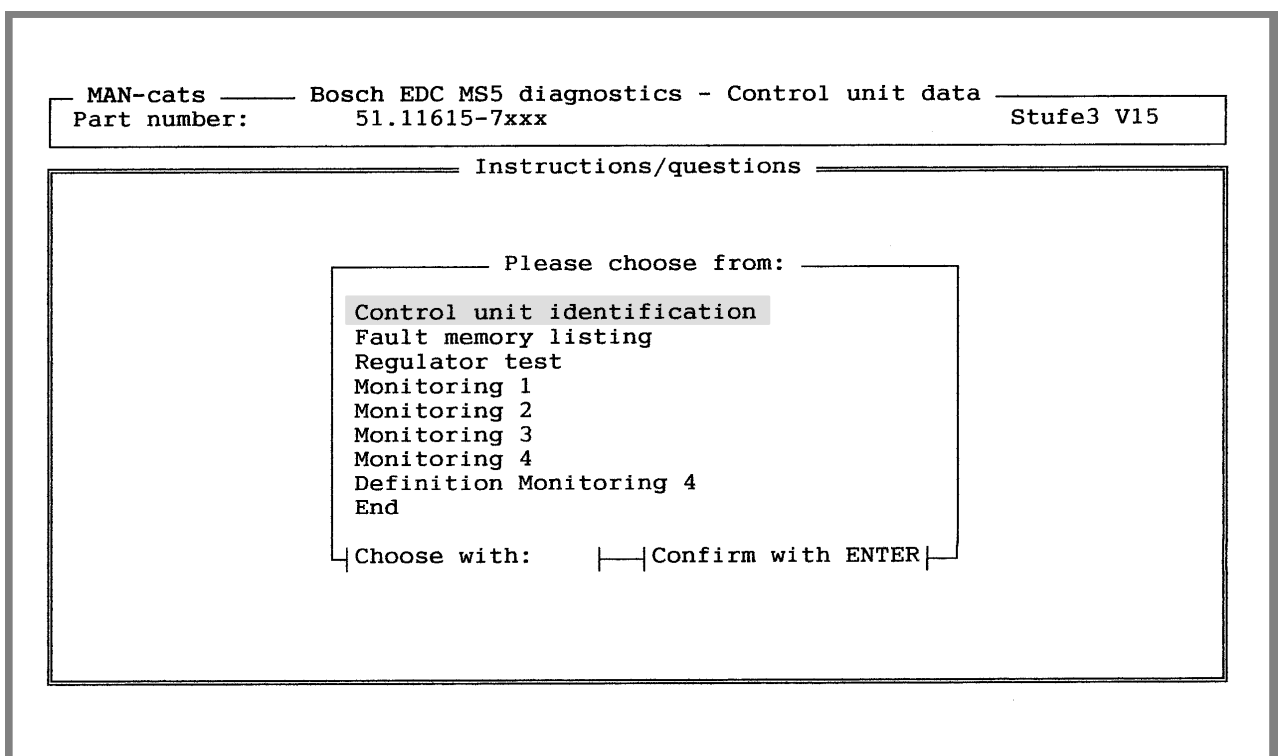
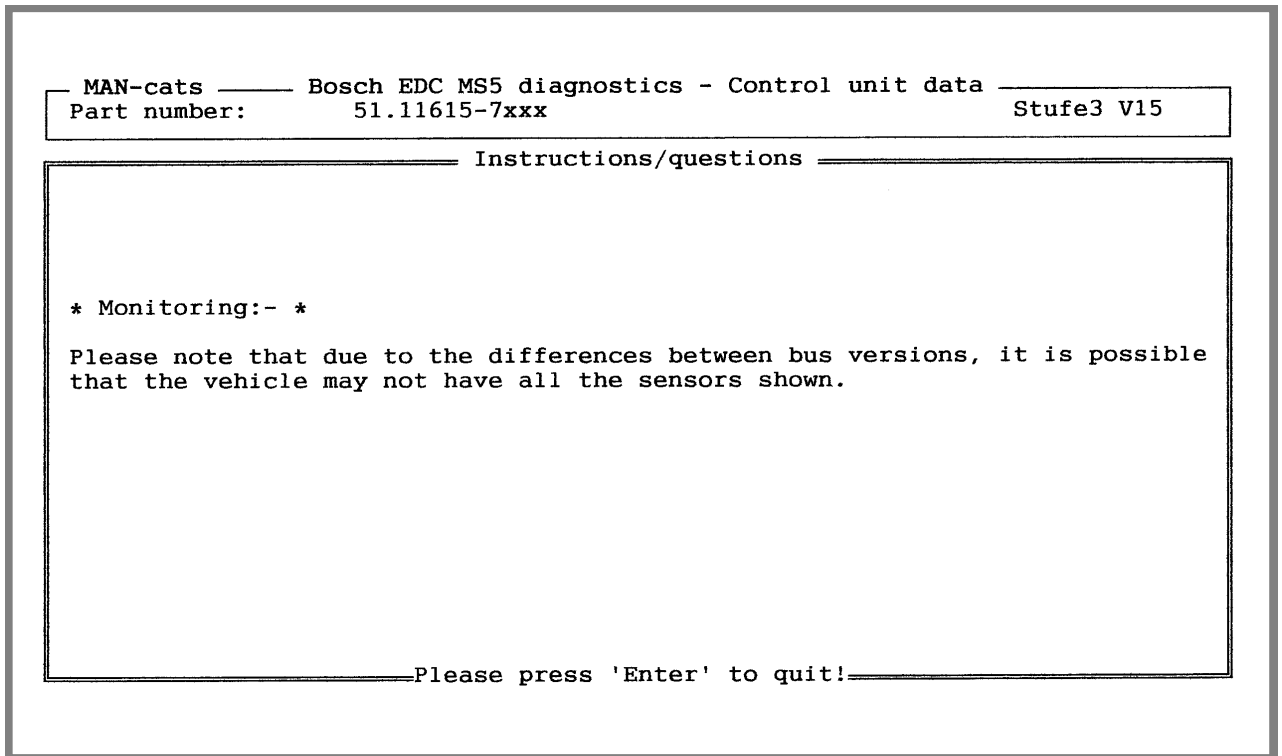
MAN-cats — Bosch EDC MS5 diagnostics - Control unit data —  
Part number: 51.11615-7xxx Stufe3 V15

## Instructions/questions

Please choose from:

F2000  
Bus

| Choose with: | | Confirm with ENTER |



Guided through the menu you come to the window “Instructions/Questions”.

Depending on the software version there are various submenus which are explained at the following pages.



# MAN-Cats – Software Description

At “control unit identification” you find the engine number which must be checked. If engine and control unit do not match it is very important to inform MAN. Further informations see below:

```

MAN-cats ----- Bosch EDC MS5 diagnostics - Control unit data -----
Part number:      51.11615-7xxx                                     Stufe3 V15

----- Instructions/questions -----
Control unit identification

Bosch EDC MS5 diagnostics Stufe3 V15
Part number:      51.11615-7180
DAMOS:           M24000.D16
EEPROM:          M240A200.X16
Engine number:   9561080
Chassis number:
Unmachined part no.: 51.11615-1005
MAN-cats Code:  MAABAB

Last programming session carried out with registration no. N

----- Please press 'Enter' to quit! -----

```

Next in the submenu you find “Fault memory content” which again shows the EDC’s actual fault memory (e.g. see picture below).

```

MAN-cats ----- Bosch EDC MS5 diagnostics - Control unit data -----
Part number:      51.11615-7xxx                                     Stufe3 V15

----- Instructions/questions -----
** Fault memory content **

Code Description/Type of fault      Peripheral conditions      Frequency
87  Water temperature sensor        Engine speed: 0 1/min      2
   ↓ . ' ~
1D  Control lever                    Engine speed: 0 1/min      1
   ? . '
1C  Resistor array SG Pin 35         Engine speed: 0 1/min      1
   ↑ . '
Voltage: 4922 mV
Voltage: 4961 mV

↑: too large           ↓: too small           -: no signal
?: implausible        *: saved               ': present
~: sporadic

Please press 'Enter' to quit! -----

```

“Control rod test” contains on “EHAB” test which will not be explained here.



Monitoring 1 – 3” shows various engine parameter. The measured datas will not be recorded.

MAN-cats ——— Bosch EDC MS5 diagnostics - Control unit data ——— Stufe3 V15  
 Part number: 51.11615-7xxx

---

Instructions/questions  
Monitoring 1

Accelerator value B121	0	100	0 %
Water temperature B200	-40	130	40 °C
Fuel temperature B199	-40	130	15 °C
Idle switch B121	OPEN		
Brake contact S145	OPEN		
Clutch contact S144	OPEN		
Control lever S146	???		
Resistor array R134	Characteristic		???

Press any key to escape

MAN-cats ——— Bosch EDC MS5 diagnostics - Control unit data ——— Stufe3 V15  
 Part number: 51.11615-7xxx

---

Instructions/questions  
Monitoring 2

Engine speed B64	0	3000	0 l/min
Auxiliary speed B180	0	3000	0 l/min
Control rod travel Y32	0	5000	526 mV
Charge air pressure B121	0	2000	143 mBar
Engine brake contact	OPEN		

Press any key to escape



# MAN-Cats – Software Description

```

MAN-cats  Bosch EDC MS5 diagnostics - Control unit data
Part number: 51.11615-7xxx                               Stufe3 V15

Instructions/questions
Monitoring 3

RSG status          PASSIVE
RSG setpoint        0 km/h
RSL status          PASSIVE
ISG status          PASSIVE
Engine mode         Torque limiter

Battery voltage      0                               40
                   ██████████░░░░░░░░░░░░░░░░ 27 V

Tachograph          0                               120
                   ░░░░░░░░░░░░░░░░░░░░░░░░ 0 km/h

Press any key to escape

```

Depending on the software version you can also select “Monitoring 4” or “Definition Monitoring 4”. In the submenu item “Definition Monitoring 4” up to six freely selectable measuring channels can be selected with the “Enter” key (see illustration below).

```

MAN-cats  Bosch EDC MS5 diagnostics - Control unit data
Part number: 51.11615-7xxx                               Stufe3 V15

Instructions/questions
Definition Monitoring X

Accelerator value   ✓
Water temperature  ✓
Fuel temperature   .
Idle switch        .
Brake contact       .
Clutch contact     .
Control lever      .
Resistor array     ✓
Engine speed       ✓
Auxiliary speed    ✓
Needle valve movement ✓
Control rod travel .
Charge air pressure .
Sleeved elem. current .
Engine brake contact .
RSG status         .
RSG setpoint       .

↑ SCROLL ↓

```





MAN-cats — Bosch EDC MS5 diagnostics - Control unit data — Stufe3 V15

Part number: 51.11615-7xxx

---

Instructions/questions  
Definition Monitoring 4

Control lever	.	
Resistor array	.	
Engine speed	.	
Auxiliary speed	.	
Needle valve movement	.	
Charge air pressure	.	S
Sleeved elem. current	.	C
Engine brake contact	.	R
RSG status	.	O
RSG setpoint	.	L
RSL status	.	L
ISG status	.	
Engine mode	.	
Battery voltage	.	
Tachograph	.	

Complete the definition of monitor window

Selection of the measuring channels is completed with "Complete the definition of monitor window".

After this you can view the measuring channels you have selected in "Monitoring 4" (see illustration below).

MAN-cats — Diagnose: Bosch EDC MS5 - Daten Steuergerät — Stufe3 V15

Sachnummer: 51.11615-7xxx

---

Instructions/questions  
Monitoring X

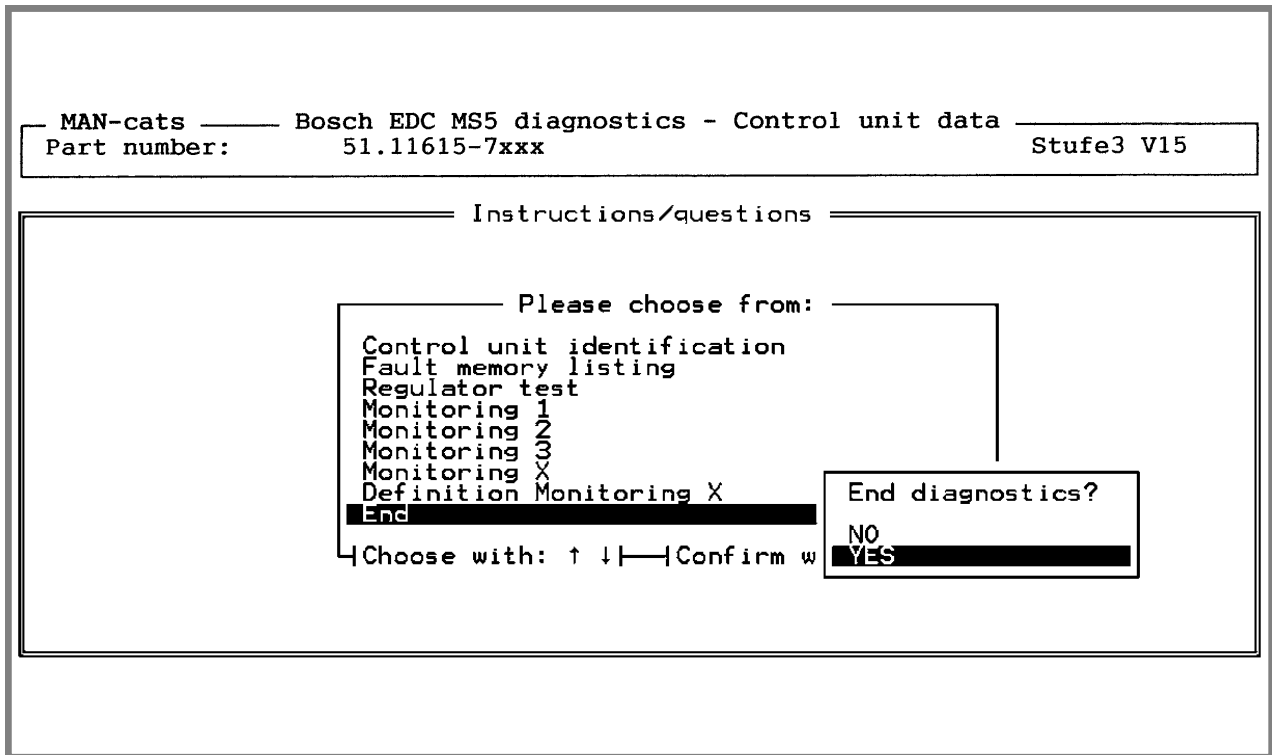
Accelerator value	0  100	3 %
Water temperature	-40  130	50 °C
Engine speed	0  3000	0 1/min
Auxiliary speed	0  3000	0 1/min
Control rod travel	0  5000	714 mV
Charge air pressure	0  2500	198 mbar

Press any key to escape

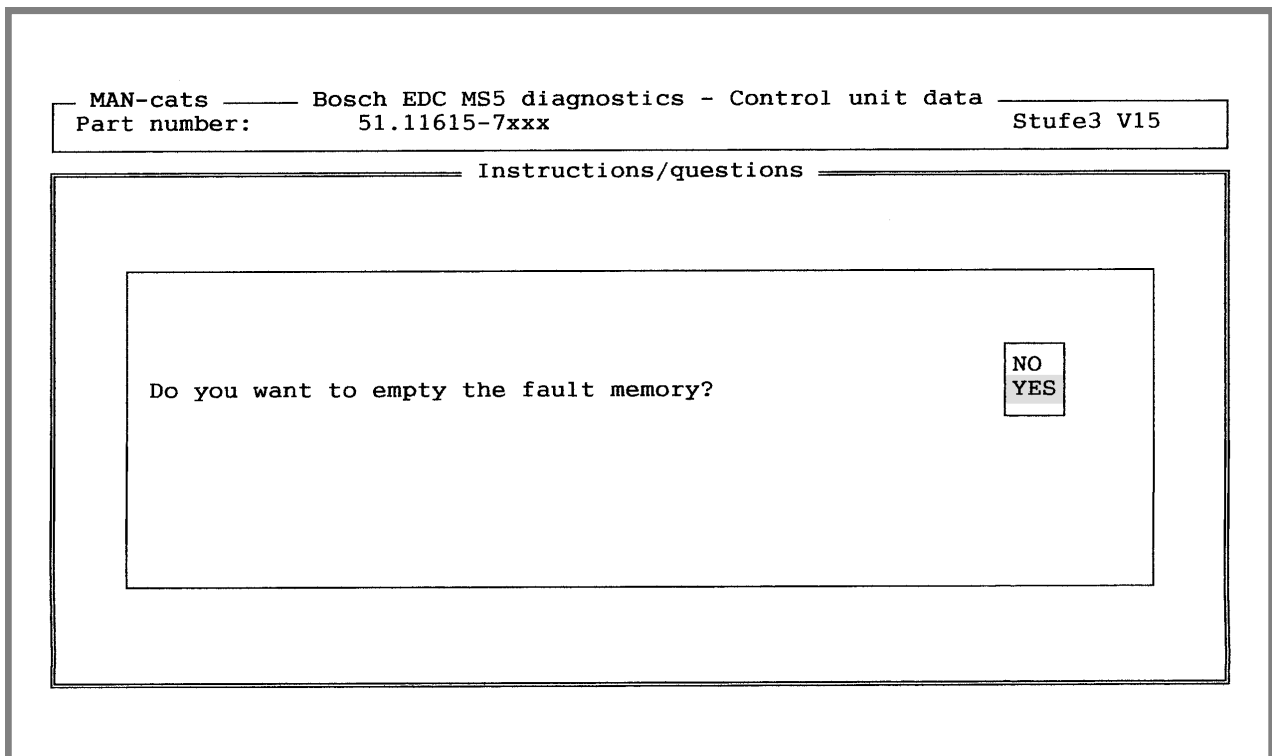


# MAN-Cats – Software Description

After diagnose and measuring of engine parameter select “End”.



Now you can use “Enter” to leave the main menu “Instructions/Questions”. The following picture will be found on the screen.



Press “yes” to confirm. Using the “Enter” key you’ll be guided through the menu.

MAN-catsDiagnose: Bosch EDC MS5 - Daten SteuergerätStufe3 V15

Sachnummer: 51.11615-7xxx

Instructions/questions

Fault memory is empty!

Please press 'Enter' to quit!

MAN-catsDiagnose: Bosch EDC MS5 - Daten SteuergerätStufe3 V15

Sachnummer: 51.11615-7xxx

Instructions/questions

Please switch off the ignition and disconnect the ammeter adapter.

Please press 'Enter' to quit!



## MAN-Cats – Software Description

Following the instruction above you'll come again to the beginning of the programm.

```
M A N Technologie AG   M A N Nutzfahrzeuge AG
=====             =====
Copyright 1999                Version 2.07
Computer assisted testing and diagnostic system
ISO-Diagnosis of on-board systems (ISO 9141)

Reproduction only with permission of MAN
```

```
Diagnostics
EOL-Programming
Installation
Information on MAN-cats
Exit to DOS
```

```
Continue
Exit
```

Select with: ▲ ▼      confirm with: ENTER

Via "Exit" you can now leave the "MAN\_CATS" software.

see also list of checking procedures, page 26

## EDC-check with engine stoped

Fig. 1

Ignition off, control unit **not** connected

Reason: Resistance measurement of EDC components



1 4264

## EDC-check with engine running, gearbox not engaged

Fig. 2

Reason: Voltage measurement of EDC components



2 4265

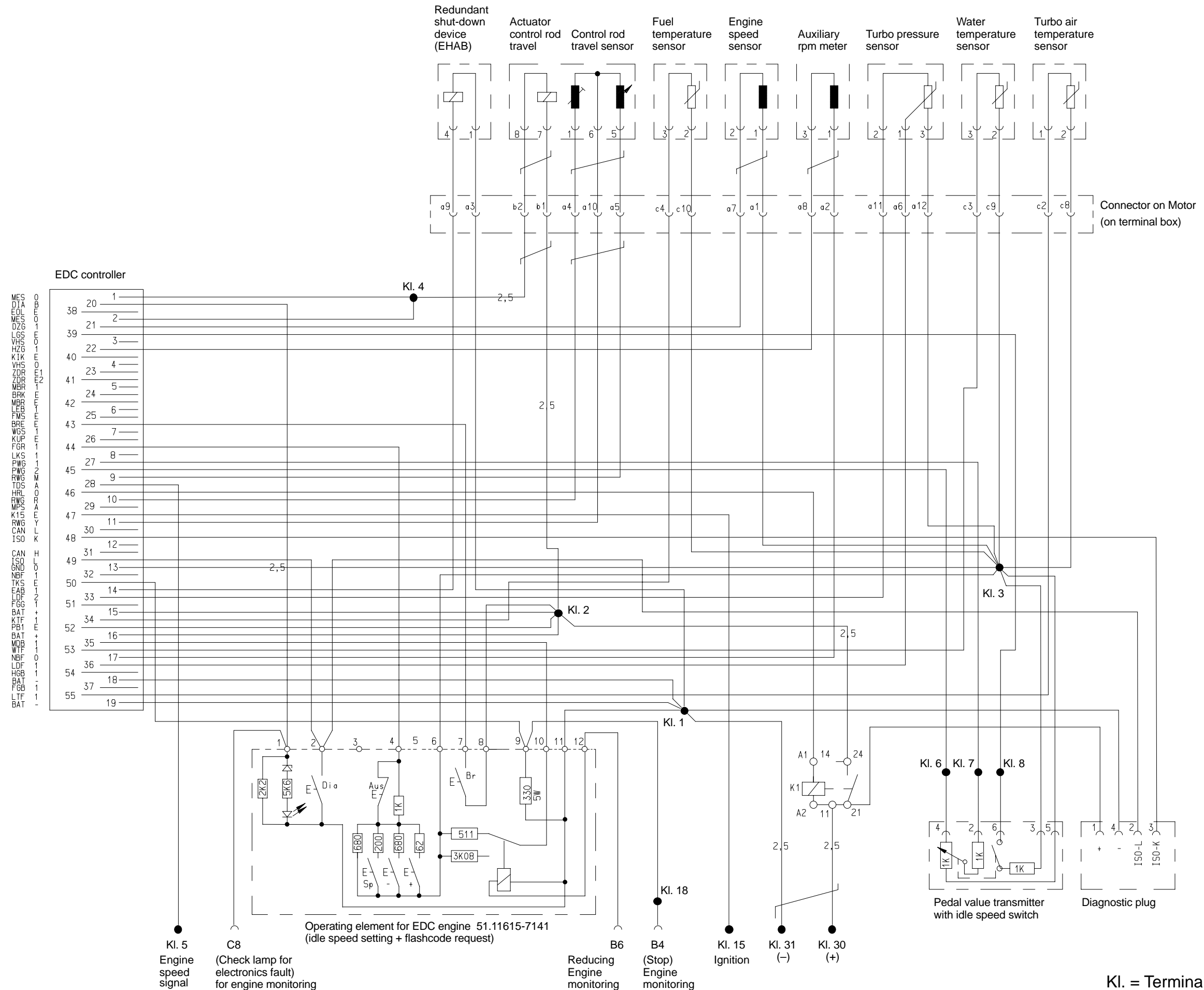


# Notes

---

A series of horizontal dotted lines for writing notes.

# Terminal connection diagram



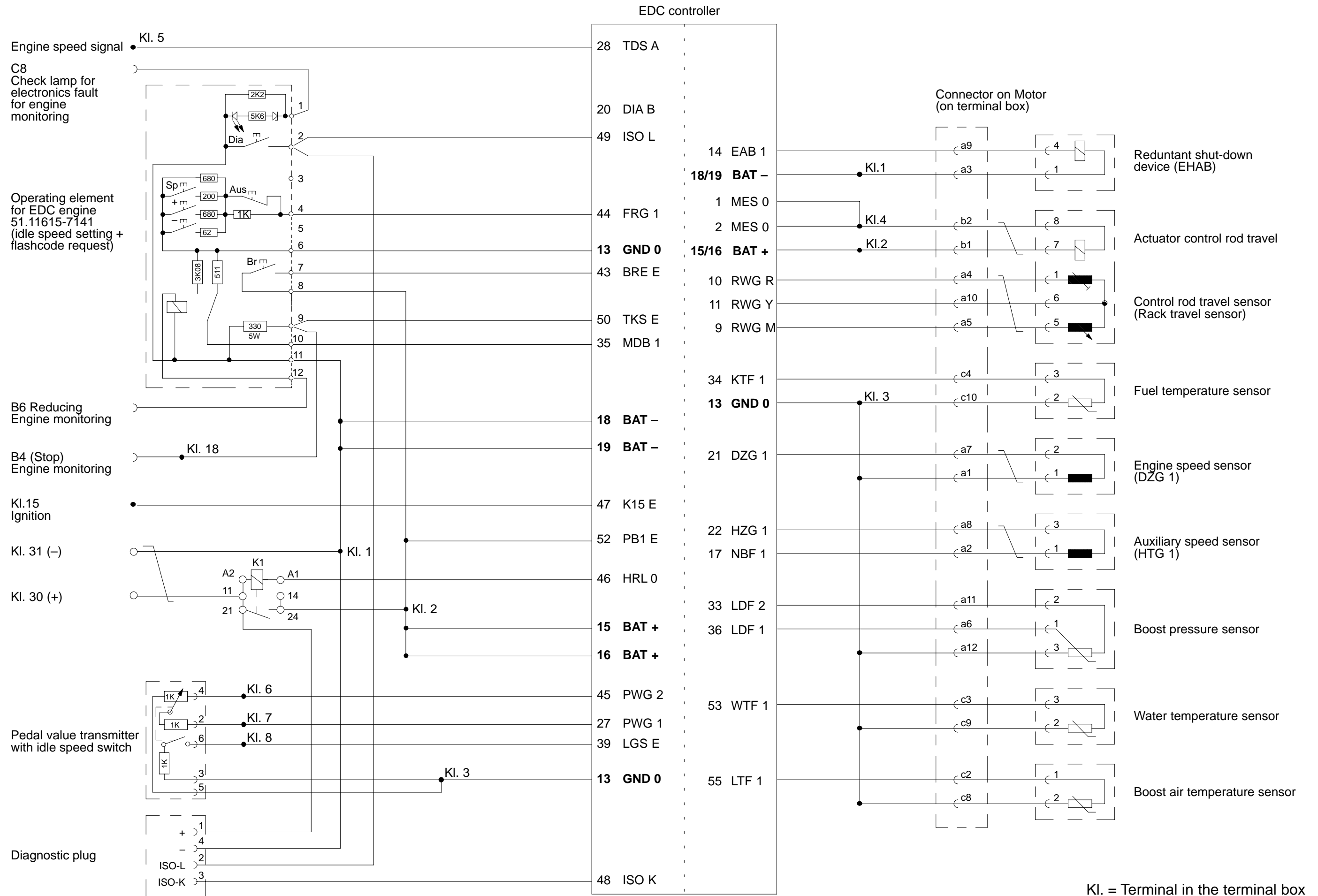


## Terminal connection diagram

---



# Terminal connection diagram – Brief overview







---

A series of horizontal dotted lines for writing notes, spanning the width of the page.

<b>A</b>		
Atmospheric pressure sensor (in control unit)	49	
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