Werkstatthandbuch
Workshopmanual
Manuel d´atelier
Manual de taller
Manuale per l´officina
Werkplaatshandboek

FENDT 900 Vario COM III

X 990.005.057.012

1

FENDT

A	General
B	Faults
C	Documents and Diagrams
D	Component location
E	Testing
F	Setting and Calibration
G	Repair
H	Service – Info

2000

Overall system/engine

FENDT 900 Vario - COM III

Volume 1

Volume 2

Volume 3

FENDT 900 Vario - COM III

Volume 4

2000 Overall system/engine

A General

1 General description of the common rail system

All previous systems operated by generating the fuel injection pressure separately for each injection event. The injection pressure increases in principle with increasing fuel quantity and increasing engine speed. Between injection events, the pressure in the system is low.
In contrast to these well-known systems, in the accumulator injection or common rail system, pressure generation is decoupled from injection events. The generation of pressure bears no relation to either the engine speed or injection quantity; the pressure is instead freely selectable within limits and is continuously available from the high-pressure accumulator (rail). The accumulator comprises the distribution rail and pipes to the injectors. The fuel quantity for the individual cylinders is taken from this accumulator.

One injector for each engine cylinder
The core of the system is a solenoid-activated injector for every engine cylinder. A pulse from the control unit to the solenoid valve in the injector initiates the injection procedure. The discharge cross-section of the injector, the opening duration of the solenoid and the accumulated pressure in the common rail system determine the fuel quantity.

Variable pressure in the accumulator
In the Deutz common rail system, the accumulator pressure is generated by two high-pressure pumps. These are activated by the camshaft. On 4-cylinder-engines, the camshaft has 2 cams per pump; on 6-cylinder engines it has 3 cams per pump. This means that fuel is delivered into the rail by the pumps, every time an injector is opened. The exact quantity to be injected by the injector is released by the dispensing unit. This keeps the rail pressure constant.
In the common rail system, pressure in the accumulator is controlled by means of a pressure sensor. The rail pressure is freely programmable between 700 bar and 1400 bar using a mapping field (programming) and can be adapted to suit the engine's operating conditions. The control unit, sensors and system functions of the common rail system require more input signals than the standard single pump system.

See the comparison between EMR 2 (COM II) and EMR 3 (COM III).

Free selection of the injection pressure in the mapping field
The functional separation of pressure generation and injection opens up new possibilities in terms of the combustion process structure. Injection pressure is freely selectable in the mapping field and remains largely constant during the injection event. The maximum rail pressure is approx. 1400 bar.

Further reductions in exhaust gas and noise emissions
A reduction in exhaust gas and noise emissions is possible thanks to multiple injection. Multiple injection means—depending on the operating conditions—a pre-injection, main injection and a post-injection. These are triggered by multiple activation of quick-response solenoids. In addition, the injection process can be shaped by controlling the profile of the nozzle needle movement.
Hydraulic support on closing the nozzle needle ensures an abrupt end to the injection process.
The multitude of possibilities for configuring the injection process opens up new paths towards further reductions in pollutant emissions and the fuel consumption of diesel engines.
No major changes to the design of the engine
The common rail system can replace conventional injection systems without major changes to the engine. Instead of the injection pumps cylinders 1 and 2, two high-pressure pumps are fitted. The injectors are integrated into the cylinder head like a nozzle-holder combination.

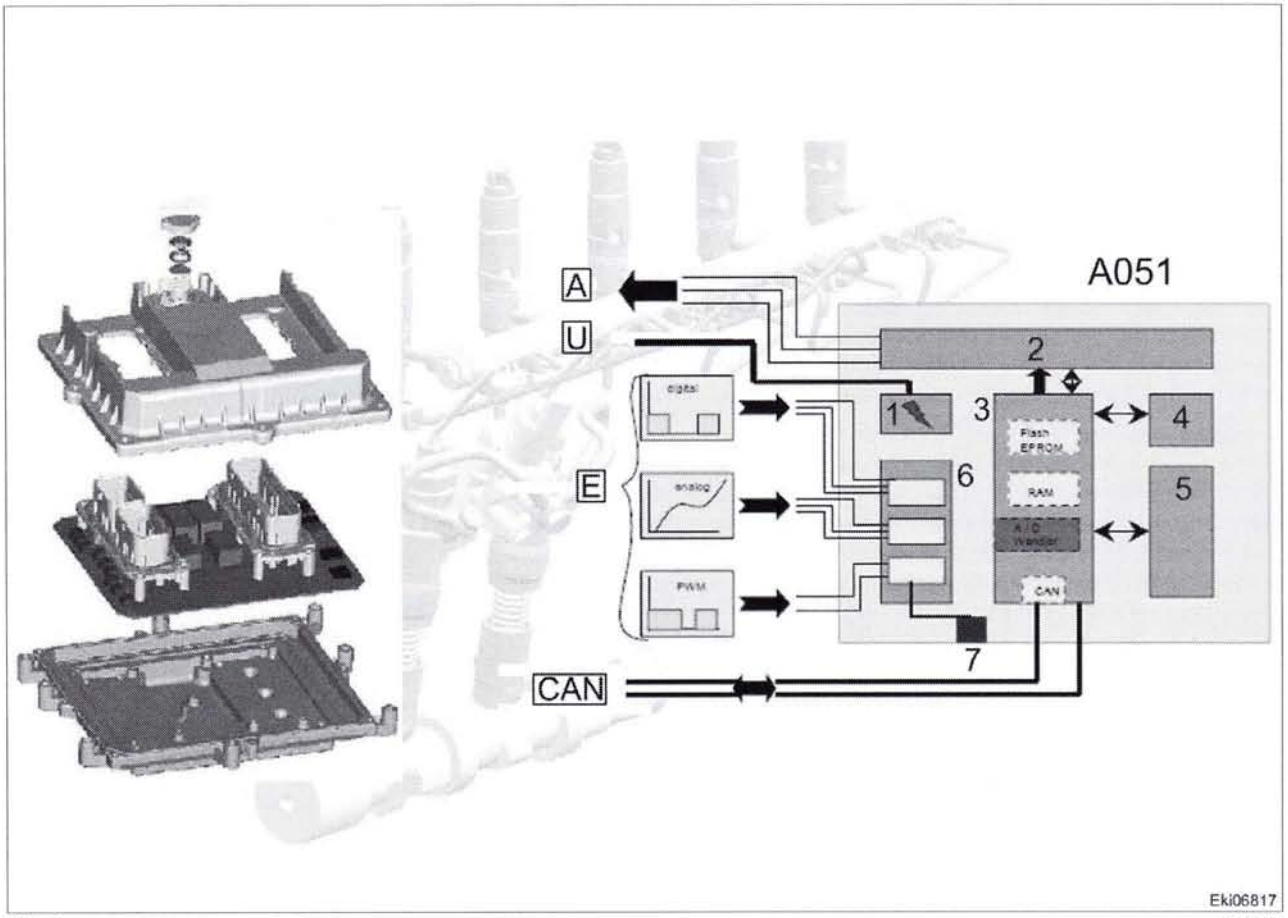


Fig. 1.

I006081

Item	Designation	Item	Designation
1	Power supply	A	Output signals (actuators)
2	Output stage	A051	ECU, engine control unit
3	Micro-controller	CAN	CAN connection to tractor
4	EEPROM		and diagnostics interface
5	Monitoring module	E	Input signals (sensors)
6	Signal pre-processing	U	Power supply
7	High-pressure sensor		

The electronically regulated diesel injection (EDC) is divided into 3 central system blocks.
The **sensors** and **switches** (information providers, input) record the operating conditions at the engine and convert the various physical variables into electronic signals.
In the **control unit** (processing), the information and the output signals are calculated in accordance with the stored mapping fields and characteristic curve. The control unit contains microprocessors and memory units. The control unit incorporates self-monitoring, the emergency running program and self-diagnostics.
The **actuators** (outputs) convert the electronic output signals into mechanical variables.
In addition:
A good power supply is required, so that the control unit can operate reliably.
This comprises:

- Unswitched supply terminal 30
- Switched supply terminal 15
- Earth supply terminal 31

The control unit is also connected to the CAN bus system of the tractor.

- Sensor signals are used for several purposes e.g. engine temperature
- Transmission Control System (TMS)
- Diagnostics

– programming

Comparison between EMR 2 (COM II) and EMR 3 (COM III).

Sensors and switches for EMR 2 (COM II)

Component	Duty
B041 EMR (camshaft) sensor	Reports the engine speed (actual value)
B042 EMR (crankshaft) sensor	Reports the engine speed (actual value);
B048 sensor, water temperature	Reports the engine temperature. This signal value is used for: Engine management, temperature display and for activating the heater flange
B053 charge-air temperature/charge-air pressure sensor	Reports the charge-air temperature (NTC) and the charge air pressure "LDA function"
B055 combination sensor, foot throttle sensor	One signal value is reported to the A002 ECU, enhanced control (normal mode)
	The second signal value is processed in the A051 ECU, engine control unit (emergency mode, with loss of enhanced control functions)
Position sensor in the Y035 EMR actuator	Reports the position of the control linkage
Note:	The two speed sensors B041 and B042 are fitted in order to provide
	diagnostics capability and emergency running characteristics

Sensors and switches for EMR 3 (COM III)

Component	Duty
B004 - Vacuum switch (air filter)	The signal is reported to the engine control unit and from there forwarded via the CAN bus system to the instrument panel (warning message)
B055 - Sensor, foot throttle	One signal value is reported to A002 ECU, enhanced control (normal operation) the second signal value is processed in the A051 ECU engine control unit (emergency mode, with loss of enhanced control functions)
B085 - Camshaft speed sensor	Reports the camshaft speed (actual value) and the position of the camshaft at cylinder 1 ignition
B086 - Rail pressure sensor	Reports the current pressure in the rail
B087 - Fuel low pressure sensor	Reports the fuel primary pressure
B088 - Crankshaft speed sensor	Reports the engine speed (actual value) and the position of the crankshaft TDC cylinders 1 and 4, or TDC cylinders 1 and 6.
B089 - Engine temperature sensor (Deutz)	Reports the engine temperature. This signal value is used for: Engine management, temperature display and for activating the heater flange
B090 - Sensor, oil pressure	Reports the oil pressure
B091 - Sensor, water in fuel	The signal is reported to the engine control unit and from there forwarded via the CAN bus system to the instrument panel (warning message)
B092 - Sensor, charge air pressure/temperature	Reports the "LDA function" charge air pressure and the charge-air temperature (NTC)
Note:	Two rotational speed sensors are fitted. These synchronise the injection, are used for diagnostics capabilities and to determine emergency running characteristics

Actuators of the EMR 2 (COM II)

Component	Duty
K034 relay (for R002 heater flange)	The relay is energised at temperatures of 5°C and below. In addition the indicator lamp on the instrument panel is energised
Y035 EMR actuator	The actuator is energised (PWM) by a certain control linkage movement (load demand)

Actuators of the EMR 3 (COM III)

Component	Duties
B077 - Engine fan (speed sensor/magnetic clutch)	The fan speed is controlled via the engine control unit so that the coolant water temperature is maintained at approx. 95°C. However, the fan can also be controlled by the hydraulic oil temperature and the transmission oil temperature.
K008 - Relay, starter lockout	The starting process is controlled by the engine control unit. When all input signals are present the relay is closed. If the rotational speed signals (camshaft/crankshaft) are not present after 5 sec, the start process is aborted
K063 - Heater flange relay	The relay is energised at temperatures of 5°C and below. In addition the indicator lamp on the instrument panel is energised
Y006 - Solenoid valve, engine brake	The engine brake is actuated by the engine control unit if the engine speed exceeds 900 rpm
Y091 - Dispensing unit (fuel)	The rail pressure is regulated by the dispensing unit in conjunction with the rail pressure sensor
Y094 - Actuator unit, AGR (exhaust gas recirculation)	The the actuator unit diverts exhaust gas into the engine
Y095 to Y101 injectors 1 to 6	The injectors inject fuel up to 3 times per working cycle

2 Emergency mode (emergency running)

DANGER: After switching off the diesel engine, wait at least 30 seconds before starting any work on the fuel system!

If the A051 ECU, engine control unit (EDC 7) detects a fault in the fuel system, it initiates emergency mode.

Warning message **High-pressure limiting valve opened**
A fault code FC 1E.1.51 is logged

Running in emergency mode means:
The Y091 dispensing unit is no longer energised. This causes the high pressure of the fuel in the rail to rise, leading to the high pressure limiting valve opening (at approx. 1800 bar).
When the high-pressure limiting valve is open, the high pressure of the fuel in the rail falls to approx. 700 bar. When the fuel passes through the open high-pressure limiting valve, it is rapidly heated. Therefore the engine can run only a maximum of 4 minutes in emergency mode, after which the A051 ECU, engine control unit (EDC 7) automatically shuts the engine down.
The high-pressure limiting valve cannot be closed whilst the engine is running; it can be closed only by shutting down the diesel engine, either by the A051 ECU, engine control unit (EDC 7) or by the driver, following which after approx. 30 seconds the high-pressure limiting valve closes.

NOTE: *After the high-pressure limiting valve has been actuated approx. 30 times, it should be replaced.*
If leaks occur in the high-pressure limiting valve, the fuel is heated.

3 Deutz Common Rail principle

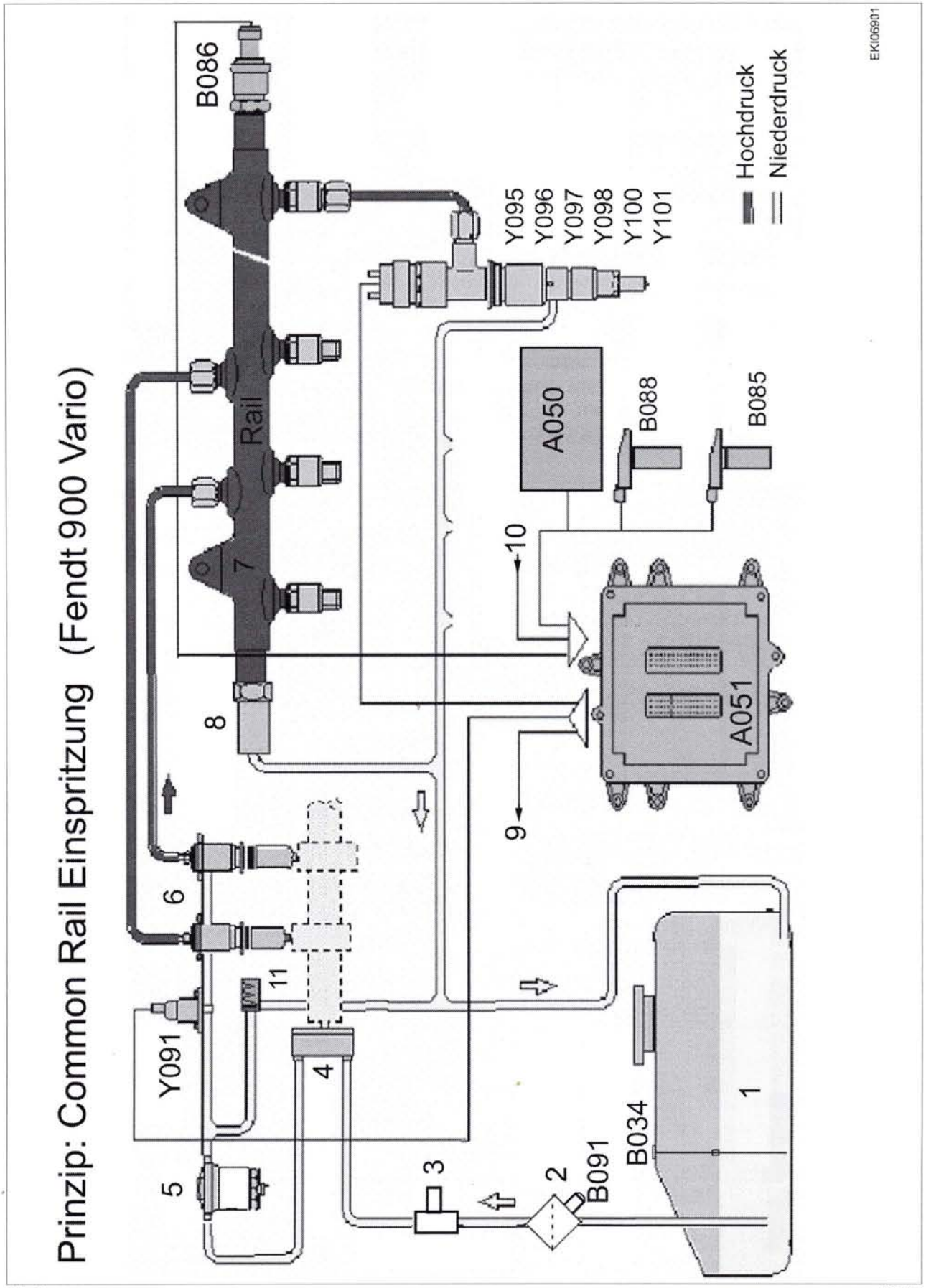


Fig. 2.

I007321

Item	Designation	Item	Designation
1	Right/left fuel tank	**B034** - Immersed tube sensor (fuel)	
2	Water sedimentor (pre-filter)	**B055** - Sensor, foot throttle	
3	Hand pump	**B085** - Camshaft speed sensor	
4	supply pump	**B086** - Rail pressure sensor	
5	Fuel filter (main filter)	**B087** - Fuel low pressure sensor	
6	High-pressure pump	**B088** - Crankshaft speed sensor	
7	Common rail (high-pressure accumulator)	**B091** - Sensor, water in fuel	
8	High-pressure limiting valve	**Y091** - Dispensing unit (fuel)	
9	Other actuators (e.g. exhaust gas recirculation)	**Y095** - Injector valve 1 (injector)	
10	Other sensors (e.g. B055 -foot throttle sensor)	**Y096** - Injector valve 2 (injector)	
11	Overflow valve	**Y097** - Injector valve 3 (injector)	
		Y098 - Injector valve 4 (injector)	
A050 - ECU, basic control unit		**Y100** - Injector valve 5 (injector)	
A051 - ECU, engine control unit (EDC 7).		**Y101** - Injector valve 6 (injector)	

4 A051 ECU, engine control unit (EDC 7)

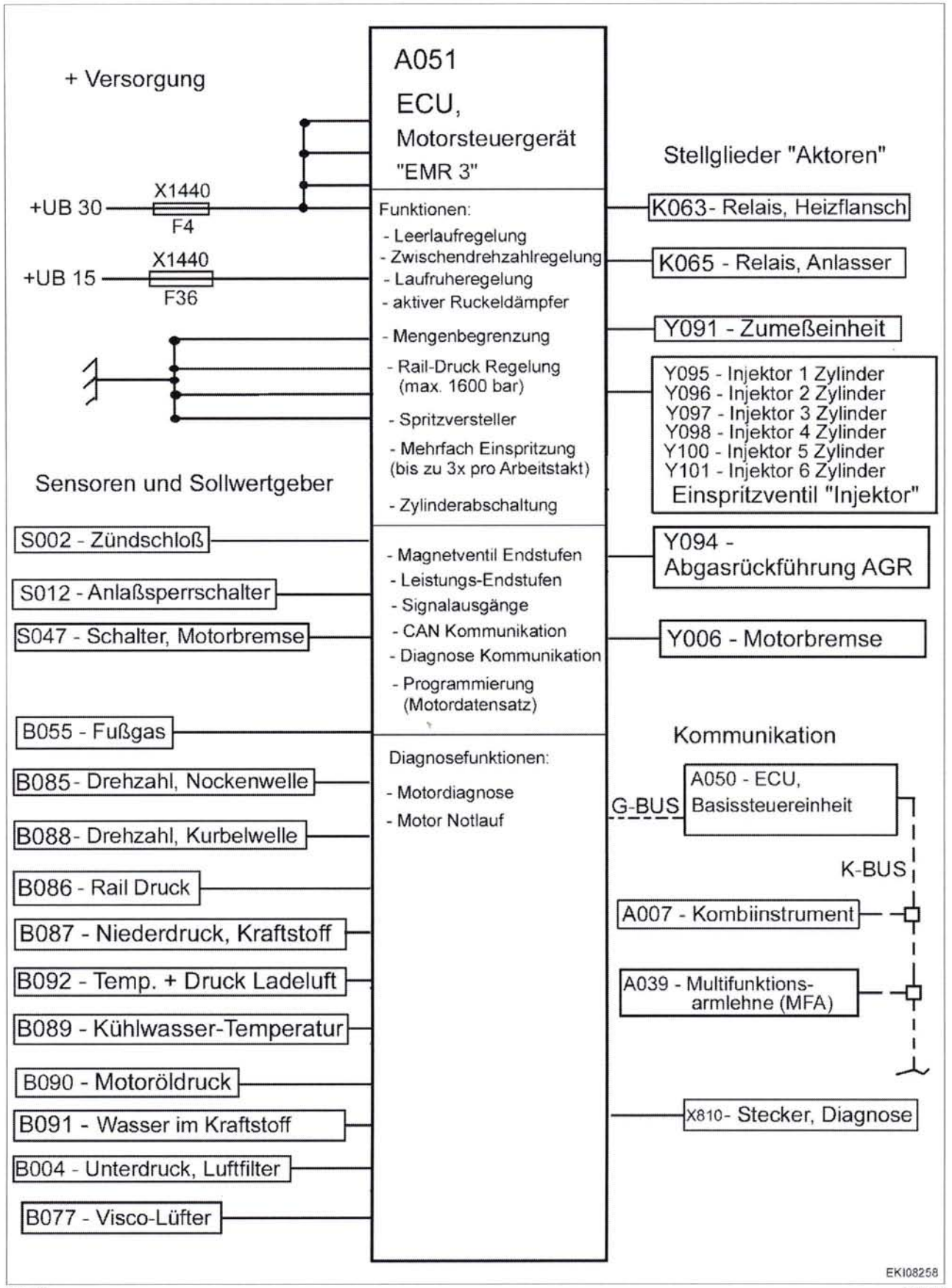


Fig. 3. I007324

919 .. 0101-1000
919 .. 1001-
922 .. 0101-1000
922 .. 1001-
925 .. 0101-1000
925 .. 1001-
928 .. 0101-1000
928 .. 1001-
931 .. 0101-1000
931 .. 1001-
934 .. 0101-1000
934 .. 1001-

Functions of the A051-ECU, engine control unit (EDC 7)

The A051 - ECU, engine control unit (EDC 7). **manages and controls the engine.**

The **A051** - ECU, engine control unit (EDC 7). has the following management functions:

All speed control

The **A051** - ECU, engine control unit (EDC 7). keeps the engine under constant load at the speed set by the foot throttle, hand throttle and memory key (target value), as long as the engine is capable of providing the necessary power.
Restriction of the maximum engine speed ("engine cut-off speed")

Torque restriction

Restriction of the maximum torque (maximum injection quantity)

Rail pressure restriction

The **Y091** - Dispensing unit (fuel) dispenses the exact fuel quantity to the rail that will be discharged by the injectors (Y095 to Y101). Control is exercised by the **B086** - Rail pressure sensor, which reports the actual pressure to the **A051** - ECU, engine control unit (EDC 7)..

Multiple injection

With a view to a reduction in exhaust gas and noise emissions, the injectors (Y095 to Y101) are activated by the **A051** - ECU, engine control unit (EDC 7). up to 3 times per working cycle.

Cylinder switch-off

If the **A051** - ECU, engine control unit (EDC 7). detects a short circuit at an injector (Y095 to Y101) (short circuit low-high), this injector is no longer activated (shut down).

Engine start

If all input signals are present the start procedure is initiated.

NOTE: *If the rotational speed signals (camshaft / crankshaft) are not present after 5 sec, the start process is aborted*

Engine stop

The injectors cease to be activated.

Monitoring and signal output functions

Coolant temperature and charge-air temperature –> for fault displays and/or reductions in power see chapter 0000 Reg. B - Fault code table

Charge pressure-dependent engine management ("LDA function")

If the charge-air temperature increases, the injection quantity will be restricted. If the charge-air pressure drops, the injection quantity will be restricted.
Preventing smoke formation

NOTE: *The **A051** - ECU, engine control unit (EDC 7). contains an atmospheric pressure sensor. Boost pressure (over pressure) = absolute pressure (B092 sensor) - atmospheric pressure (A051 ECU).*

Altitude correction
Avoidance of smoke plumes at low air density
Engine protection at low air density.
At high altitudes (Andes, Himalayas, etc.) the maximum engine power is restricted

Temperature-dependent start control ("excess fuel at starting")

Improved starting characteristics, engine protection at cold start without smoke plumes

Actuation of the cold start system

The R002 heater flange is activated by the **A051** - ECU, engine control unit (EDC 7).. The indicator lamp for the **R002** - Heater flange is located in the **A007** - Instrument panel.

Actuation of the injectors

Energising the injector causes fuel to be injected; the duration determines the quantity that is injected
The injectors inject fuel up to 3 times per working cycle

Activation of the exhaust gas recirculation (AGR)

Depending on the operating conditions of the engine, a certain quantity of exhaust gases are fed back into the engine

Emergency mode/Engine shutoff if necessary

see chapter 0000 Reg. B - Fault code table
see chapter 2000 Reg. A - Emergency mode

Actuation of the engine brake

The **Y006** - Solenoid valve, engine brake is actuated by the **A051** - ECU, engine control unit (EDC 7)..

Fault log in the A051 - ECU, engine control unit (EDC 7).

The **A051** - ECU, engine control unit (EDC 7). forwards the EMR fault data to the **A007** - Instrument panel, where the error messages are output on a display. (FENDT fault code)

Fault diagnosis using the SERDIA service diagnostics program

Reads all the sensors and the **A051** - ECU, engine control unit (EDC 7). ("program: Measured values")

Displays measured values graphically ("program: Measured values graphics") Reads the fault log (SERDIA fault log) Tests the functioning of all actuators ("program: Function test")

Loads engine data record using the Service - Diagnostics program (SERDIA)
For optimum management of the diesel engine by the **A051** - ECU, engine control unit (EDC 7)., the reference data (maximum power, engine cut-off speed, the engine mapping field (injection quantity at a specific operating point), maximum permissible operating temperature etc.) must be loaded into the **A051** - ECU, engine control unit (EDC 7)..
The engine data record (consisting of the reference data, engine-specific data (mechanical tolerances), fittings (power pack engine or vehicle engine)) is loaded into the **A051** - ECU, engine control unit (EDC 7)..

NOTE: *If an engine data record that does not match the chassis number of the tractor is loaded, or an **A051** - ECU, engine control unit (EDC 7). that does not match the chassis number of the tractor is fitted, **this will invalidate any claims under warranty, the general operating licence (ABE) and hence also the insurance cover!***
*If an **A051** - ECU, engine control unit (EDC 7). that does not match the chassis number of the tractor is fitted, the power of the tractor will be restricted! The chassis number and engine number of the tractor, and also the interface serial number (interface cable for the SERDIA diagnostics program) are recorded in the **A051** - ECU, engine control unit (EDC 7)..*

Calculated fuel consumption
The **A051** - ECU, engine control unit (EDC 7). calculates the fuel consumption of the diesel engine in litres/hour. This figure is displayed on the instrument panel.

Input signal
The sensors fitted to the diesel engine supply the electronics in the **A051** - ECU, engine control unit (EDC 7). with all the relevant physical variables.

- **B004** - Vacuum switch (air filter)
- **B055** - Sensor, foot throttle
- **B085** - Camshaft speed sensor
- **B086** - Rail pressure sensor
- **B087** - Fuel low pressure sensor
- **B088** - Crankshaft speed sensor
- **B089** - Engine temperature sensor (Deutz)
- **B090** - Sensor, oil pressure
- **B091** - Sensor, water in fuel
- **B092** - Sensor, charge air pressure/temperature
- **Via the CAN bus system:**
- Memory key in the control panel
- TMS Tractor Management System
- Activation of the **B077** - Engine fan (speed sensor/magnetic clutch) by the hydraulic oil and transmission oil temperatures.

Based on information about the current engine status and the inputs (foot throttle, hand throttle, memory keys on the joystick, TMS), the A051 - ECU, engine control unit (EDC 7). manages and controls the actuators.

The actuators fitted to the diesel engine are as follows:

- **B077** - Engine fan (speed sensor/magnetic clutch)
- **K008** - Relay, starter lockout
- **K063** - Heater flange relay
- **Y006** - Solenoid valve, engine brake
- **Y091** - Dispensing unit (fuel)
- **Y094** - Actuator unit, AGR (exhaust gas recirculation)
- **Y095** - Injector valve 1 (injector)
- **Y096** - Injector valve 2 (injector)
- **Y097** - Injector valve 3 (injector)
- **Y098** - Injector valve 4 (injector)
- **Y100** - Injector valve 5 (injector)
- **Y101** - Injector valve 6 (injector)

5 B055 sensor, foot throttle

Pin	Function
1	Earth
2	+ supply (8.5 VDC)
3	Signal
4	Earth
5	+ supply (5.0 VDC)
6	Signal

Fig. 4. I001074

Duty:
The **B055** - Sensor, foot throttle conveys the driver's desired torque/power to the **A051** - ECU, engine control unit (EDC 7)..

Function:
The **B055** - Sensor, foot throttle consists of two potentiometers (redundant).
Potentiometer 1 responds to the rotation of a shaft in the pedal position sensor when the foot throttle (throttle pedal) is depressed. The potentiometer mounted on the end of the shaft transmits an analogue voltage signal to the **A050** - ECU, basic control unit. The **A050** - ECU, basic control unit senses the exact throttle pedal position and hence the driver's current requirement (target value) from the voltage value. So as to improve driving comfort, the throttle pedal position is regulated by a mapping field and further processed to damp it.
The voltage signal from potentiometer 1 is responsible for engine speed control, the throttle pedal module and the Tractor Management System (TMS). The part of the sensor is powered by the tractor electronics **A013** - PCB, microfuses .
If this voltage signal drops out, the tractor switches to emergency mode (loss of enhanced control functions). The engine speed (target value) can then only be transmitted via the foot throttle potentiometer 2. TMS, throttle pedal mode and the memory buttons cannot be pre-selected.
When the foot throttle (throttle pedal) is depressed, **potentiometer 2** responds to the rotation in exactly the same way. This analogue voltage signal is transmitted to the **A051** - ECU, engine control unit (EDC 7).. The **A051** - ECU, engine control unit (EDC 7). senses the exact throttle pedal position and hence the driver's current requirement (target value) from the voltage values. So as to improve driving comfort, the throttle pedal position is regulated by a mapping field and further processed to damp it.
Both voltage signals from the **B055** - Sensor, foot throttle are compared with each other. If control units **A050** - ECU, basic control unit and **A051** - ECU, engine control unit (EDC 7). detect differing values to potentiometer 1 and potentiometer 2, then a plausibility error is output.

NOTE: *see §63*

6 B085 camshaft speed

Pin	Function
1	Signal
2	Earth
3	Shielding against interference

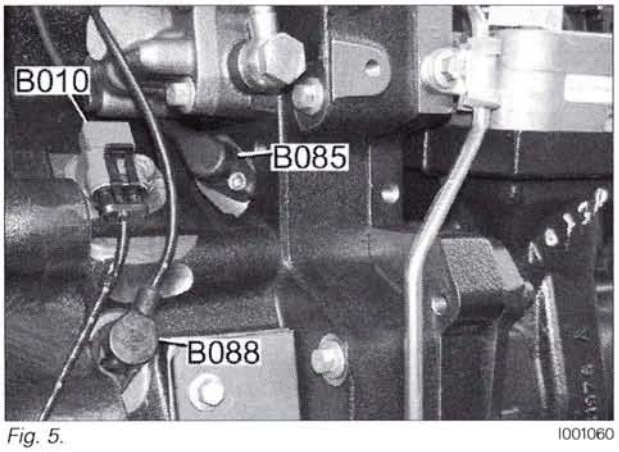


Fig. 5. I001060

Functions of the **B085** - Camshaft speed sensor

Sensing the current engine position (cylinder 1 ignition)
Sensing the engine speed (camshaft speed) for emergency running characteristics
Self diagnosis

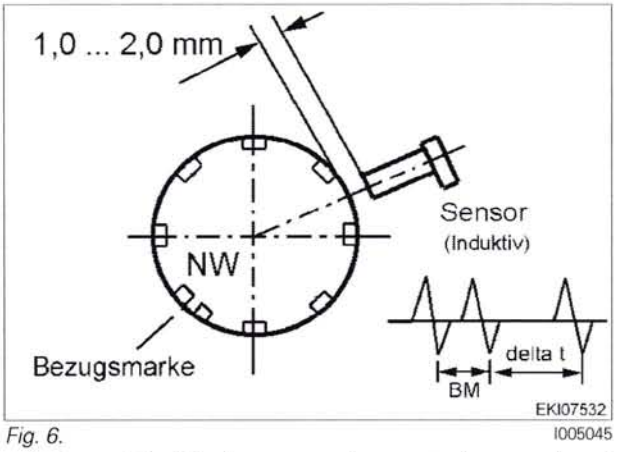


Fig. 6. I005045

The **B085** - Camshaft speed sensor is necessary for the synchronisation of the injection events. It reports the speed and the position of the camshaft at cylinder 1 ignition. This reference mark must then match the **B088** - Crankshaft speed sensor.

When the camshaft is rotating, an alternating voltage (VAC) is induced in the **B085** - Camshaft speed sensor by the marks on the camshaft gear.
The **A051** - ECU, engine control unit (EDC 7). calculates the camshaft speed from the voltage frequency.
The double cog (reference mark) causes a change in the frequency.
The double cog (reference mark) is used to determine the current position of the camshaft and appears once per working cycle, at TDC cylinder 1 ignition.

NOTE: ***Working cycle (4-stroke engine)***
2 crankshaft revolutions
1 camshaft revolution

Induction voltage and frequency

IN Inductive sensor
Ua Induced voltage

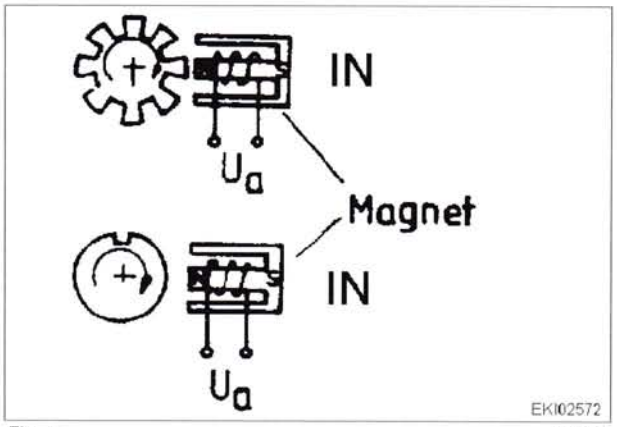


Fig. 7. I001547

Measurement of inductive sensors

The **inductive sensor** receives pulses directly from a pulse generator (gearwheel or disc).
Where the magnetic field of the inductive sensor is intersected by measuring points, an **AC induction voltage (VAC) is generated.**

The A051 - ECU, engine control unit (EDC 7). calculates the speed from the number of voltage pulses (frequency).

The amplitude of the pulse is proportional to the speed (i.e., the voltage increases as the speed increases).

A Reference mark (cylinder 1 ignition)

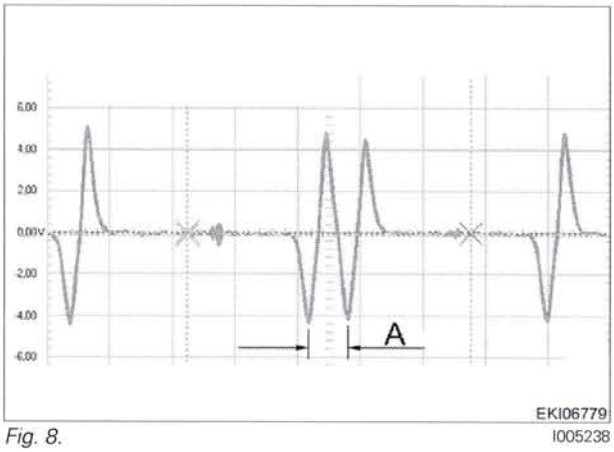


Fig. 8. I005238

Calculation of crankshaft revs (engine speed) on the basis of the oscilloscope display

NW Camshaft gear
delta t Time between voltage peaks

The A051 ECU, engine control unit calculates the speed from the number of voltage peaks.

Clearance between sensor and camshaft gear: 1.0 to 2.0 mm

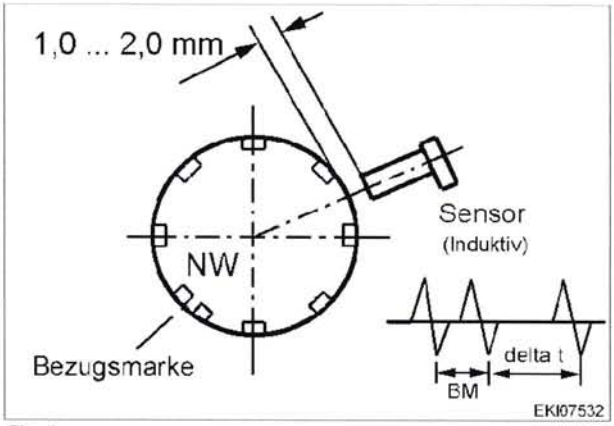


Fig. 9. I001550

NOTE: *see §77*

7 B086 rail pressure sensor

DANGER: After switching off the diesel engine, wait at least 30 seconds before starting any work on the fuel system!

Pin	Function
1	Earth
2	Signal
3	Supply

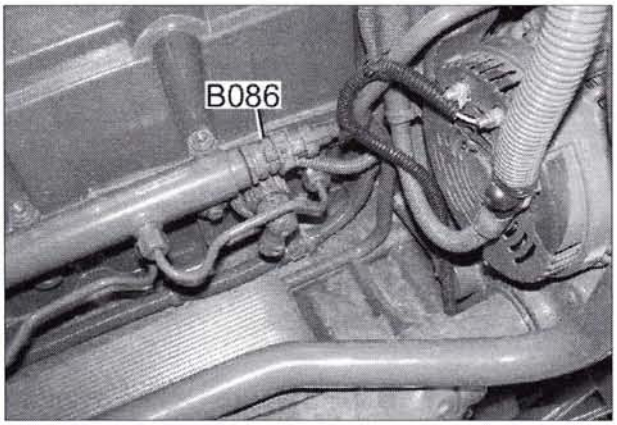


Fig. 10. I001086

Item	Designation
1	Separation point
2	Evaluation circuit
3	Steel membrane with expansion resistors
4	Pressure connection
5	Thread
p	Rail pressure (400 to approx. 1400 bar during normal operation)

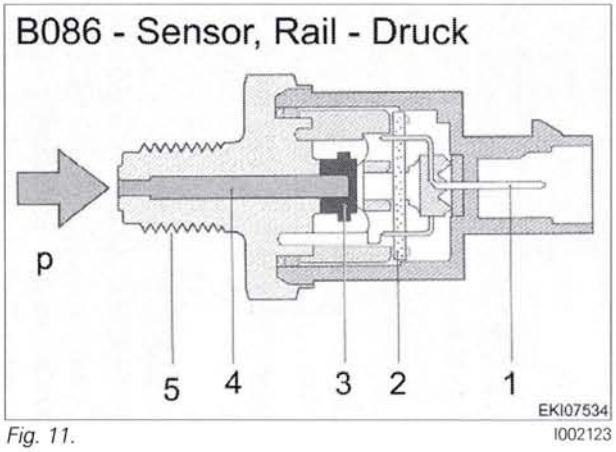


Fig. 11. I002123

Design and mode of operation of the B086 - Rail pressure sensor

The core of the sensor consists of a steel membrane (3) on which expansion resistors have been vapour deposited to form a bridge circuit.

As soon as the pressure to be measured via the pressure connection (4) takes effect on the steel membrane (3), the resistance value of the expansion resistors changes due to the membrane flexion.

The output voltage of 0 to 80 mV generated by the bridge circuit is forwarded to an evaluation circuit (2) via a connecting cable.

The evaluation circuit amplifies the signal to approx. 0.5 VDC at idling speed and approx. 4.5 VDC at maximum pressure, and forwards the signal to the **A051** - ECU, engine control unit (EDC 7)..

With the assistance of the Y091 dispensing unit, the **A051** - ECU, engine control unit (EDC 7). controls the fuel high pressure in the rail (pressure accumulator)

NOTE: *see §78*

The rail pressure is displayed as a target and actual value in the Deutz "SERIDA" diagnostics program.

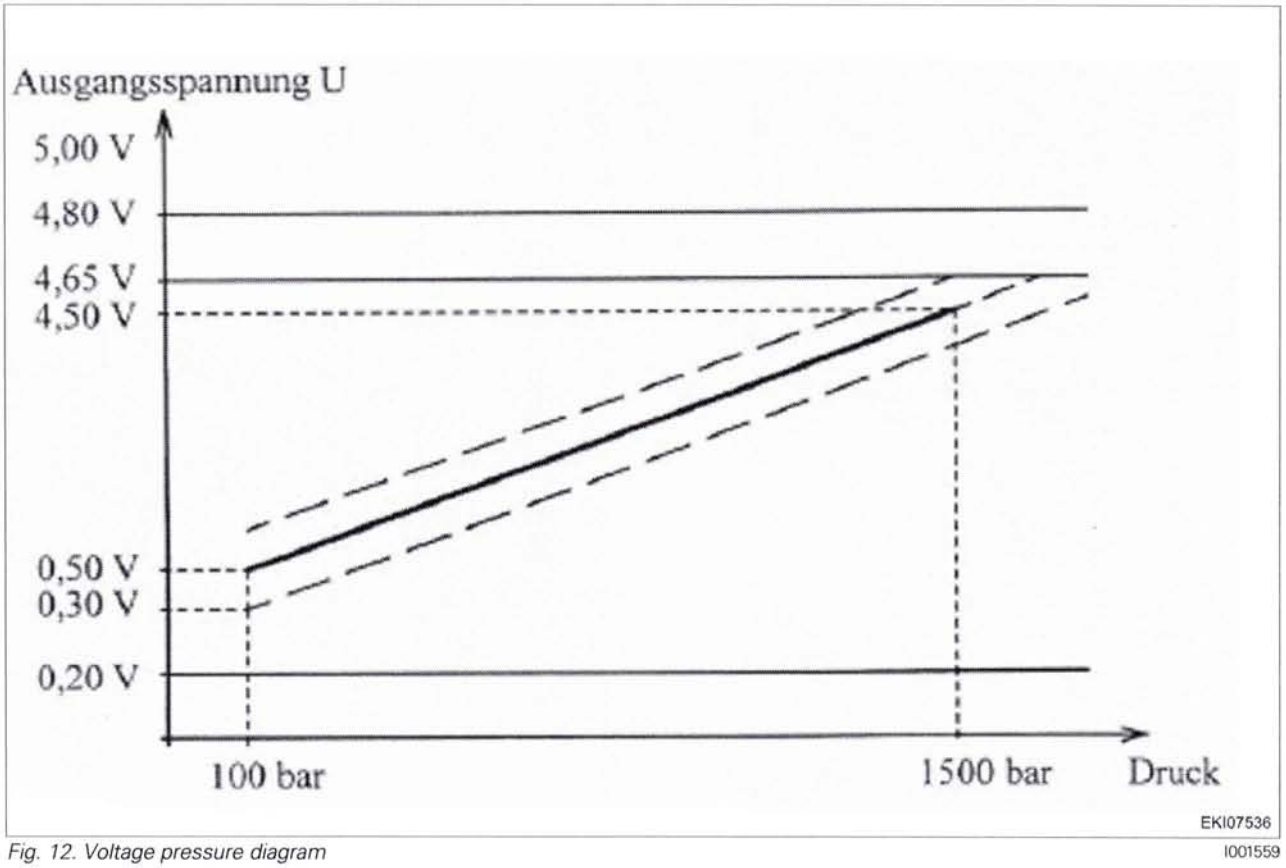


Fig. 12. Voltage pressure diagram I001559

The **B086** - Rail pressure sensor measures the current pressure in the high-pressure circuit and supplies a voltage signal to the **A051** - ECU, engine control unit (EDC 7). for further processing.
The exact reading of the high pressure in the rail is essential for the functioning of the common rail system.
Therefore, the tolerances of the **B086** - Rail pressure sensor are very small during pressure measurement.
Measuring accuracy is within approx. 30 bar.

In the event of fault

The B086 - Rail pressure sensor is determined to be faulty by the A051 - ECU, engine control unit (EDC 7). in the range below 0.2 VDC and above 4.8 VDC.

In the event of a fault, the Y091 dispensing unit is actuated "blind" by the **A051** - ECU, engine control unit (EDC 7)..
The Y091 dispensing unit is de-energised, i.e. fully open.
This causes the high-pressure limiting valve to open.
In idle, this produces a pressure of approx. 400 bar.

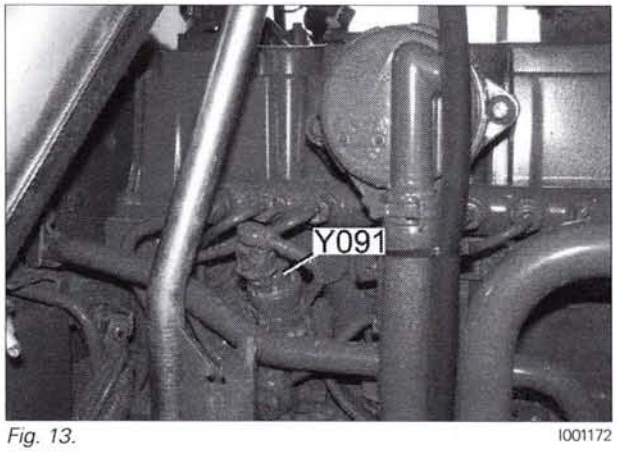


Fig. 13. I001172

When the high-pressure limiting valve opens, the warning message **"High-pressure limiting valve opened"** is displayed on the A007 instrument panel.
A fault code FC 1E.1.51 is logged
Since high pressure (approx. 400 bar) is relieved via the pressure-limiting valve, the fuel is heated.
Therefore, the diesel engine is switched off automatically by the **A051** - ECU, engine control unit (EDC 7). after approx. 3 minutes.

Restart tractor

Switch off ignition.
Wait at least 30 seconds until the pressure in the rail (high-pressure accumulator) has dissipated.
Start tractor.

NOTE: *When the high-pressure limiting valve opens, the return line (arrowed) heats up.*
*The diesel engine is switched off by the **A051** - ECU, engine control unit (EDC 7). after approx. 4 minutes.*

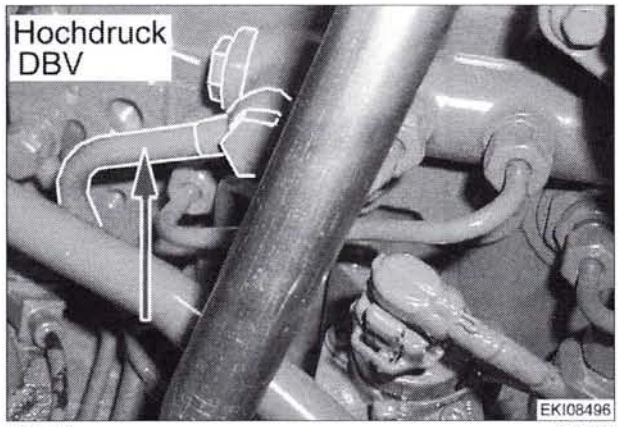


Fig. 14. I002044

8 B087 fuel low pressure and B090 oil pressure sensor

Pin	Function B087	Function B090
1	+ supply	+ supply
2	Signal	Signal
3	Not assigned	Earth
4	Earth	-

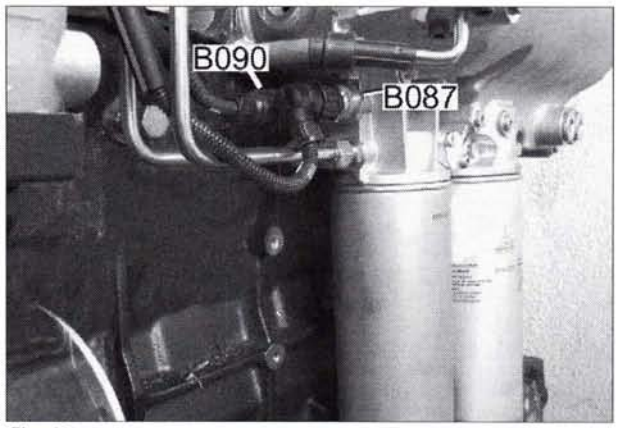


Fig. 15. I001087

Duty:
Component **B087** - Fuel low pressure sensor reports the fuel low pressure (primary pressure) to the **A051** - ECU, engine control unit (EDC 7).
Component **B090** - Sensor, oil pressure reports the engine oil pressure to the **A051** - ECU, engine control unit (EDC 7).

Function:
The fuel pressure and oil pressure (physical variables) are converted into a voltage signal (electrical variable). The pressure and the signal voltage are proportional, so that as the fuel pressure increases, the signal voltage increases proportionately.

NOTE: *see §79*
see §82
The fuel low pressure and the oil pressure are output in the Deutz "SERDIA" diagnostics program

9 B088 crankshaft speed

Pin	Function
1	Signal
2	Earth
3	Shielding against interference

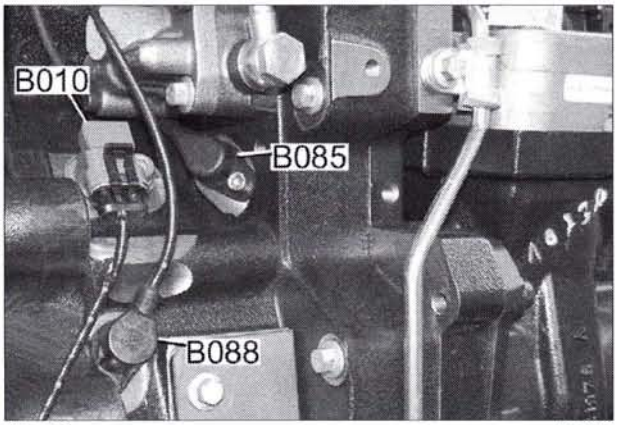


Fig. 16. I001060

Detection of current engine position (TDC cylinder 1 and cylinder 6)
Detection of engine speed
Self diagnosis

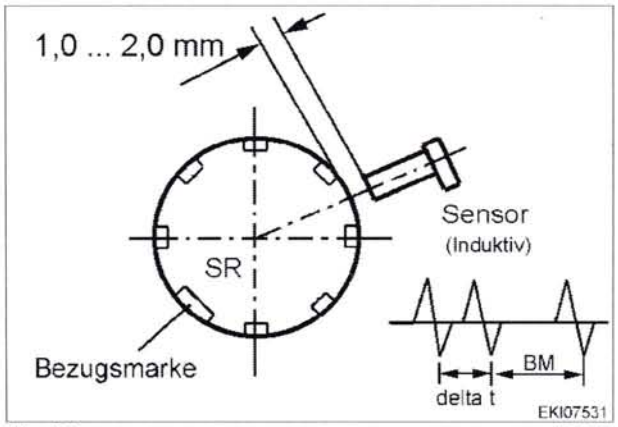


Fig. 17. I005049

As the crankshaft rotates, the teeth of the gear plate on the flywheel induce an AC voltage (VAC) in the **B088** - Crankshaft speed sensor.

The **A051** - ECU, engine control unit (EDC 7). calculates the engine speed from the voltage frequency.

The gap (reference mark) between the markings causes a break in the induced voltage.

This break is used to determine the current position of the crankshaft and appears twice per working cycle.

The **B085** - Camshaft speed sensor is necessary for synchronising injection. It delivers only 1 TDC signal (1st cylinder combustion) per working cycle and must be aligned with the reference mark (of the 1st cylinder) on the crankshaft.

NOTE: ***Working cycle (4-stroke engine)***
2 crankshaft revolutions
1 camshaft revolution

A Reference mark (TDC cylinder 1)

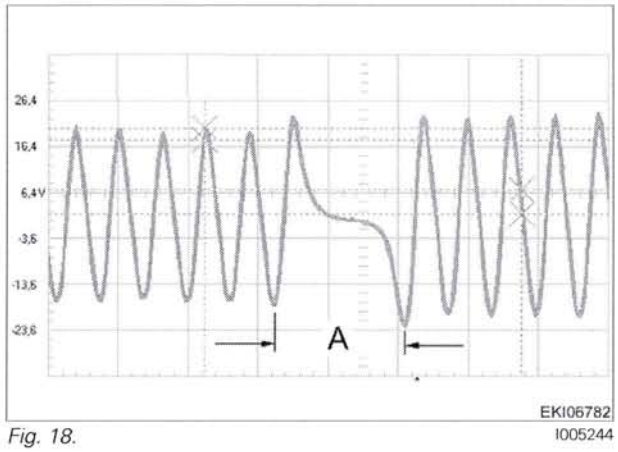


Fig. 18. I005244

NOTE: *see §80*
It is also possible to read the sensor value using the Deutz "SERDIA" diagnostics program.

10 B089 Deutz temperature sensor

Pin	Function
1	Earth
2	Signal

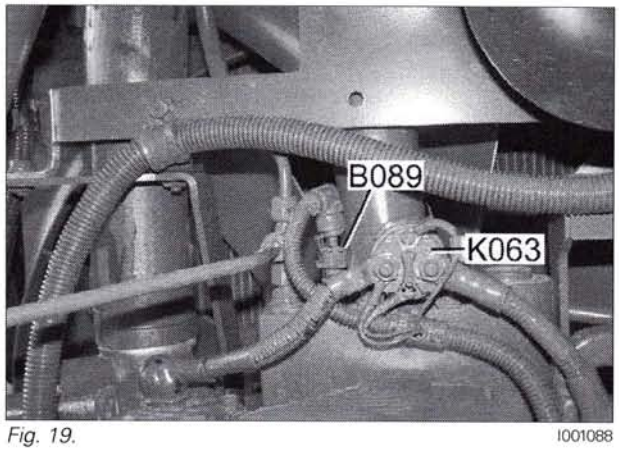


Fig. 19. I001088

Duty:
Component **B089** - Engine temperature sensor (Deutz) reports the engine temperature to the **A051** - ECU, engine control unit (EDC 7)..
This temperature signal is used for many purposes:

- Engine control
- Temperature display on the **A007** - Instrument panel
- Activation of the heater flange at temperatures lower than 5°C
- Report to **B077** - Engine fan (speed sensor/magnetic clutch)

Function:
The resistance of the temperature sensor changes depending on the temperature. The sensor has either an NTC (negative temperature coefficient) or a PTC (positive temperature coefficient) characteristic.
The **B089** - Engine temperature sensor (Deutz) is an NTC sensor, i.e. as the temperature rises, the resistance of the sensor falls.

NOTE: *see §81*
The engine temperature is output in the Deutz "SERDIA" diagnostics program.

11 B091 water in fuel sensor

Pin	Function
1	Earth
2	Signal

Fig. 20. Version A I007328

Pin	Function
1	Earth
2	Signal

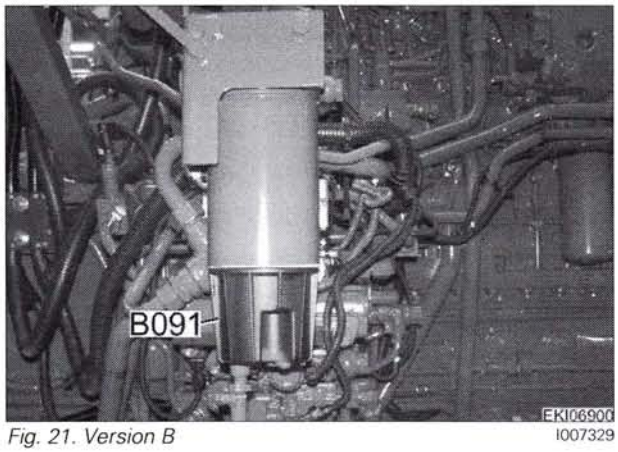


Fig. 21. Version B I007329

Version A is fitted up to chassis numbers:
919/../1011; 922/../1006; 925/../1010; 928/../1013; 931/../1009; 934/../1083

Version B is fitted from the following chassis numbers onwards:
919/../1012; 922/../1007; 925/../1011; 928/../1014; 931/../1010; 934/../1084

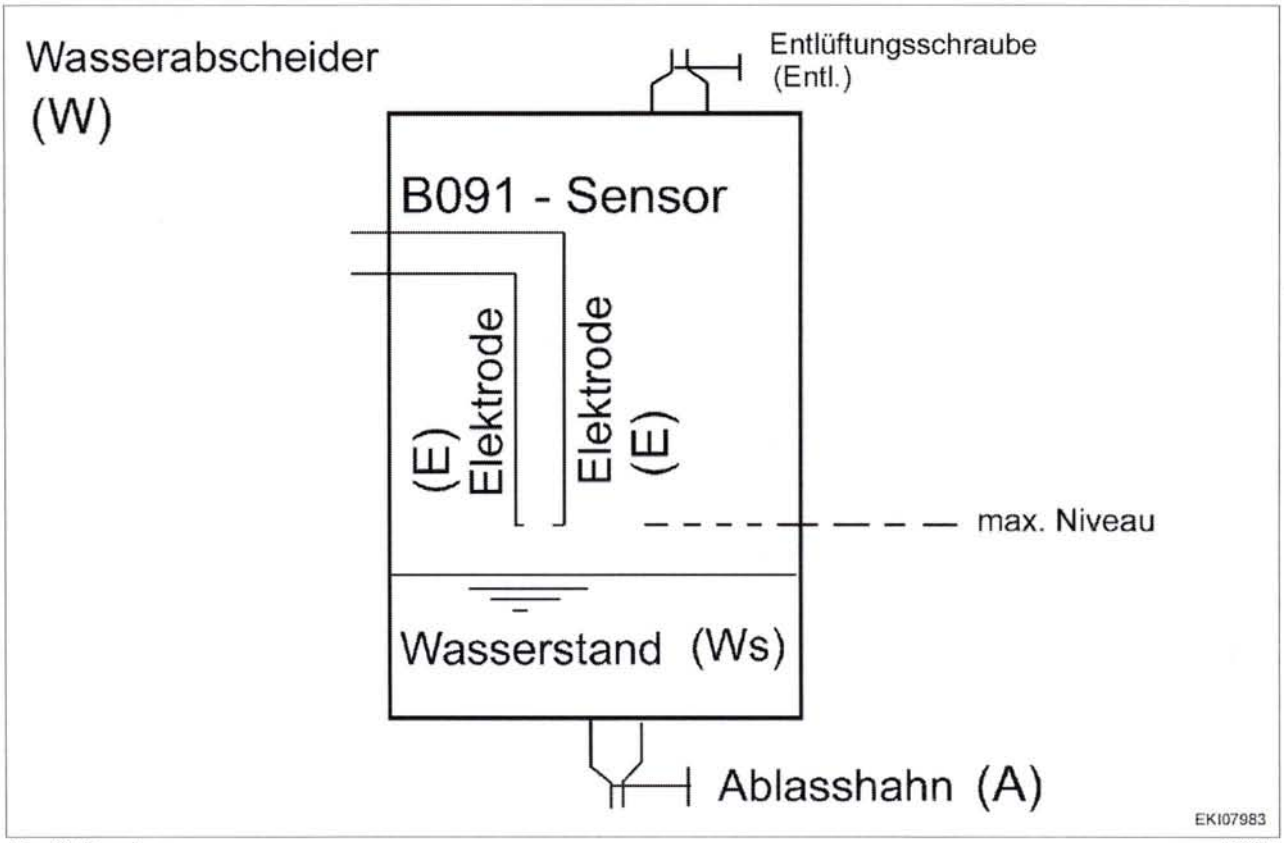


Fig. 22. Function I002155

Item	Designation	Item	Designation
A	Drain cock	Vent	Bleed screw
B091	Water in fuel sensor	W	Water sedimentor
E	Electrode	Ws	Water level

The **B091** - Sensor, water in fuel measures the water level in the water sedimentor. If the water level reaches the maximum, the water forms a contact across the two electrodes. That is then detected as a fault, and the signal is reported by the engine control unit via the bus system to the instrument panel. and is output as the following warning message.

EDC
1E.1.07

If the water reaches the maximum permitted level:
An alert appears in the multiple display:
Drain water and dirt

NOTE: *see §83*

12 B092 boost pressure/temperature sensor

Pin	Function
1	Earth
2	Temperature signal
3	Supply
4	Pressure signal

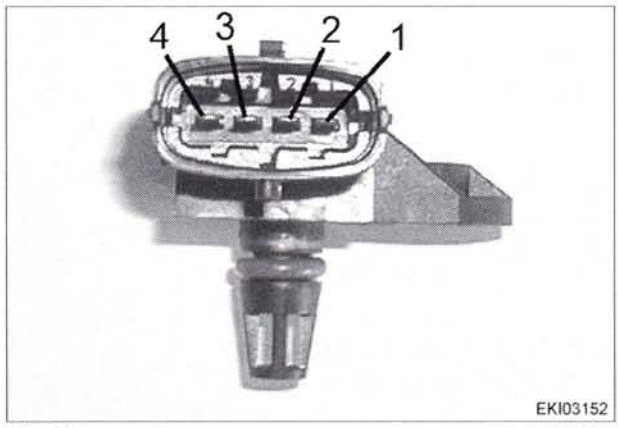


Fig. 23. I005051

Duty:
Component **B092** - Sensor, charge air pressure/temperature reports the boost pressure and charge air temperature to the **A051** - ECU, engine control unit (EDC 7).

The **B092** - Sensor, charge air pressure/temperature is a combination sensor. Two sensors with a shared power supply are mounted in the same component

Function of the pressure sensor:
The charge pressure (physical variable) is converted into a voltage signal (electrical variable). The pressure and the signal voltage are proportional, so that as the charge pressure increases, the signal voltage increases proportionately. ("LDA function")

Function of the temperature sensor:
The resistance of the temperature sensor changes depending on the temperature. The sensor has either an NTC (negative temperature coefficient) or a PTC (positive temperature coefficient) characteristic.

The **B092** - Sensor, charge air pressure/temperature is an NTC sensor, i.e. as the temperature rises, the resistance of the sensor falls.

Circuit diagram of the B092 charge air pressure/temperature sensor

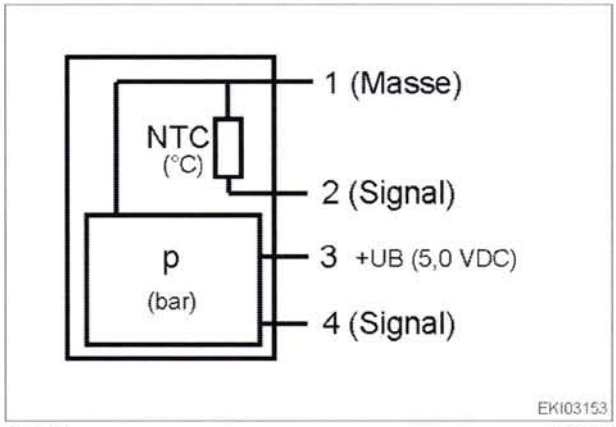


Fig. 24. I005052

Duty:

Used for controlling the engine (A051 - ECU, engine control unit (EDC 7).)
The **B092** - Sensor, charge air pressure/temperature picks up the boost pressure and the charge air temperature.
The signals are forwarded to the **A051** - ECU, engine control unit (EDC 7)..
In the **A051** - ECU, engine control unit (EDC 7)., the boost pressure is used to control the engine ("LDA function").

For charge air temperature warning message (on the A007 - Instrument panel)
The **A051** - ECU, engine control unit (EDC 7). picks up the charge air temperature from the **B092** - Sensor, charge air pressure/temperature and forwards it to the A050 ECU, basic control unit via the G BUS.
The "Warning threshold" for the charge air temperature is stored in the A050 ECU, basic control unit.
If the charge air temperature rises above the "warning threshold", the **A050** - ECU, basic control unit issues an error message.
The error message is sent to the **A007** - Instrument panel via the K BUS and appears on the display.

NOTE: *see §84*
*The **B092** - Sensor, charge air pressure/temperature can be read using the Deutz "SERDIA" diagnostics program.*

13 Starter control

On the FENDT 900 COM III series, as on all other COM III tractors, the starter is controlled by means of the **A051** - ECU, engine control unit (EDC 7)..

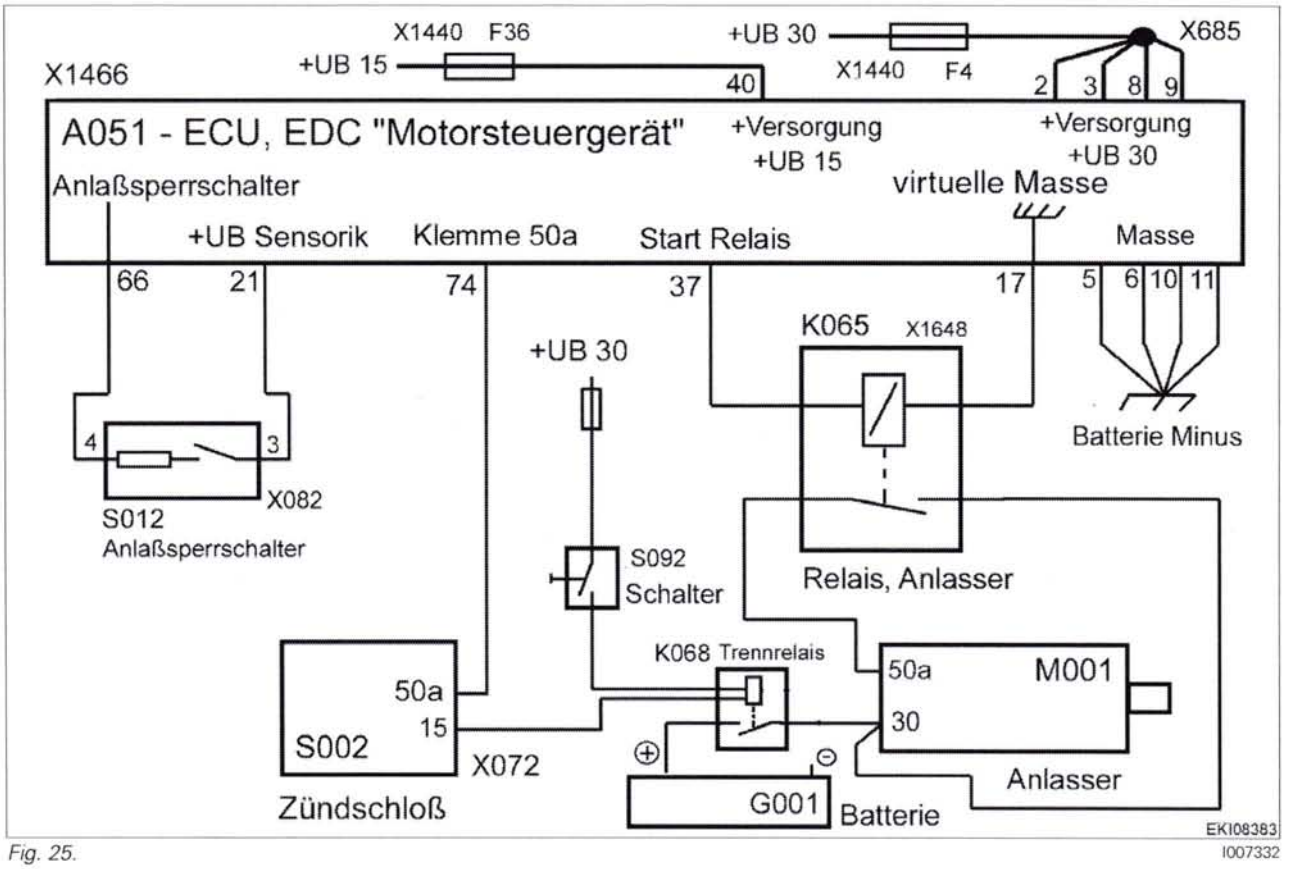


Fig. 25. I007332

When all input signals are present, the **K065** - Starter relay is energised by the **A051** - ECU, engine control unit (EDC 7)..

Start signals include:

- Supply voltage at terminals 30, 15, 31
- **S012** - Switch, starter lockout +UB at pin 66
- **S002** - Switch, ignition terminal 50a +UB at pin 74

During the start process, the **A051** - ECU, engine control unit (EDC 7). also requires the **following signals:**

- Start quantities released by the immobiliser control unit via the G bus
- A speed signal from the **B085** - Camshaft speed sensor or the **B088** - Crankshaft speed sensor

NOTE: *If the **A051** - ECU, engine control unit (EDC 7). does not detect a speed signal after about 5 seconds, the start process is aborted.*

The start process is aborted for the following reasons:

- Without a speed signal, the **A051** - ECU, engine control unit (EDC 7). cannot classify the rotational speed of the engine, speed control
- Without a speed signal, the **A051** - ECU, engine control unit (EDC 7). cannot assign the injection time
- **B085** - Camshaft speed sensor TDC cylinder 1 ignition, or
  B088 - Crankshaft speed sensor TDC cylinder 1/6

14 starter.

Diagram: starter.

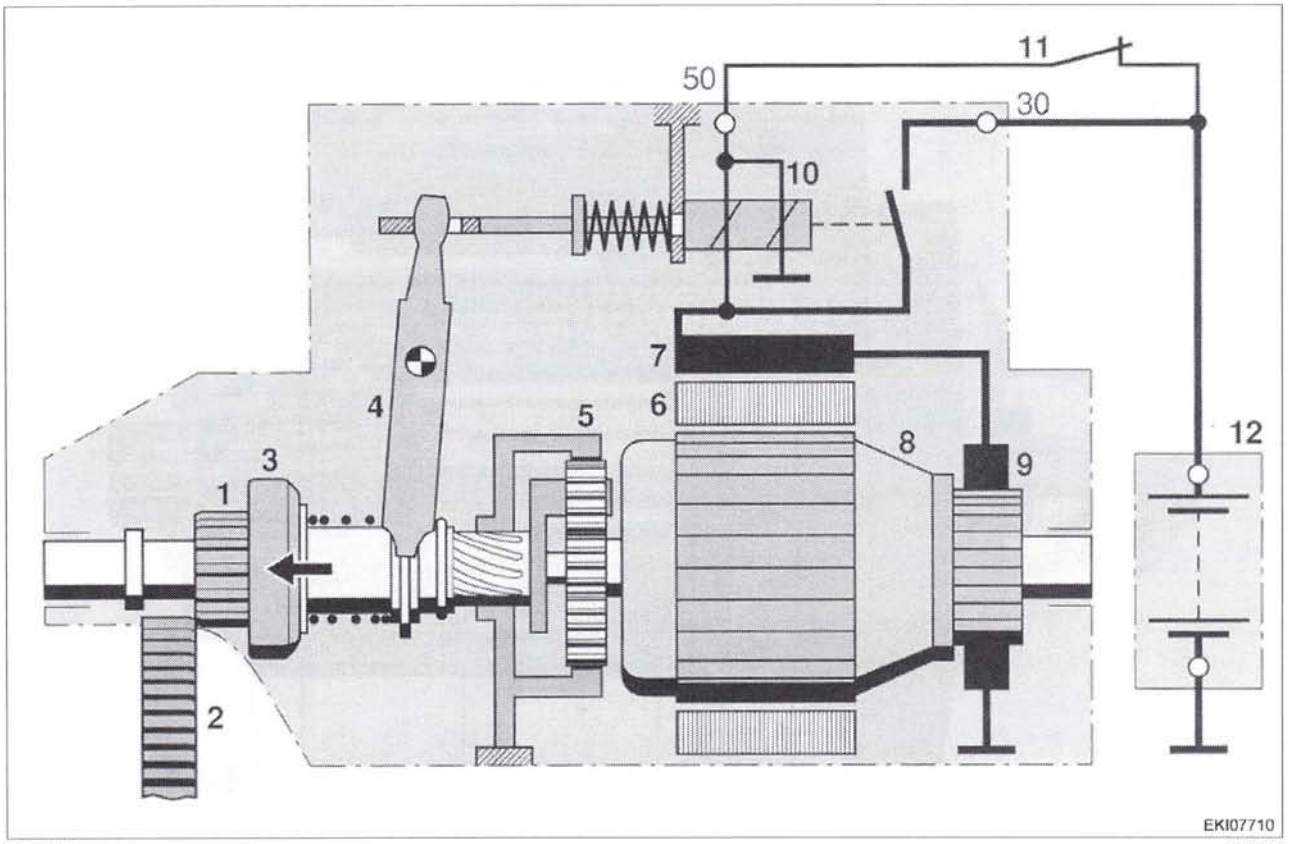


Fig. 26.

I000762

Item	Designation	Item	Designation
1	Pinion	7	Exciter winding
2	Gear rim	8	Anchor
3	Roller-type freewheel	9	Commutator with carbon brushes
4	Engagement lever	10	Engagement relay with pull-in and hold-in winding
5	Planetary gear (reduction gear)	11	K065 starter relay
6	Pole shoe	12	G001 battery

Diagram: Reduction gear starter with free running pinion

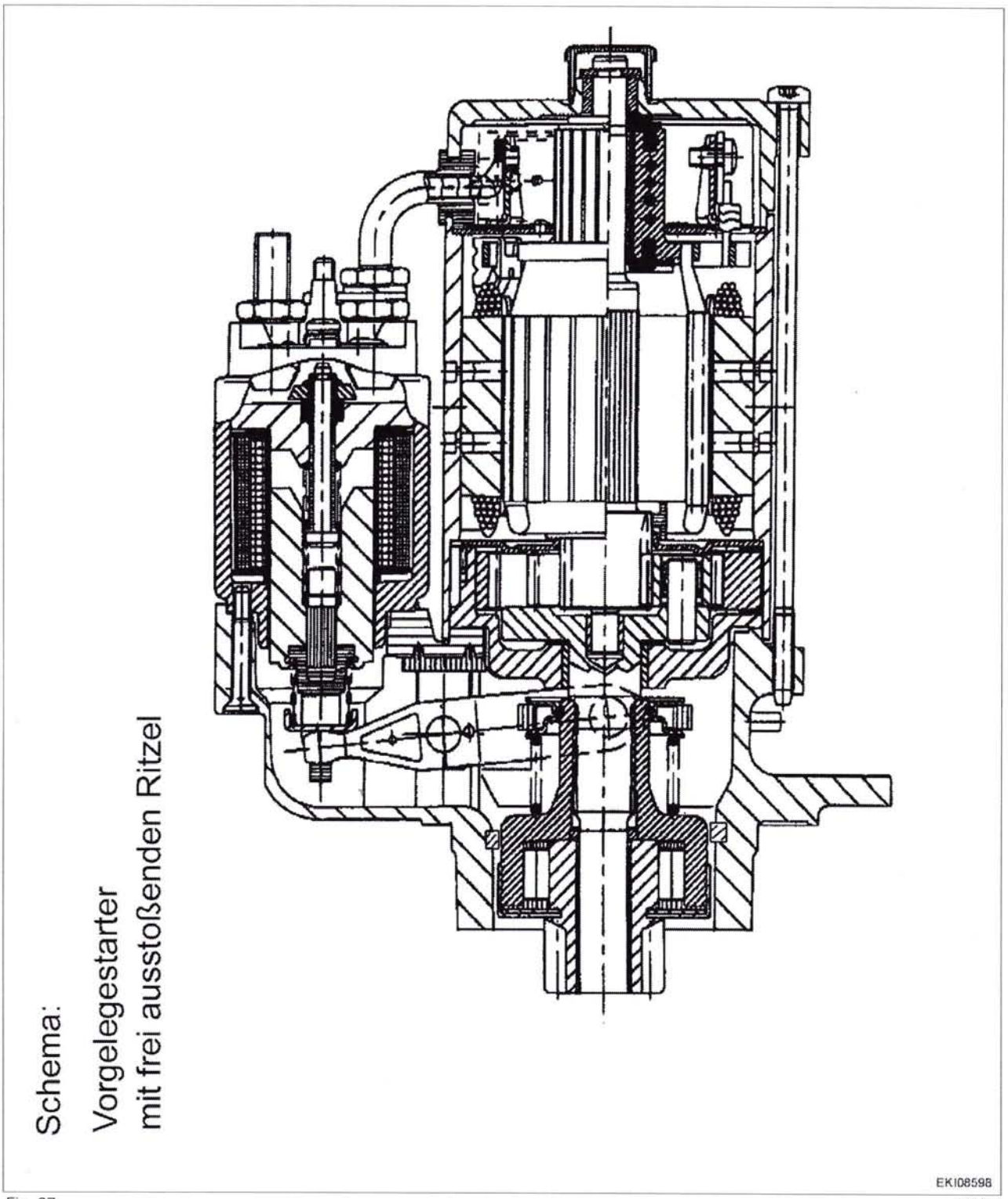


Fig. 27.

I002396

15 Calculating the fuel consumption of a diesel engine

NOTE: *See also:*
Service Information 23/2007 (PTO power and fuel consumption of the COM III tractor)

Rough calculation for the fuel consumption of a diesel engine operating under full load
The rough calculation produces an approximate value for the fuel consumption of a diesel engine
The fuel consumption depends upon the tractor engine horse power

Tractor type	Chassis no.	Engine horsepower (max. power ECE R24 KW/HP)	Fuel consumption under full load
FENDT 922 Vario	919 / .. / ...	162 / 220	**approx. 44 l/Rhr**
FENDT 924 Vario	922 / .. / ...	176 / 240	**approx. 48 l/Rhr**
FENDT 927 Vario	925 / .. / ...	199 / 270	**approx. 54 l/Rhr**
FENDT 930 Vario	928 / .. / ...	220 / 300	**approx. 60 l/Rhr**
FENDT 933 Vario	931 / .. / ...	242 / 330	**approx. 66 l/Rhr**
FENDT 936 Vario	934 / .. / ...	265 / 360	**approx. 72 l/Rhr**

Under full load (i.e. max. engine power = max. injection volume)

Cons. = Fuel consumption (l/hr)

l = Amount of fuel in litres

HP = Engine power in HP (1 HP = approx. 0.736 kW)

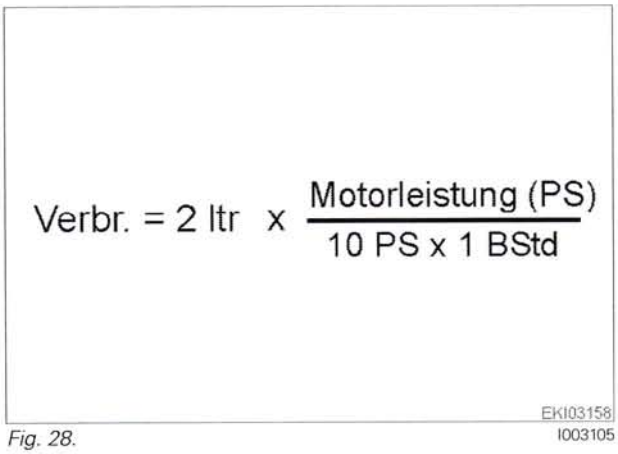


Fig. 28. I003105

Operating at maximum power (full load)
Fully depress foot throttle (B055 foot throttle sensor), accelerate the tractor using the joystick (A039 multifunction armrest) until the
engine speed reaches approx. 1800..1900 rpm. (Diesel engine running a maximum power)

Calculation example:

- Tractor power = 360 HP (max. engine power)
- Tractor operating under full load

Approx. fuel consumption per running hour = 2 l x (360/10) HP x 1 Rhr

Fuel consumption per running hour = approx. 72 l

Operating the diesel engine for optimum fuel consumption (l/Rhr)

Opt. = Economical operating level of the diesel engine

In the partial-load operating range = 2/3 of full load operating ("driving with reduced engine speed")

Fig. 29. I003106

Driving in the partial-load operating range of the diesel engine

Using the foot throttle (B055 foot throttle sensor), set the engine speed to approx. 2000 rpm, accelerate the tractor using the joystick (A039 multifunction armrest),
engine speed reaches approx. 1800..1900 rpm. (The diesel engine is running in the partial-load operating range)

Measuring fuel consumption with the Vario terminal (approx. value)

Press F5.

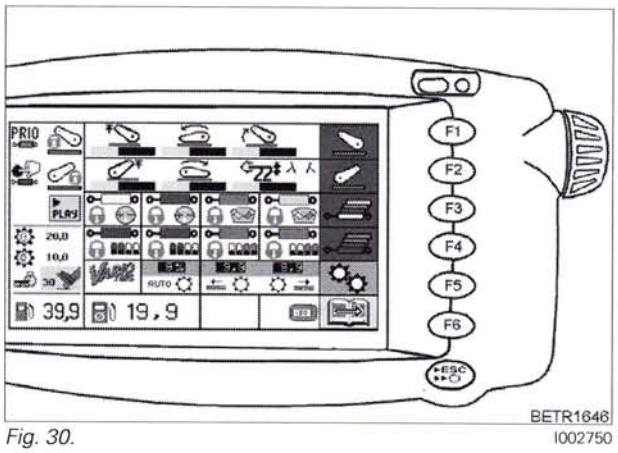


Fig. 30. I002750

The sub-menu is displayed.

Press F4.

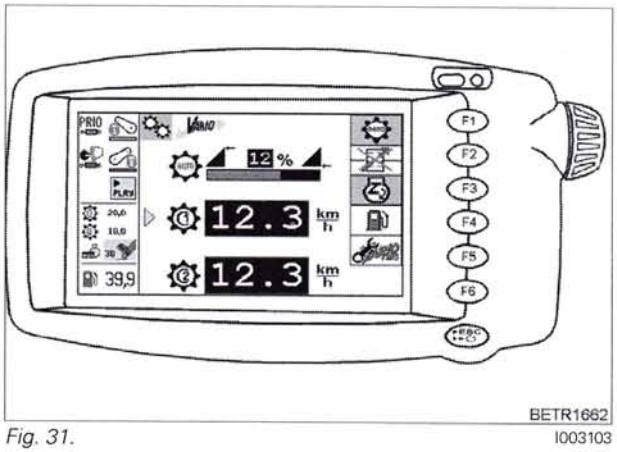


Fig. 31. I003103

The sub-menu is displayed.

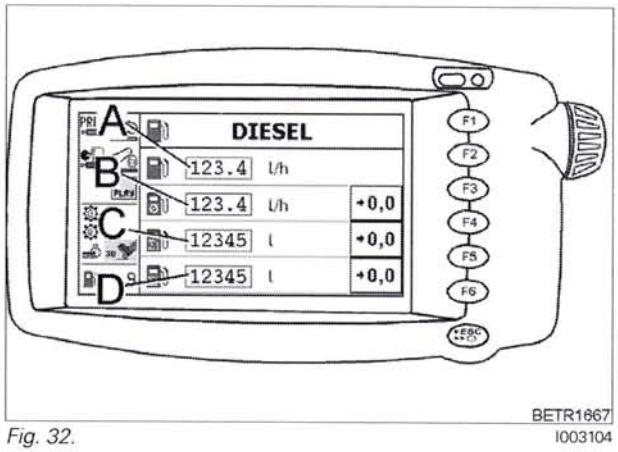


Fig. 32. I003104

A = Current fuel consumption

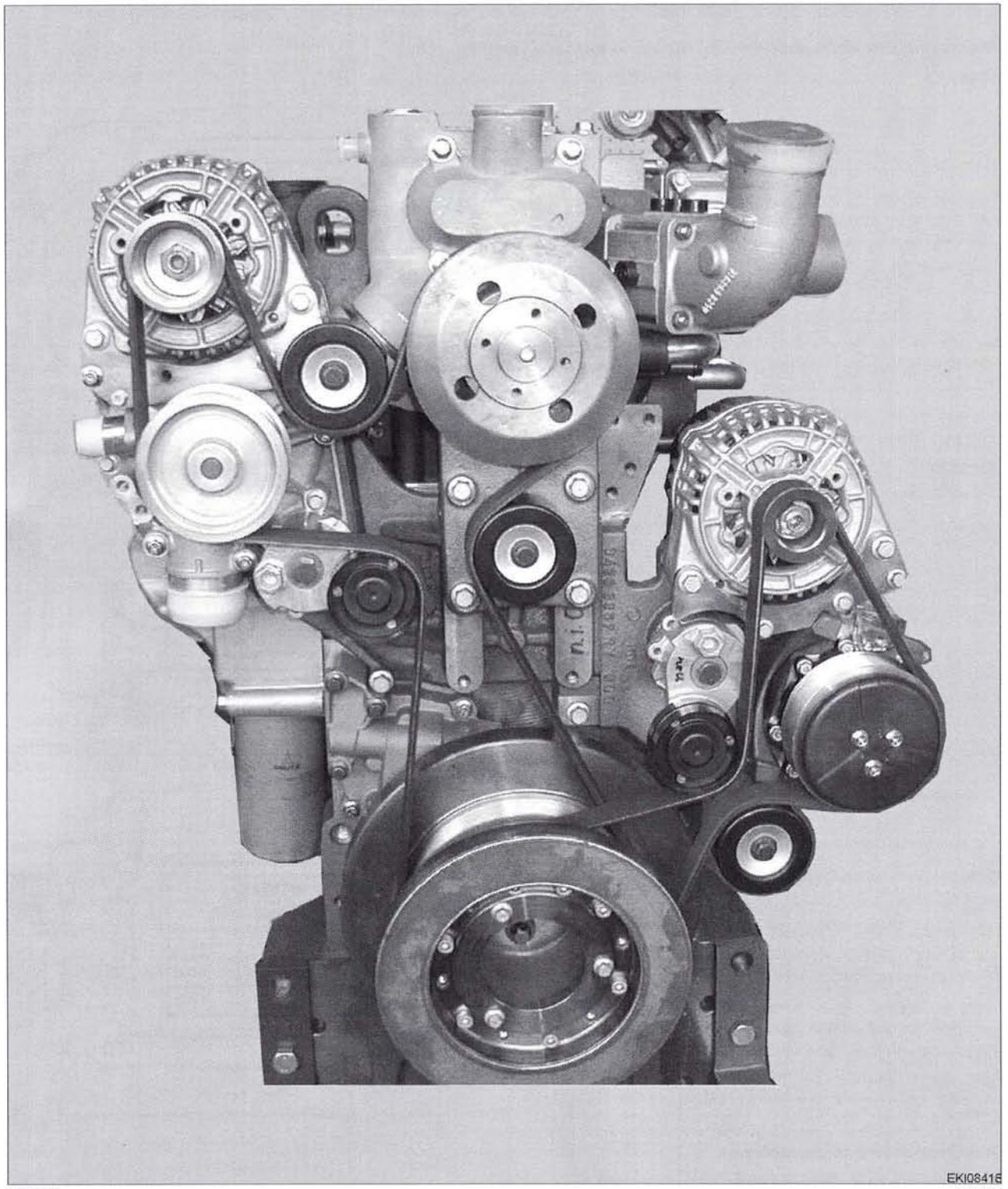
B = Average fuel consumption
Display is reset to "0"

C = 1st sum counter
For example between different driving styles for similar task
Display is reset to "0"

D = 2nd sum counter
For example between different driving styles for similar task
Display is reset to "0"

NOTE: *Maximum value for the sum counter is 30,000 litres, then measuring starts at 0 again.*

16 Belt drive: Deutz TCD 2013



EKI08416
I001732

Fig. 33.

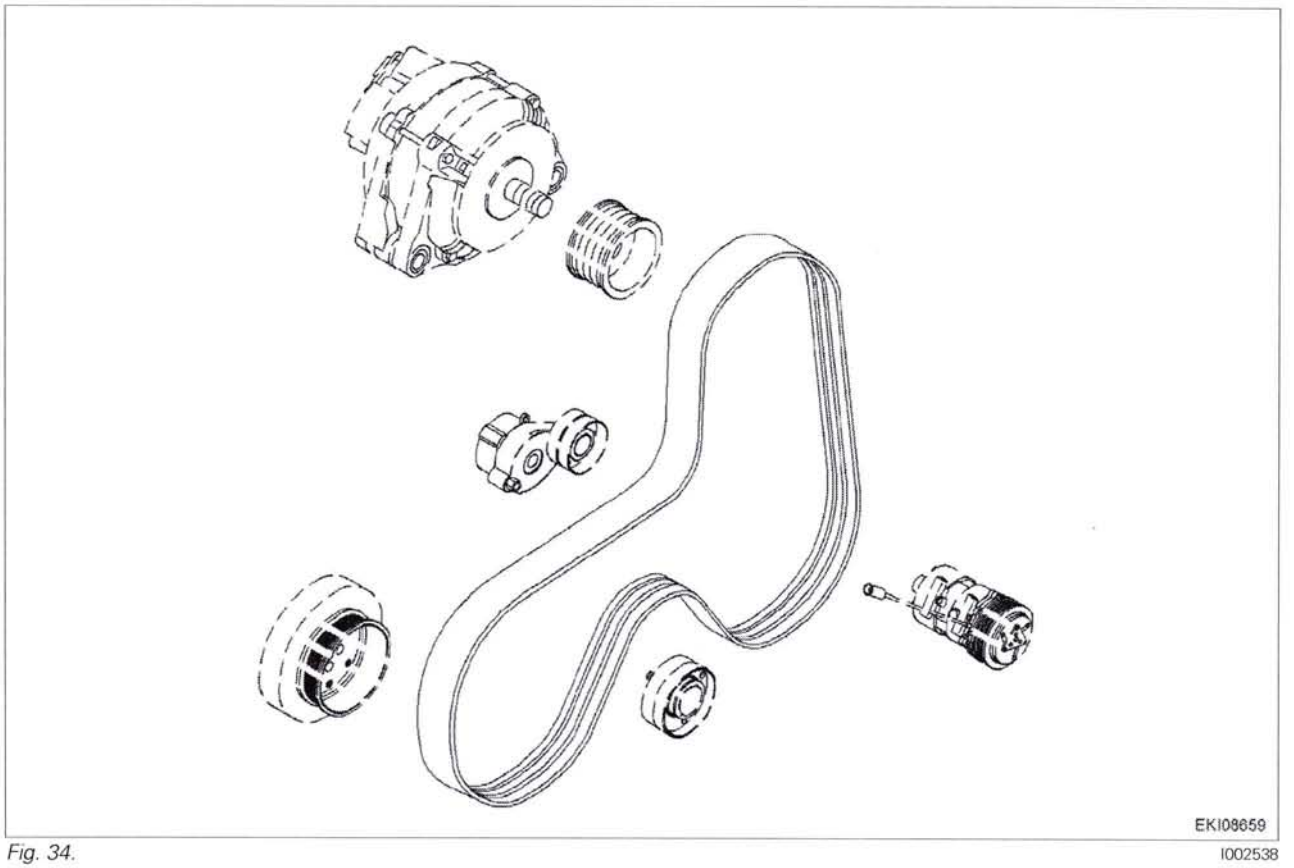


Fig. 34. I002538

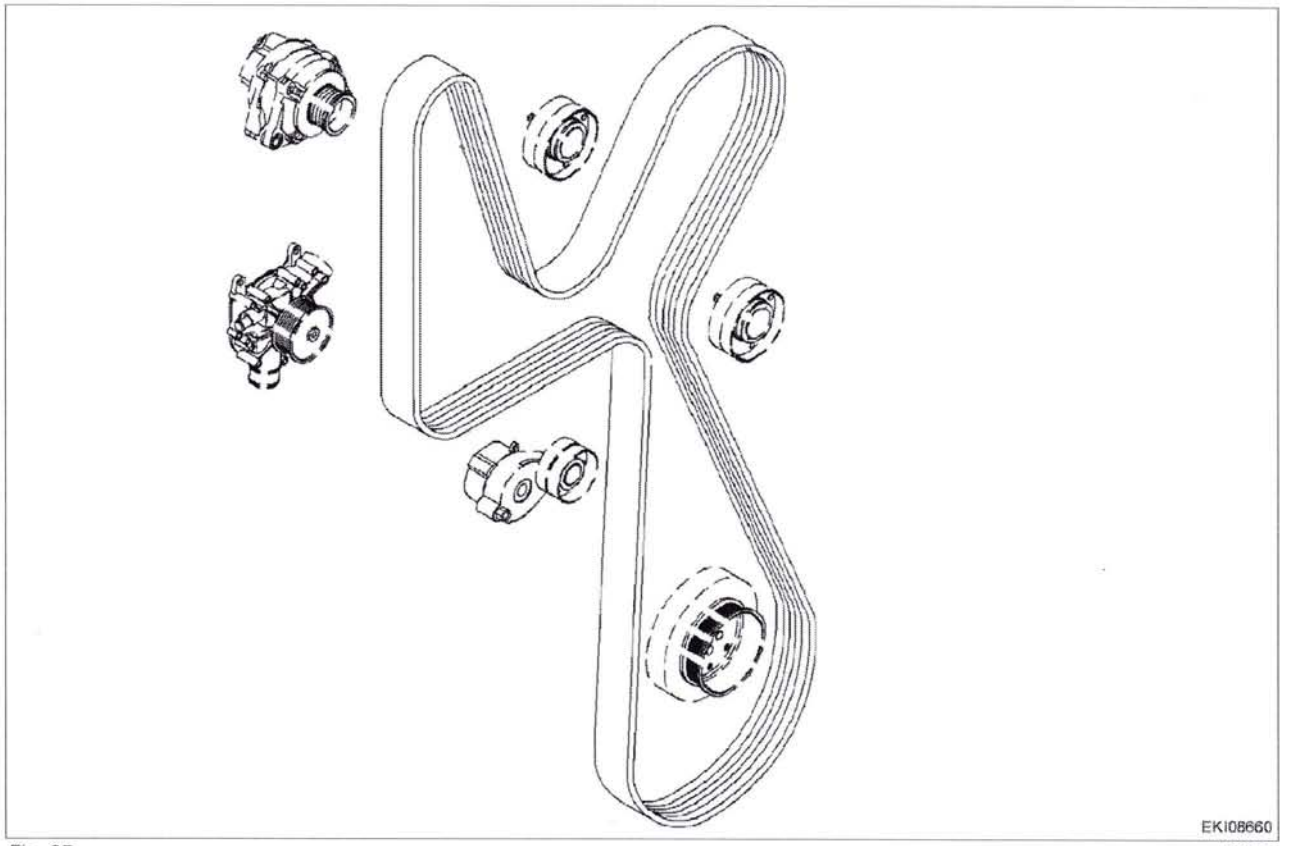


Fig. 35. I002550

17 Air intake and exhaust routing: Deutz TCD 2013

Diagram: Air intake and exhaust routing

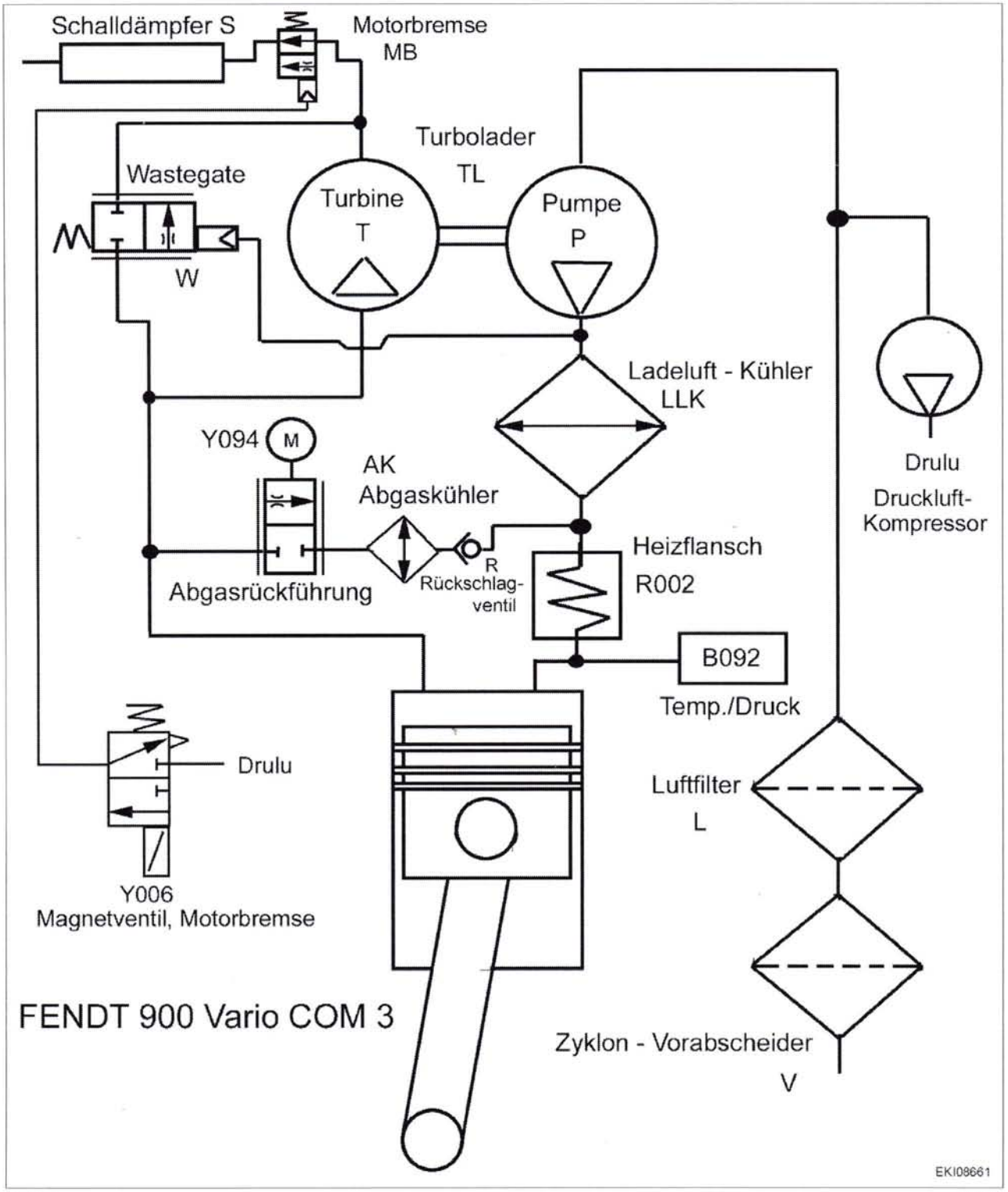


Fig. 36. I003270

Item	Designation	Item	Designation
V	Zyklon pre-cleaner	AK	Exhaust gas cooler
L	Air filter	R	Non-return valve
TL	Turbocharger (pump wheel P)	TL	Turbocharger (exhaust gas turbine T)
LLK	Intercooler	W	Wastegate (bypass valve)

Item	Designation	Item	Designation
R002	Heater flange **Note:** Chapter 9000 Reg. E – Measuring and testing R002 heater flange	S	Silencer
B092	Boost pressure/charge air temperature sensor **Note:** Chapter 9000 Reg. E – Measuring and testing B092 sensor	MB	Engine brake
Drulu	Air compressor	Y006	Engine brake solenoid valve
Y094	Exhaust gas recirculation actuator motor **Note:** Measuring and testing Y094 actuator motor		

Component position

Air filter with Zyklon pre-cleaner

NOTE: *See also:*
Chapter 2000 Reg.G – Cleaning air filter with Zyklon pre-cleaner

At top in engine compartment

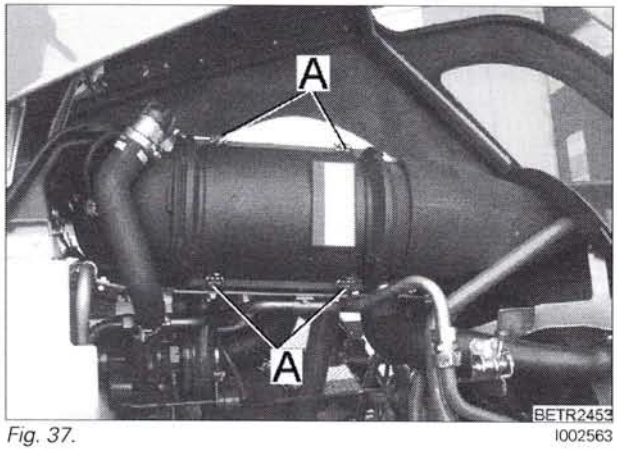


Fig. 37. I002563

Turbocharger (TL)
T = turbine wheel (exhaust side)
P = pump wheel (intake side)
Wastegate = bypass valve

At top in engine compartment

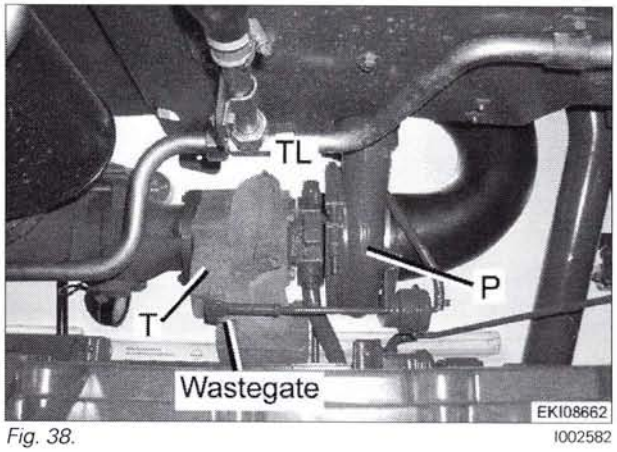


Fig. 38. I002582

Intercooler (LLK)

At the front of the cooler assembly

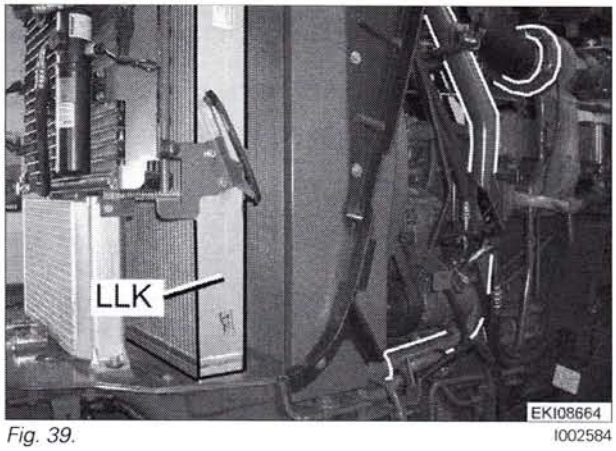
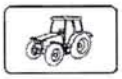


Fig. 39. I002584

R002 heater flange

The heater flange is activated at temperatures below 5°C .
It is preheated for approx. 1 minute.
Ignition on, preheat indicator lit
When the preheat indicator is extinguished, start the tractor ("Start readiness")



At the front of the engine

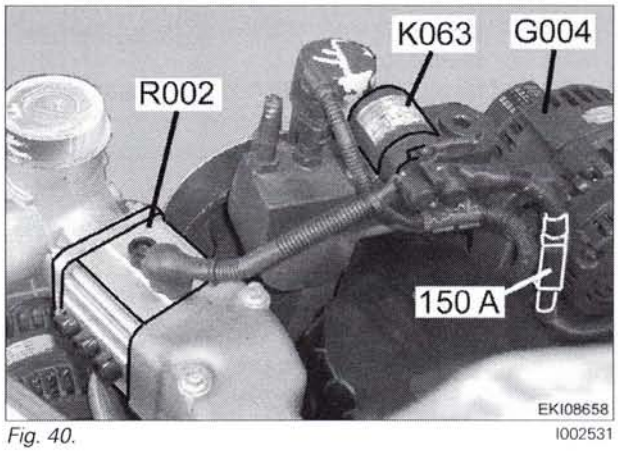


Fig. 40. I002531

B092 boost pressure/charge air temperature sensor

max. boost pressure = approx. 1.6 bar
max. temperature = approx. 110°C

At the intake pipe

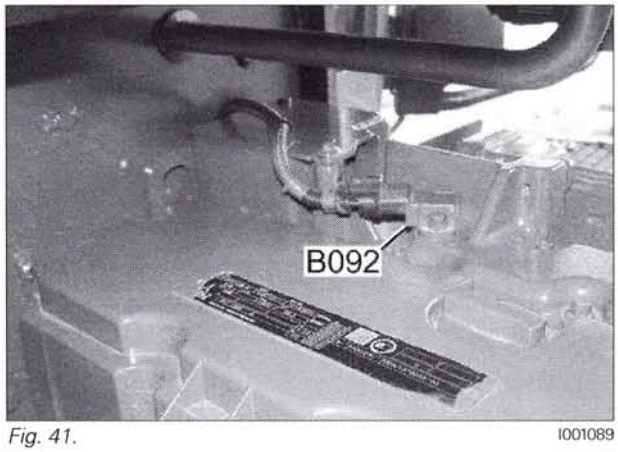


Fig. 41. I001089

Y094 exhaust gas recirculation actuator motor
A = open
Z = closed

The maximum exhaust recirculation rate is approx. 10% of the exhaust gas quantity

On the left of the engine

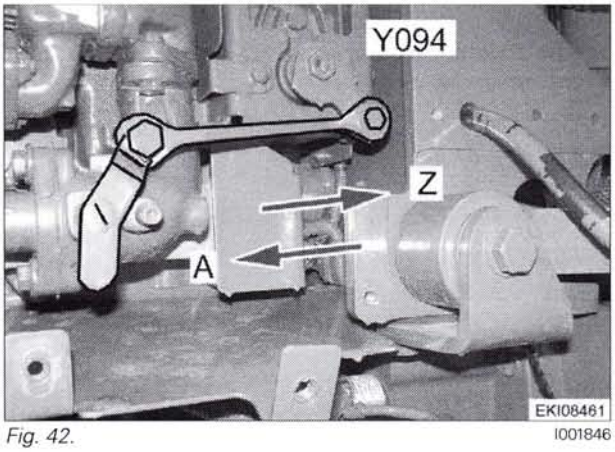


Fig. 42. I001846

Exhaust gas cooler for exhaust gas recirculation (water-cooled) (AK)
Non-return valve "chatter valve" (R)

On the left of the engine

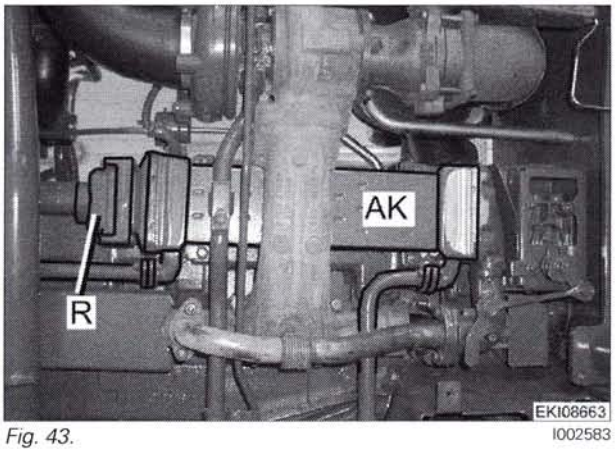


Fig. 43. I002583

Non-return valve "chatter valve" (R)

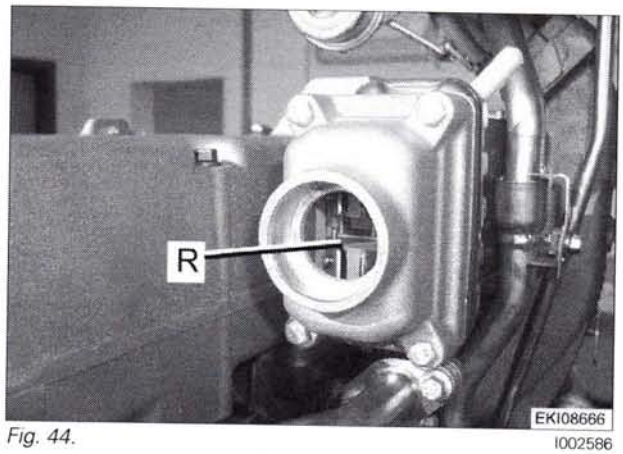
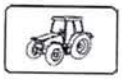


Fig. 44. I002586

Turbocharger (TL)
T = turbine wheel (exhaust side)
P = pump wheel (intake side)
Wastegate = bypass valve



At top in engine compartment

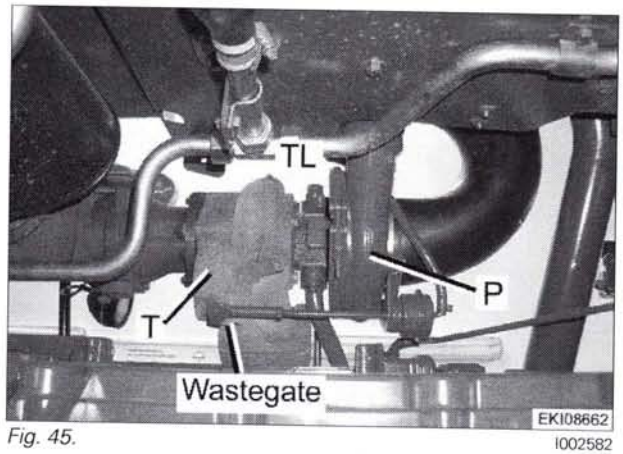
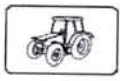


Fig. 45. I002582

Y006 solenoid valve, engine brake



At top in engine compartment, left side of engine

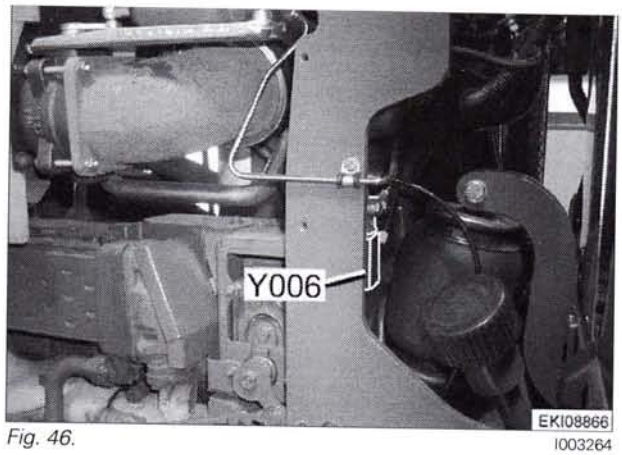


Fig. 46. I003264

Exhaust silencer (S)

On right side of cab

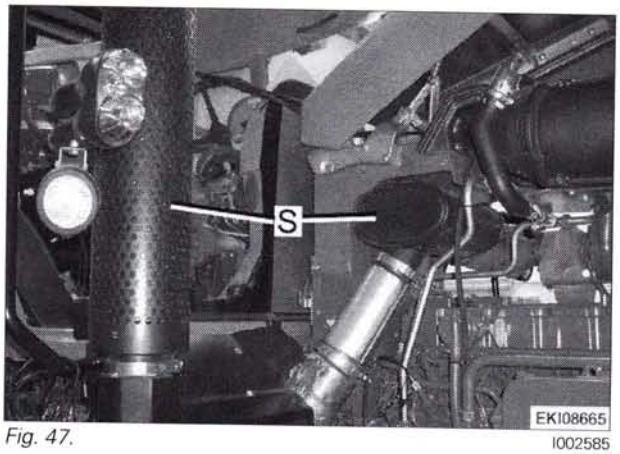
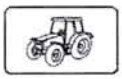


Fig. 47. I002585

Air compressor (Drulu)



On right of engine

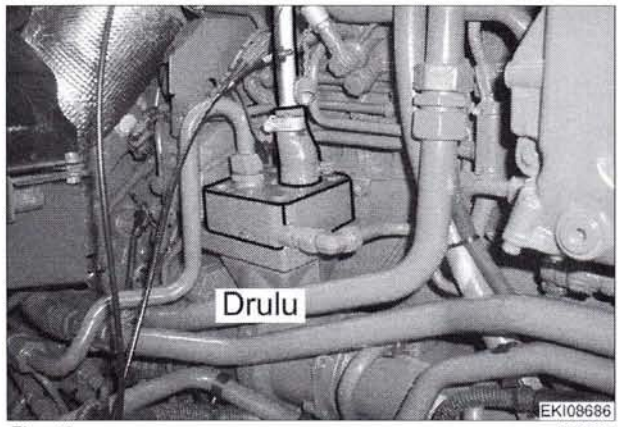


Fig. 48. I002607

Intake for the air compressor (Drulu)

At top in engine compartment

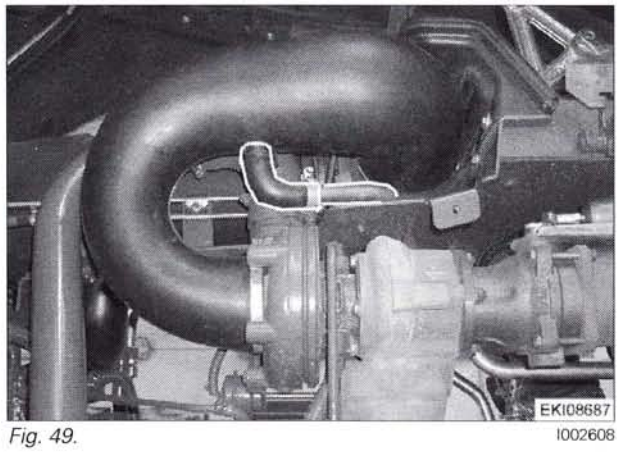


Fig. 49. I002608

18 Cleaning the air filter (with Zyklon pre-cleaner)

Function: Zyklon pre-cleaner

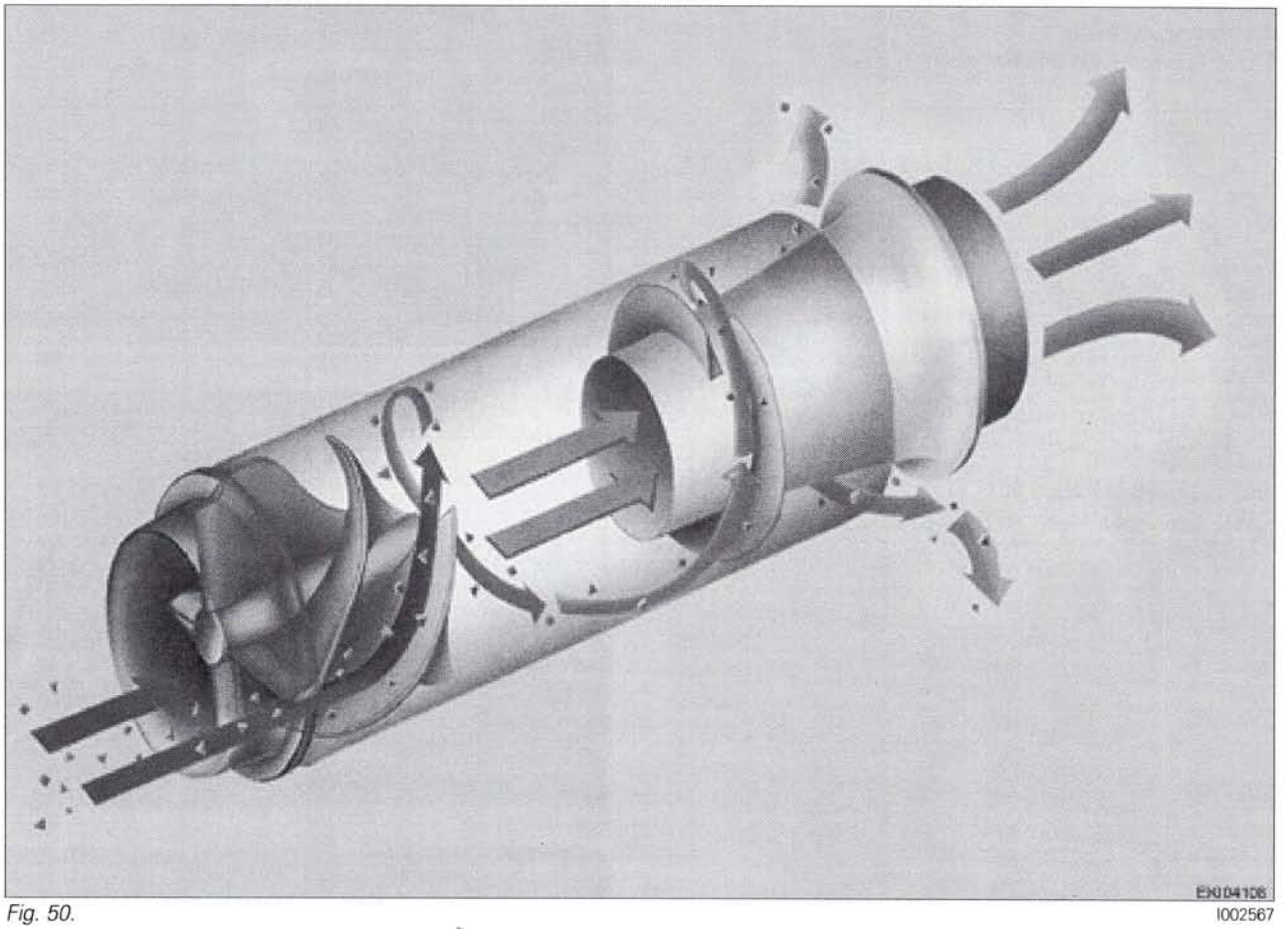


Fig. 50. I002567

Dust is extracted via the fan (arrow)

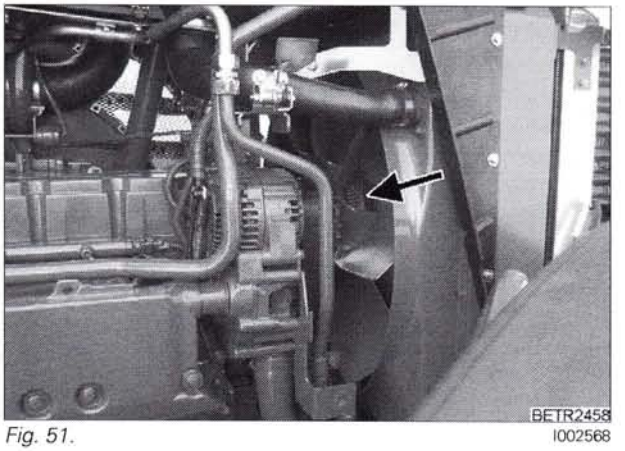


Fig. 51. I002568

Air filter

Replacing air filter
Open fasteners (A) and remove the cover

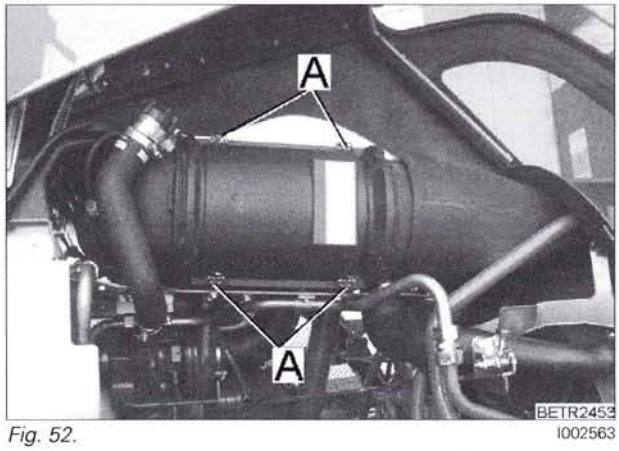


Fig. 52. I002563

Pull out main cartridge (A)
Clean filter housing and ensure sealing surfaces are free of defects

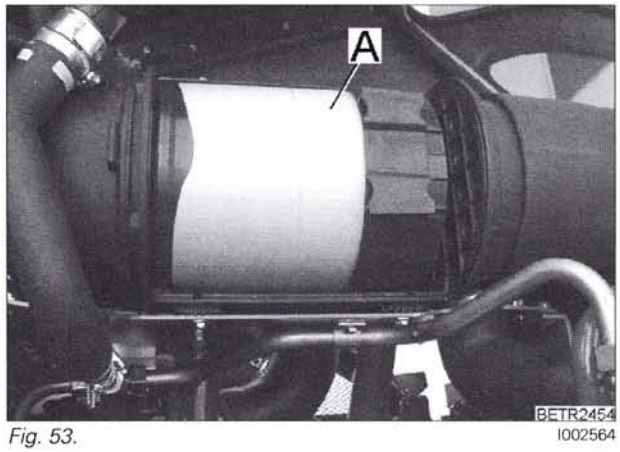


Fig. 53. I002564

Clean main cartridge (A)
Tap out the cartridge with the palm of the hand only

NOTE: *Check that the main cartridge (A) is in perfect condition after every cleaning!*
The main cartridge (A) must be replaced after 5 cleanings, or after 2 years at the latest!

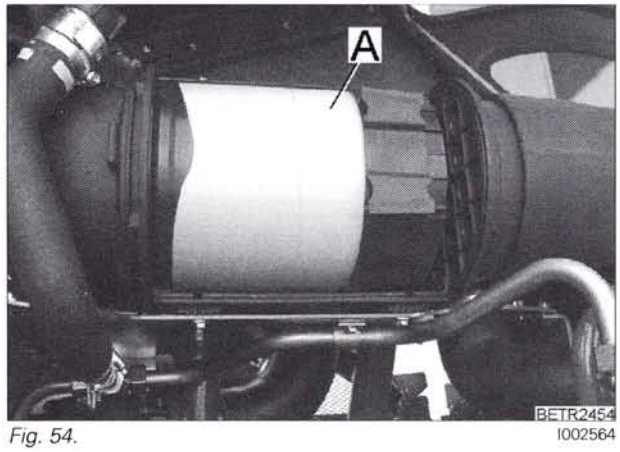


Fig. 54. I002564

The safety cartridge (A) must be replaced after the main cartridge has been replaced 3 times or if the main cartridge is damaged.

NOTE: *The safety cartridge (A) must only be replaced, not cleaned!*

Pull out safety cartridge (A).

NOTE: *Make sure that it is clean!*
The clean air duct must be kept free of dust particles!

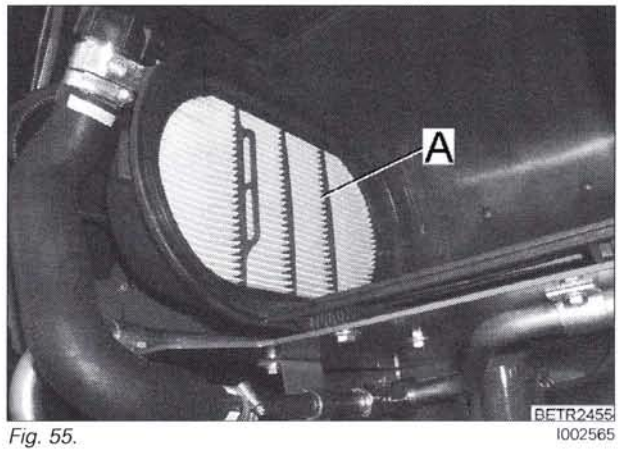


Fig. 55. I002565

Fit cover (A)

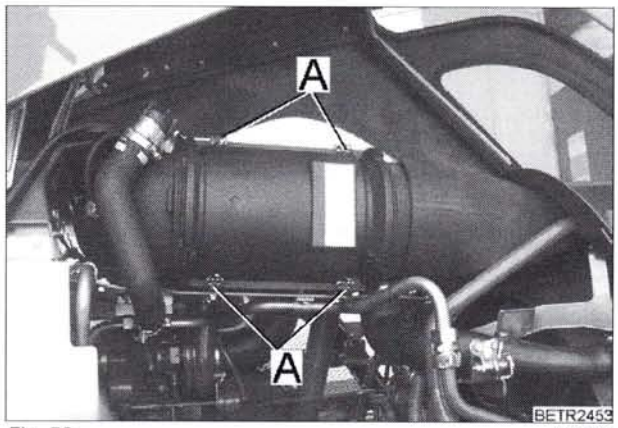


Fig. 56. I002563

19 Function: Turbocharger with wastegate (bypass valve)

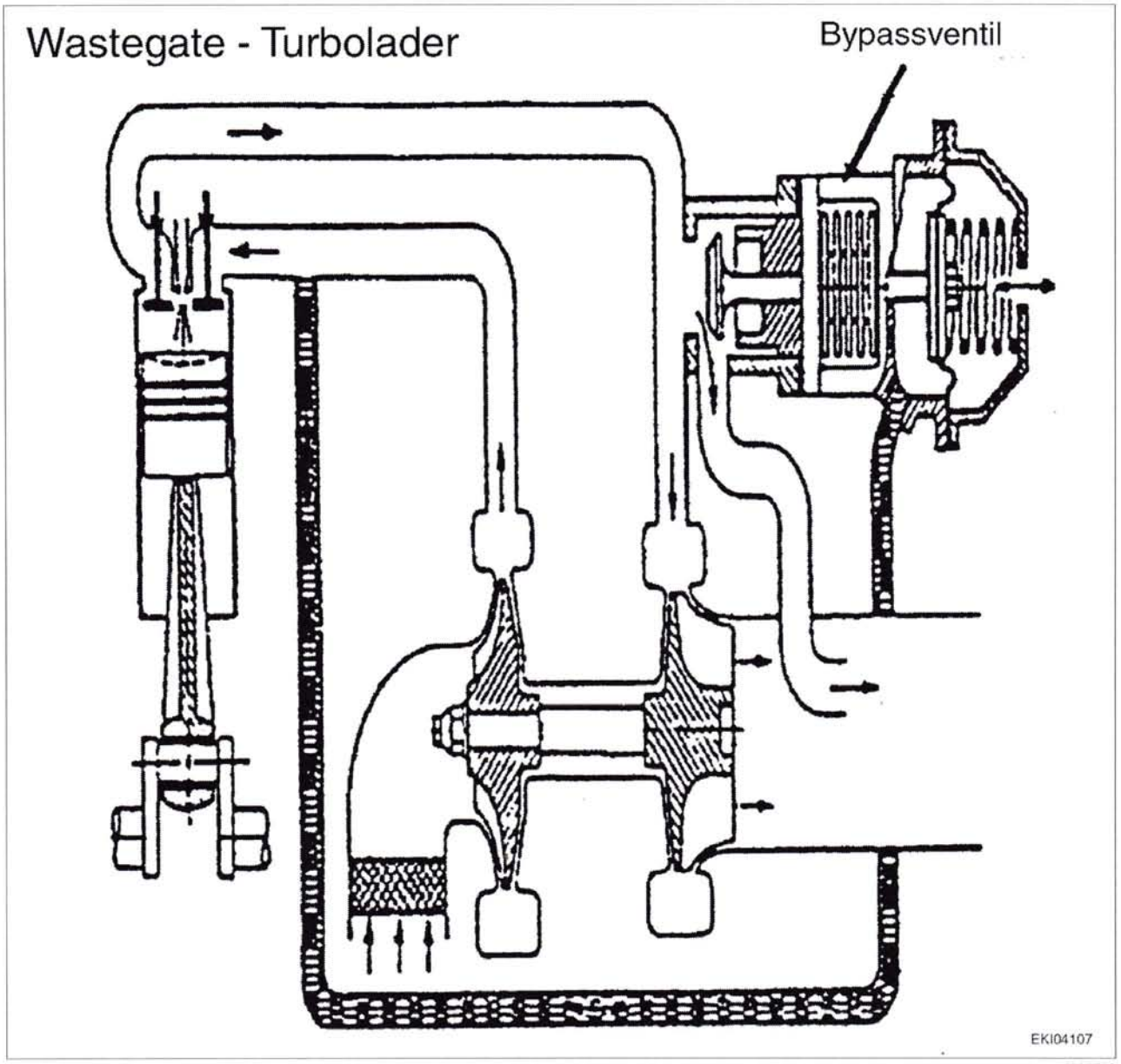


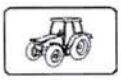
Fig. 57. I002590

The diesel engine in the FENDT 900 Vario is fitted with a wastegate turbocharger.
Unlike a normal turbocharger, wastegate turbochargers are controlled by the engine speed.
This means that full boost pressure is reached as early as approx. 1100 rpm.
At higher engine speeds, the turbocharger controls back, i.e. the boost pressure is limited.
This limiting is made possible by a bypass valve, a connection between air intake and exhaust.
If the boost pressure exceeds a given limit, the bypass valve opens and part of the exhaust flows past the turbine and directly to the exhaust pipe.
The turbine accelerates no further.

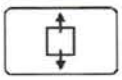
NOTE: *To check maximum boost pressure:*
- *Check level of engine oil*
- *Check level of coolant*
- *Drive tractor at operating temperature*
- *Put diesel engine under load using a dynamometric brake (the turbocharger builds up boost pressure)*
- *Max. boost pressure: see technical datasheets*

20 A051 ECU, engine control unit (installing engine software)

A051 = ECU, EDC engine control unit



at the bulkhead, between engine and cab



Open bonnet.

The settings (engine power, engine cut-off speed, governor behaviour, engine configuration etc.) have been saved in the engine software (engine data record and operating software).
The engine software is installed on the A051 ECU, engine control unit

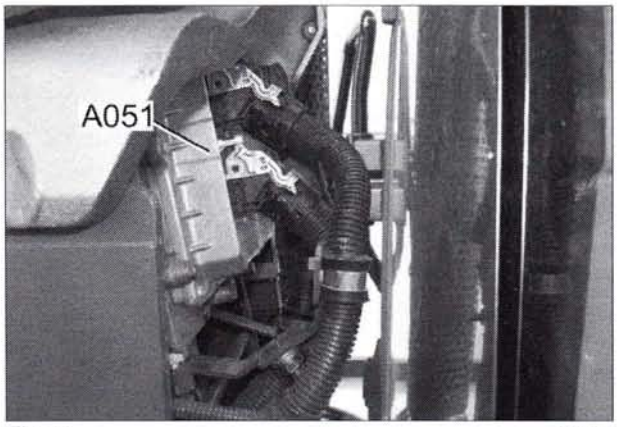


Fig. 58. I001150

WARNING: If the A051 ECU, engine control unit is programmed with engine software that does not match the chassis number, any claims under warranty will be invalid.

The person carrying out the programming is responsible for correctly carrying out the procedure and may be held liable if it is carried out incorrectly.

The chassis number and engine number of the tractor are stored in the A051 ECU, engine control unit, as is the Serdia adapter serial number.

If engine software that does not match the chassis number of the tractor is programmed, the tractor's immobiliser is activated. (i.e. the A051 ECU, engine control unit does not release an injection volume).

If an A051 ECU, engine control unit that does not match the tractor's chassis number is installed, the tractor's immobiliser is activated (i.e. the A051 ECU, engine control unit does not release an injection volume).

If a new A051 ECU, engine control unit is installed, it must be programmed with the engine software that matches the tractor.
The A051 ECU, engine control unit must then be taught to recognise the immobiliser.
Only new components that have not yet been activated can be taught in.
(See also: Chapter 9015 Reg.F – Teaching in B083 immobiliser control unit and/or A051 ECU, engine control unit.)

The following conditions must be met in order to be able to replace the engine software or load it for the first time in an A051 ECU, engine control unit:

Condition	Note
The programming procedure for the Deutz diagnosis program is protected by a password.	This password varies according to the Serdia adapter Read off the serial number of the Serdia adapter Example: SN:131467 Report the Serdia adapter serial number to FENDT Customer Service: **Telephone:** +49 8342 / 77 - 123 **Fax**: +49 8342 / 77 - 222 Fendt Customer Service will send you the valid password for the Serdia adapter
The most recent Deutz diagnostics program (SERDIA) must have been installed on the diagnostic computer (laptop)	Downloading SERDIA software from AGCONET: **Customer service - FENDT - Customer service - Downloads**
The engine software must be available.	- Request the engine software from FENDT Customer service (Tel.: +49 (0) 8342 / 77 - 123) - The engine software will be sent to you in a "zipped" compressed file. - "Unzip" the file and save it to a folder **Suggestion:** Select the tractor's chassis number as the name of the folder. - Save the folder in: **C:\Program Files\Deutz\Data**
Load the engine software onto the A051 ECU, engine control unit	Programming process: Please refer to the detailed description

Determine the SERDIA password

Read off the serial number (arrow) on the Serdia adapter.
Example: SN:131467

Request the SERDIA password from FENDT Customer Service
Telephone: +49 8342 / 77 - 123
Fax: +49 8342 / 77 - 222

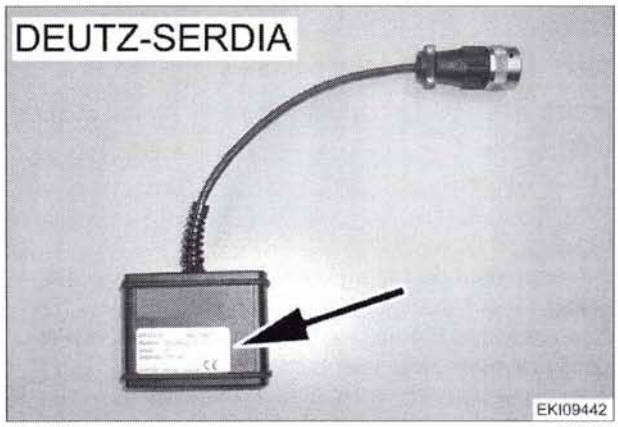


Fig. 59. I006515

Connect the SERDIA adapter (level 3) to the X810 diagnostics socket

NOTE: *When programming, make sure that the laptop is connected to the mains power supply (220 V) or that there is sufficient power remaining in the laptop battery.*
If the laptop suffers a power failure during programming, the A051 ECU, engine control unit will crash!

NOTE: *The USB cable to the laptop should be no longer than 2 m.*
If the cable is longer than 2 m, this may cause interference when programming.
This interference may cause the A051 ECU, engine control unit to crash.

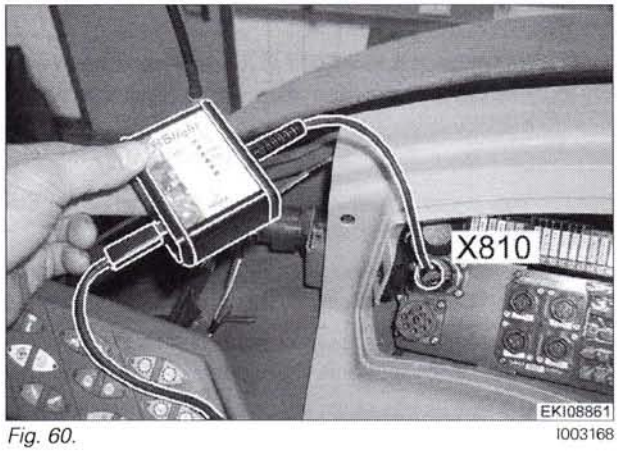
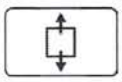


Fig. 60. I003168

Cab, on the right mudguard



Remove cover.

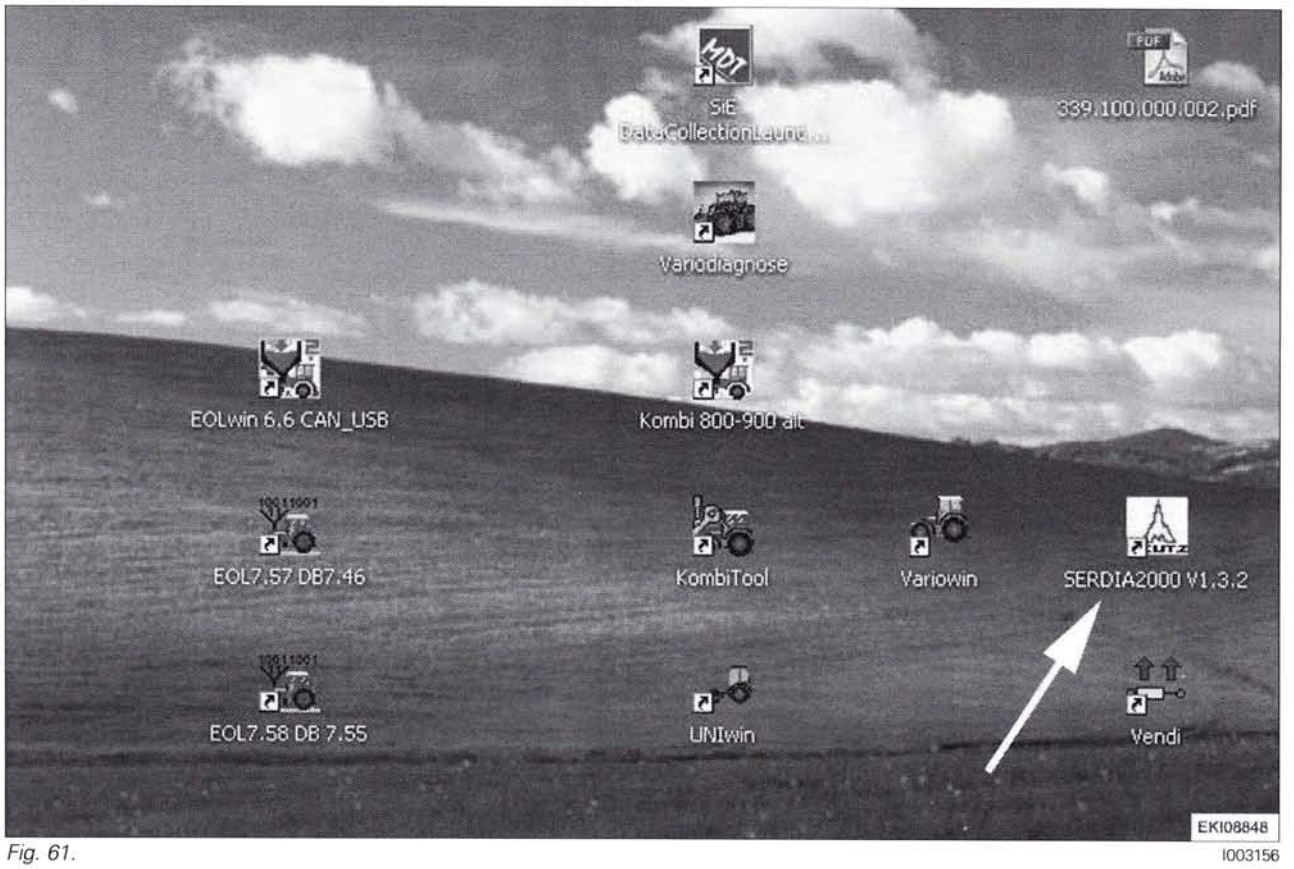


Fig. 61. I003156

Open the Deutz diagnostics program (Serdia)

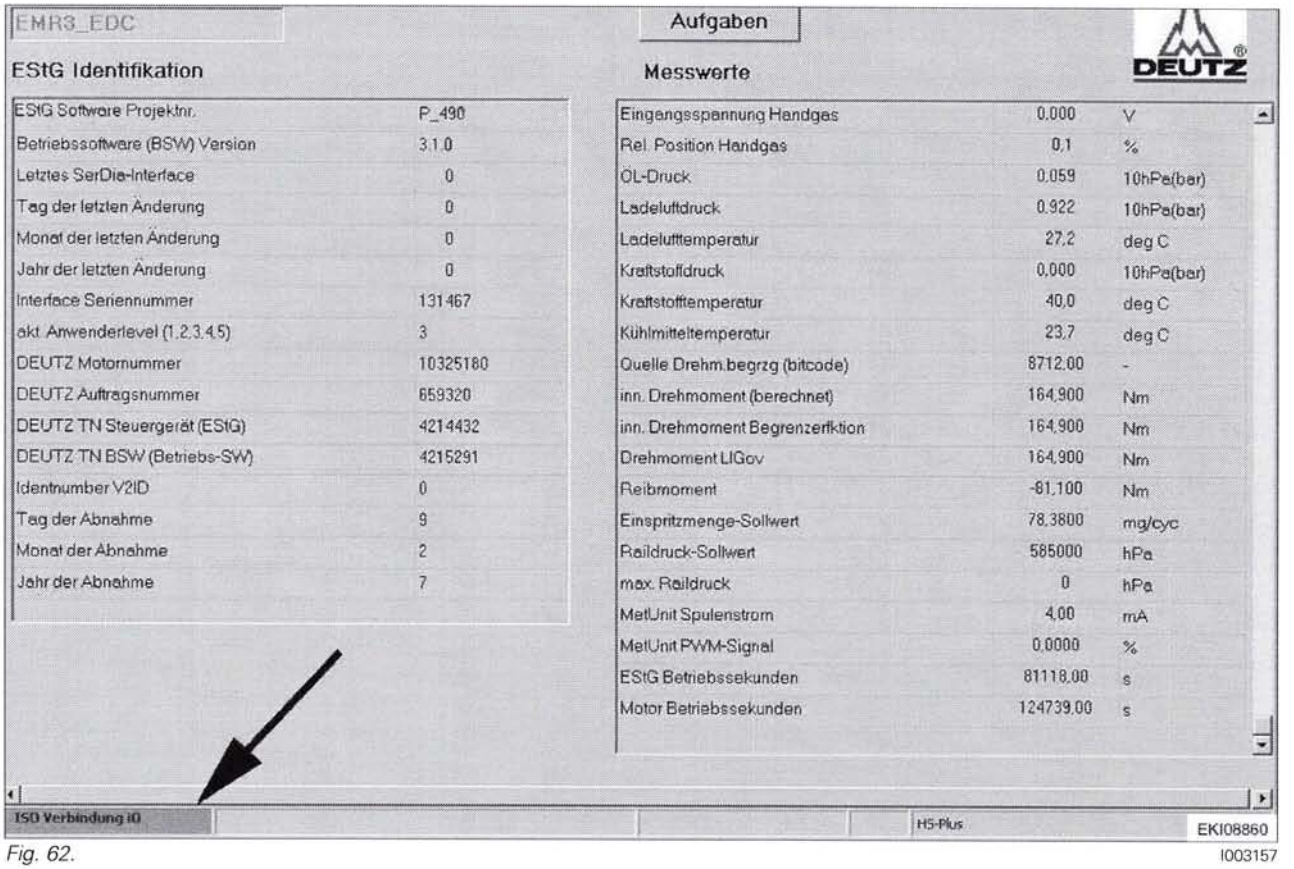


Fig. 62. I003157

Green bar = connection established between A051 ECU, engine control unit and laptop
Red bar = a connection has not been established between the A051 ECU, engine control unit and the laptop

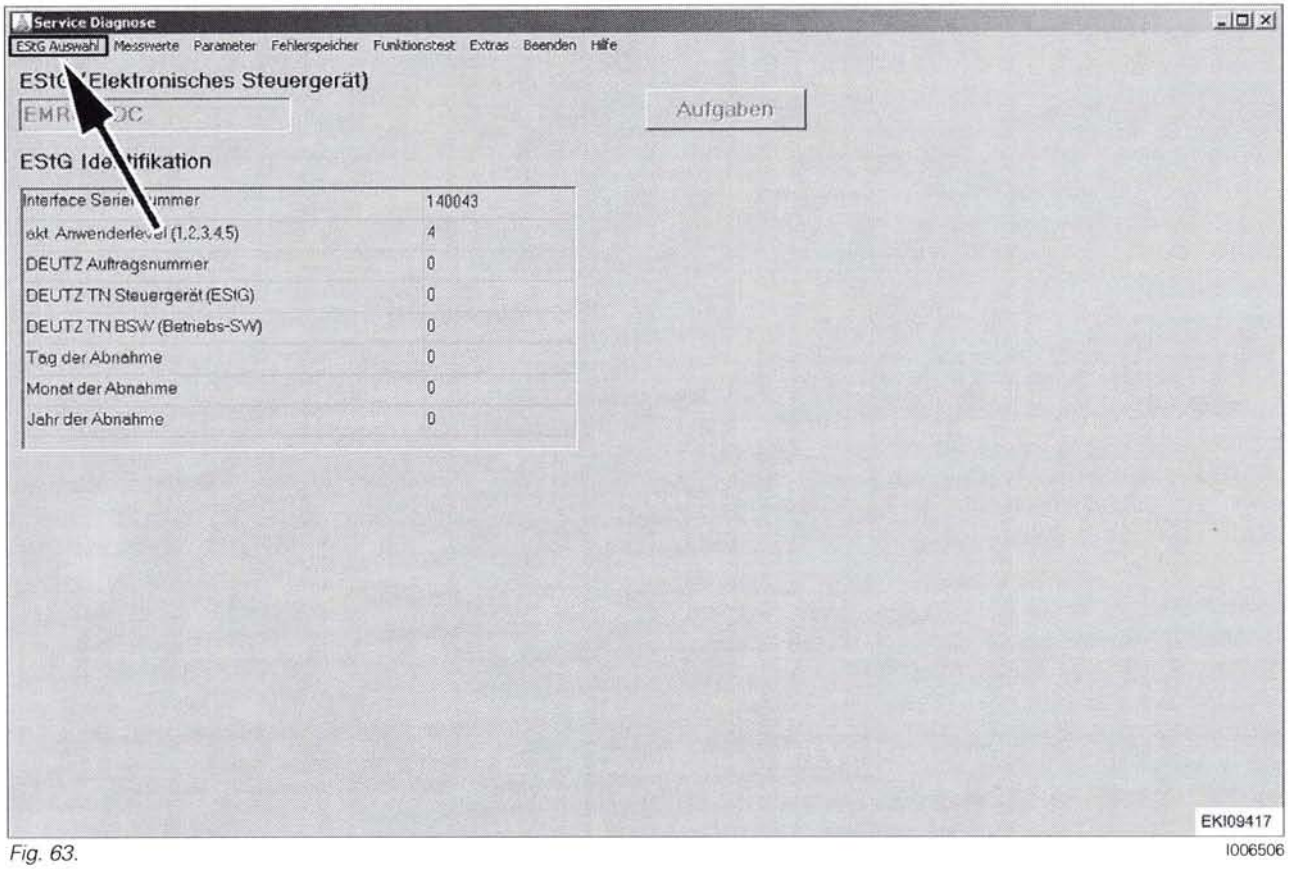


Fig. 63. I006506

Press the **ECU selection** button

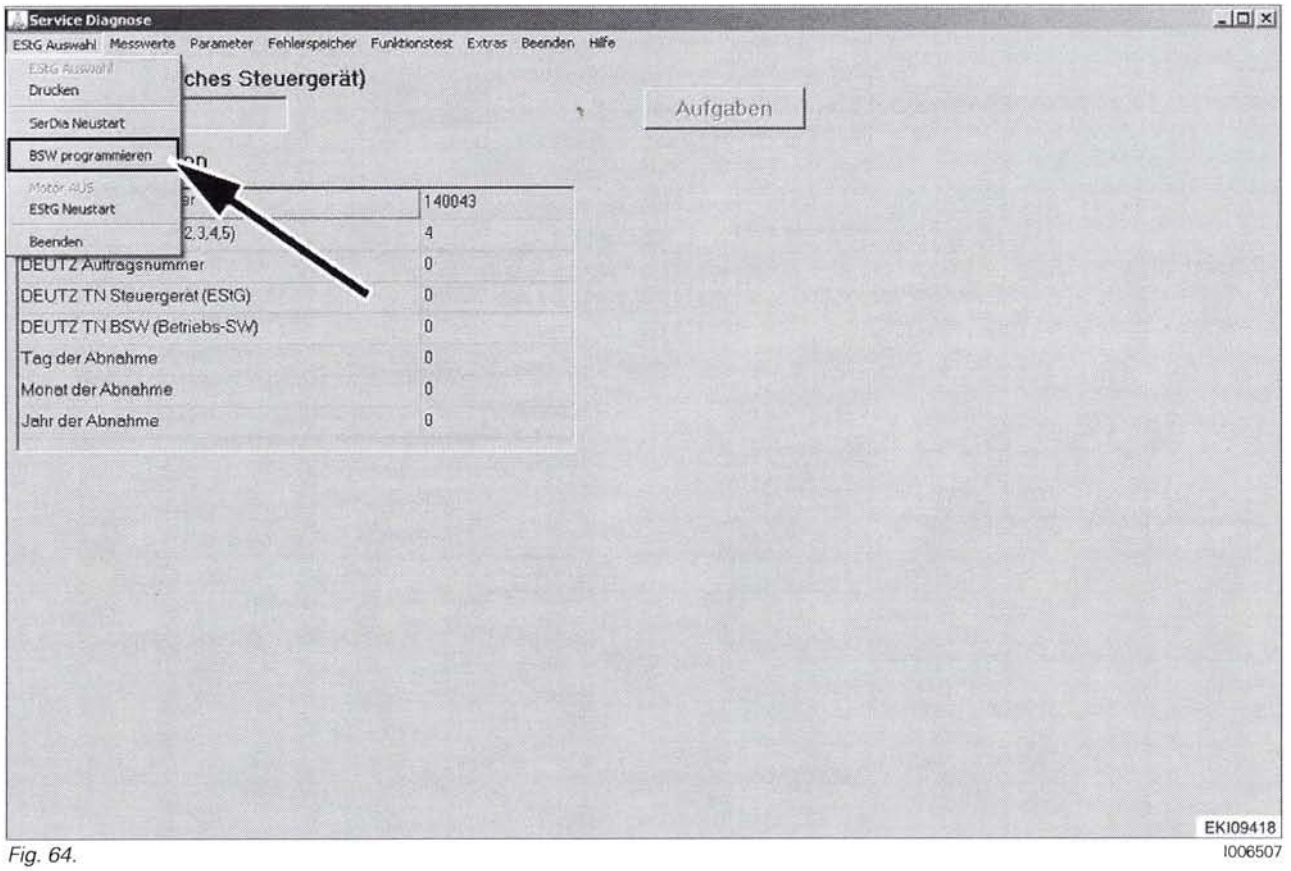


Fig. 64. I006507

Press the **Program ECU** button

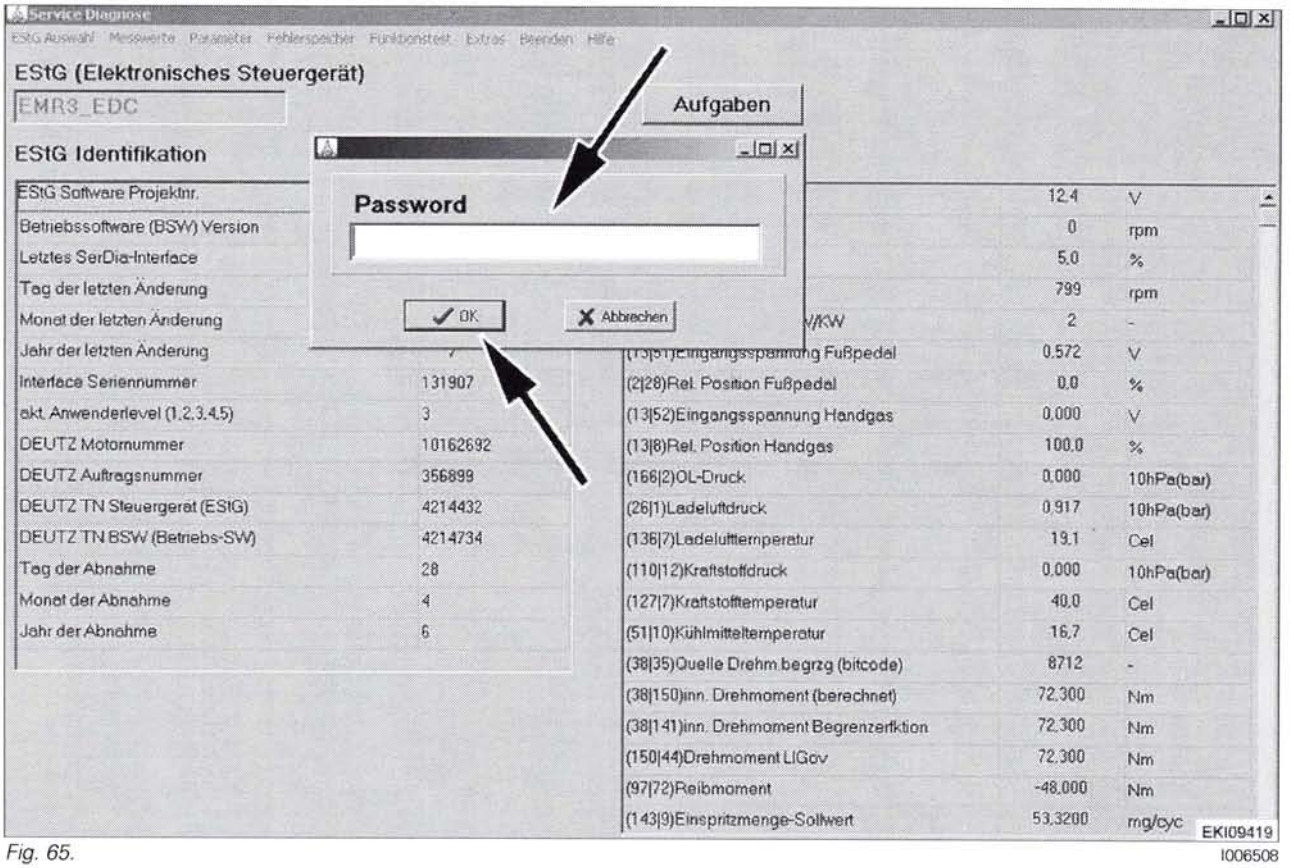


Fig. 65. I006508

Enter the **Serdia password** and confirm with **OK**

Example: 12345

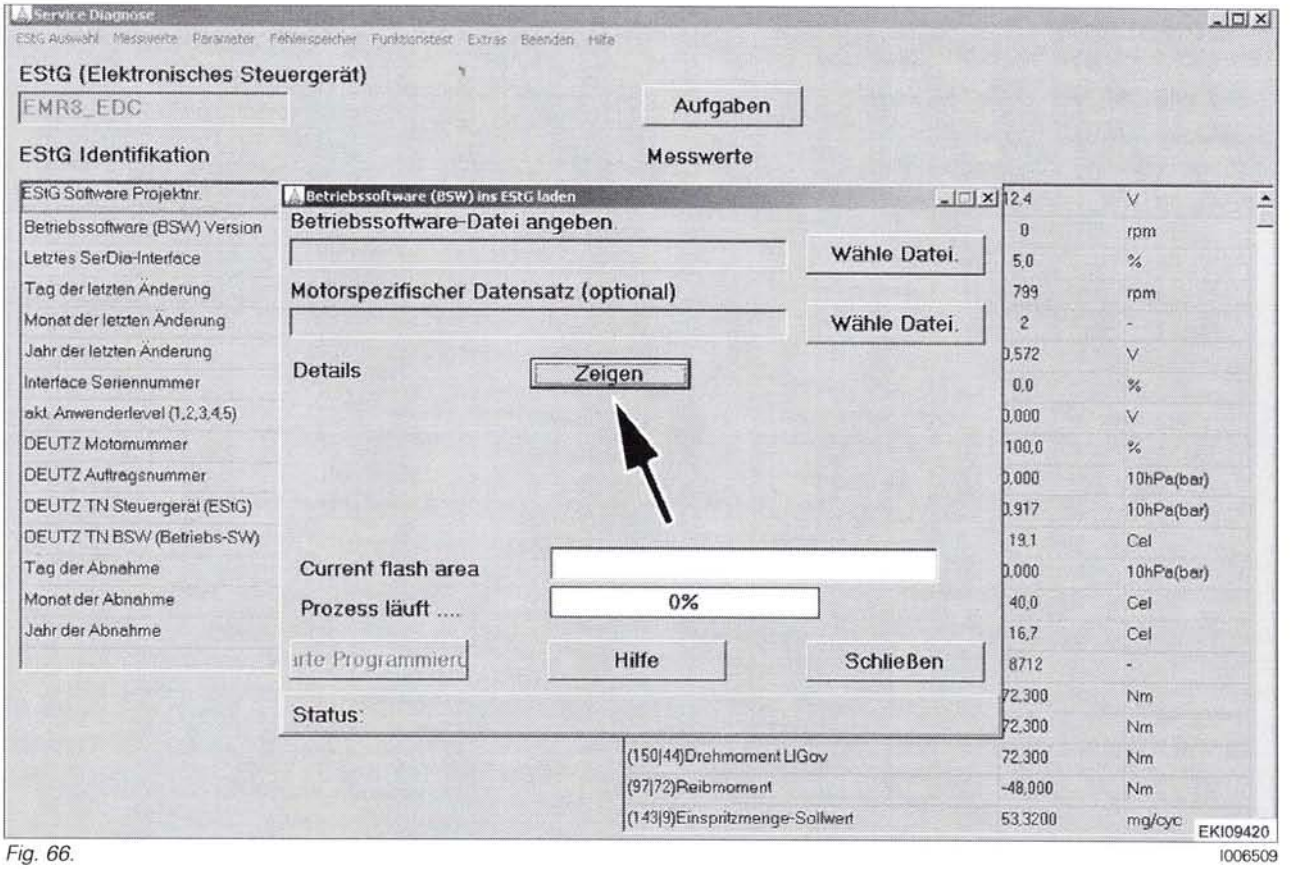


Fig. 66. I006509

Press the **show** button

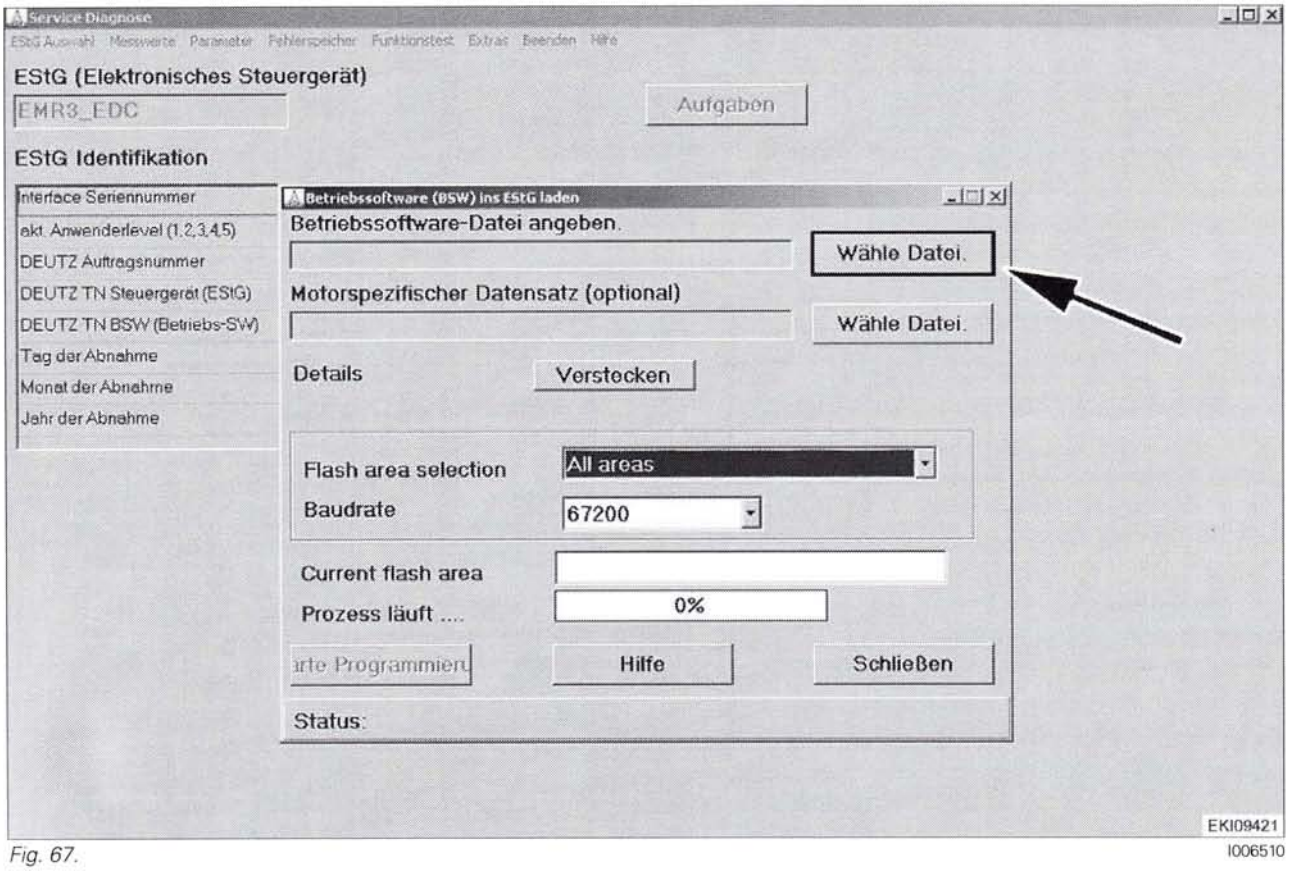


Fig. 67.

I006510

The baud rate is displayed.
The baud rate must be set to **67200**.

The A051 ECU, engine control unit memory is displayed.
"Flash area selection"
This section must be set to "**All areas**".

Select with the "select file" button:

Operating software file:
With the operating software, the entire software package needed for operating the A051 ECU, engine control unit is loaded.

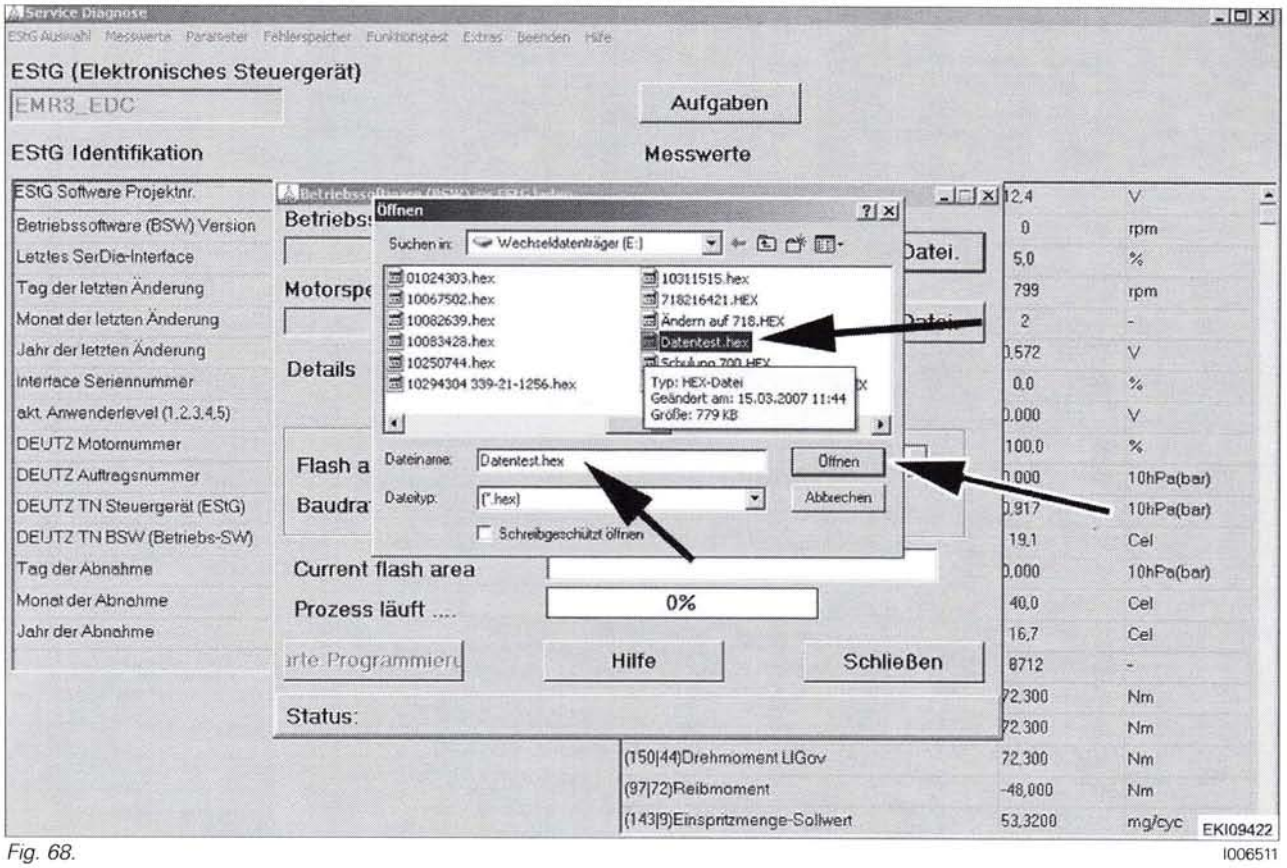


Fig. 68. I006511

Select the operating software file and open it.

Example:
C:\Program files\Deutz\Datachassis number.hex

NOTE: *Operating software:*
Type: Hex file
Size: Approx. 800 KB

Call up the operating software file with the **open** button.

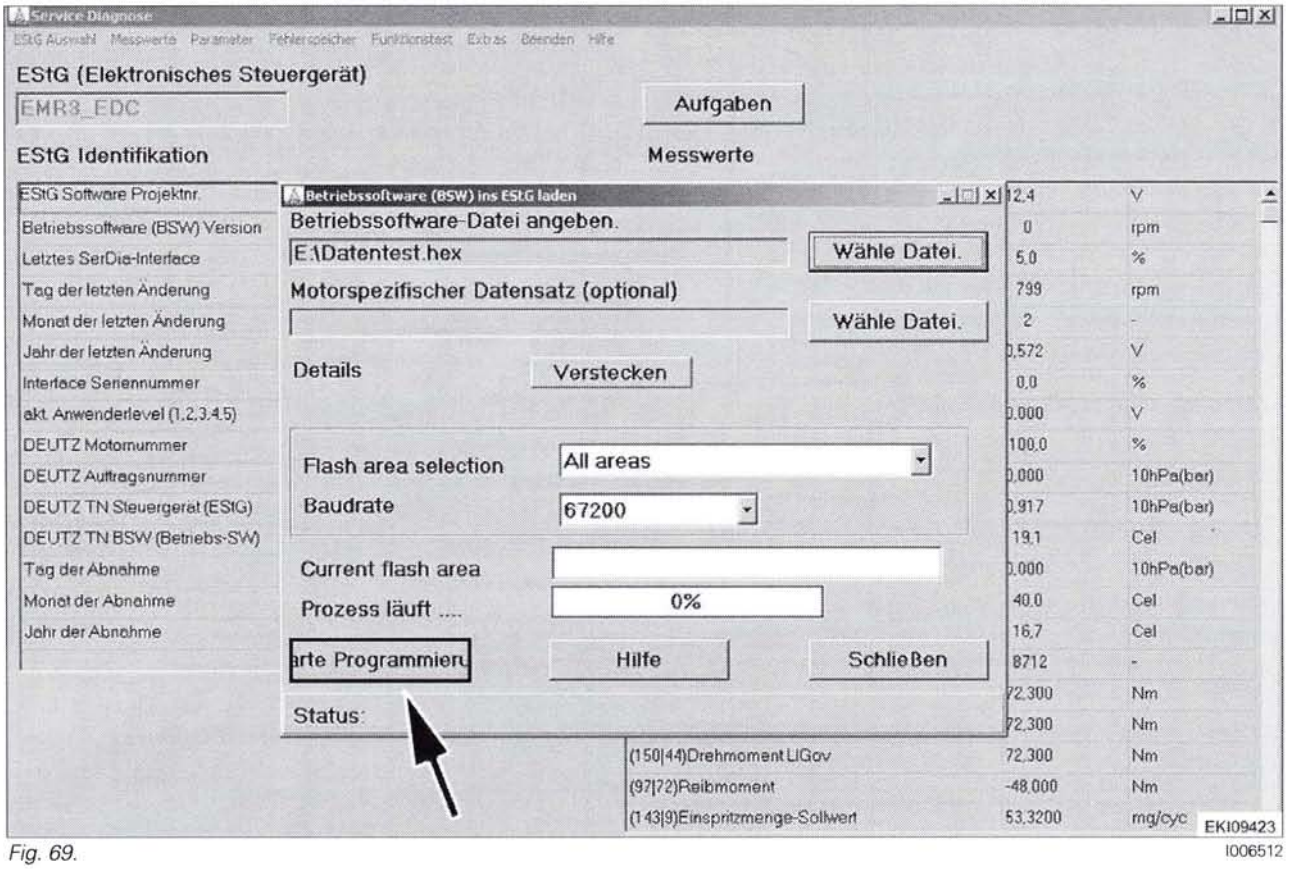


Fig. 69. I006512

Start the programming procedure with the **programming** button.

A few prompts may appear after this. Confirm these prompts with "OK".
After that, the programming routine will execute automatically.

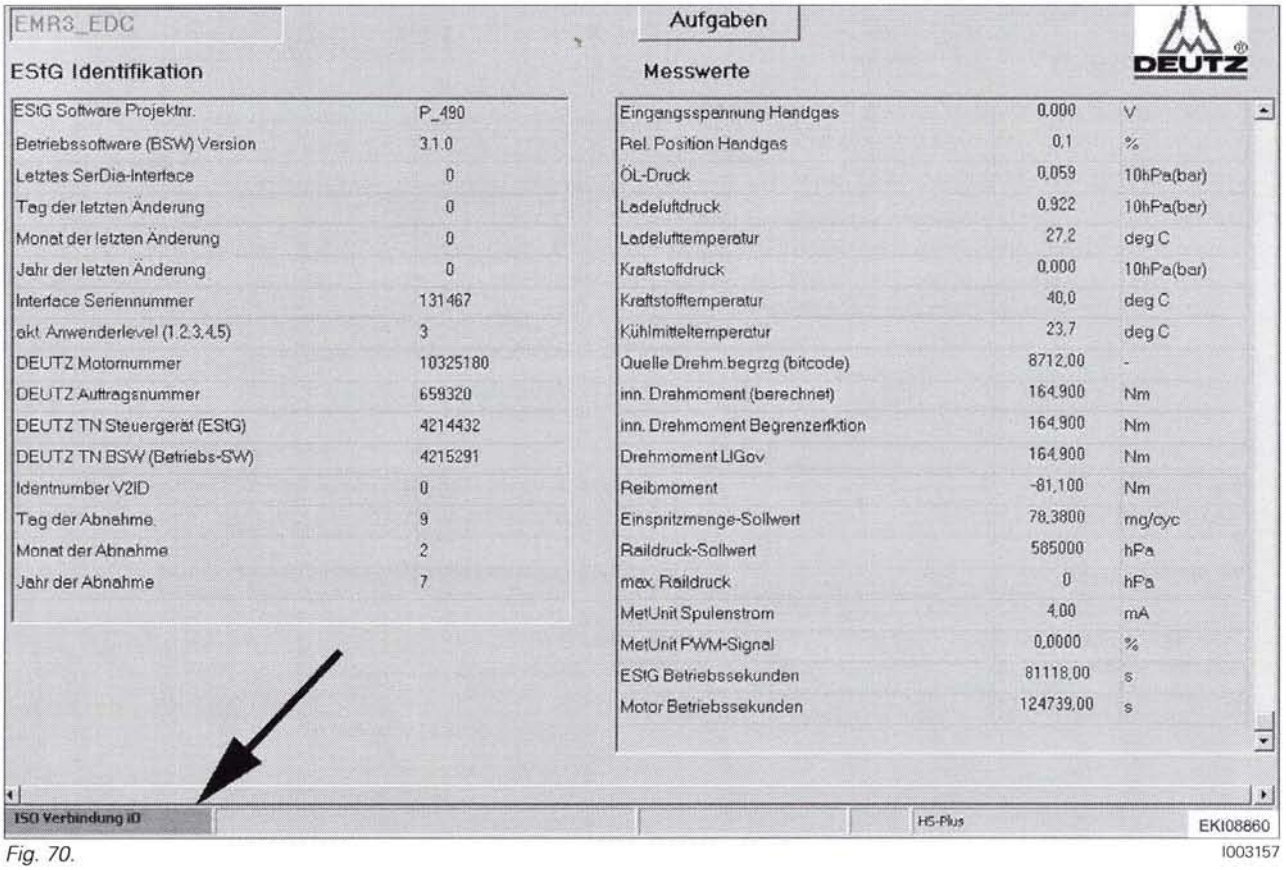


Fig. 70. I003157

919 .. 0101-1000
919 .. 1001-
922 .. 0101-1000
922 .. 1001-
925 .. 0101-1000
925 .. 1001-
928 .. 0101-1000
928 .. 1001-
931 .. 0101-1000
931 .. 1001-
934 .. 0101-1000
934 .. 1001-

When the operating software has been programmed successfully, the A051 ECU, engine control unit is read out again automatically.
This display (arrow) first turns red (the A051 ECU, engine control unit is powered down)
The display (arrow) then turns green again (the A051 ECU, engine control unit is powered up)

NOTE: *Wait until the display (arrow) is steady green again. Only then can the Deutz diagnostic program Serdia be shut down!*
Otherwise, the A051 ECU, engine control unit may be damaged.

B Faults

1 Faults on the Common Rail diesel engine (without fault code)

Faults	Cause	Note
The engine does not start or starts poorly	**Incorrect ignition key** The tractor has an immobiliser. When using an unauthorised ignition key, the A051 ECU, engine control unit releases no starting quantity and the engine can not start	Chapter 9000 Reg. E – B083 immobiliser control unit
	R002 heater flange defective (coolant water temperature below 5°C)	Chapter 9000 Reg. E – R002 heater flange
	Fuel filter clogged, fuel low pressure below approx. 5 bar , (B087 fuel low pressure sensor)	Chapter 2060 Reg. A – Fuel system, Chapter 9000 Reg. E – B087 fuel low pressure sensor
	Fuel pump (gear driven) defective	Chapter 2060 Reg. A – Fuel system,
	air in the fuel system	Chapter 2060 Reg. A – Fuel system,
	Y095/Y096/Y097/Y098/Y100/Y101 injector defective	Chapter 9000 Reg. E – Y095/Y096/Y097/Y098/Y100/Y101 injector
	Y091 dispensing unit defective Y091 dispensing unit de-energised = fully open Y091 dispensing unit fully energised = closed	Chapter 9000 Reg. E - Y091 dispensing unit
	High pressure pumps are worn	Chapter 2060 Reg. A – Fuel system,
	G001 battery defective or not charged	Chapter 9000 Reg. E – G001 battery
	Cable connections to the M001 starter oxidised or loose	Chapter 9000 Reg. E – M001 starter
	A051 ECU, engine control unit defective	Chapter 9000 Reg. E – A051 ECU, engine control unit
	Incorrect valve play	Chapter 2010 Reg. F – Adjusting the valve
	PR - LS pump does not swivel back to zero delivery Check the load sensing pressure and LS pump	Chapter 9600 Reg. A – Pressure regulation PR (axial piston pump) Chapter 9600 Reg. F – Hydraulic test report (fax template)
	Incorrect fuel	See the fuels and lubricants list
	Incorrect engine oil	
The engine starts, but runs irregularly or switches off **The engine has low power**	**Fuel filter clogged,** fuel low pressure below approx. 5 bar , (B087 fuel low pressure sensor)	Chapter 2060 Reg. A – Fuel system,
	Engine brake closed	Chapter 9000 Reg. E – A051 ECU, EDC engine control unit Chapter 9000 Reg. E – S047 engine brake switch Chapter 9000 Reg. E – Y006 engine brake solenoid valve Chapter 8800 Reg. C – Compressed air system wiring diagram "4-circle"
	Intercooler dirty	Chapter 2190 Reg. A – Air inlet and exhaust gas routing
	Turbocharger worn	Chapter 2190 Reg. A – Air inlet and exhaust gas routing
	B092 boost pressure/charge air temperature sensor defective	Chapter 9000 Reg. E – B092 boost pressure/charge air temperature sensor
	Incorrect valve play	Chapter 2010 Reg. F – Adjusting the valve

Faults	Cause	Note
	air in the fuel system	Chapter 2060 Reg. A – Fuel system,
	Engine air bleed clogged (overpressure in the crankcase)	Chapter 2210 Reg. A – Crankcase air bleed
	Fuel pump (gear driven) worn	Chapter 2060 Reg. A – Fuel system,
	Y095/Y096/Y097/Y098/Y100/Y101 injector defective	Chapter 9000 Reg. E – Y095/Y096/Y097/Y098/Y100/Y101 injector
	Y091 dispensing unit defective Y091 dispensing unit de-energised = fully open Y091 dispensing unit fully energised = closed	Chapter 9000 Reg. E - Y091 dispensing unit
	B086 rail pressure sensor (high pressure) defective	Chapter 9000 Reg. E – B087 rail pressure sensor (high pressure)
	High pressure pumps are worn	Chapter 2060 Reg. A – Fuel system,
	A051 ECU, engine control unit defective	Chapter 9000 Reg. E – A051 ECU, engine control unit
	Piston rings/cylinder liner worn (check compression pressure)	See the Deutz TCD 2013 engine workshop manual
Engine overheating	**Engine oil level** too low	See the operating manual
	Engine oil level too high	See the operating manual
	Water cooler contaminated	Chapter 2000 Reg. A – Coolant circuit
	Water cooler calcified	Chapter 2000 Reg. A – Coolant circuit
	Thermostat defective	Chapter 2000 Reg. A – Coolant circuit
	Engine oil cooler (heat exchanger) defective Cold engine = the engine oil warms the coolant At operating temperature = the coolant cools the engine oil	Chapter 2000 Reg. A – Coolant circuit
	Bleed lines in the coolant circuit clogged	Chapter 2000 Reg. A – Coolant circuit
	B077 electr. viscous fan defective Unplugging the X1532 separation point causes the viscous fan clutch to become fully engaged.	Chapter 9000 Reg. E – B077 electr. viscous fan (magnetic clutch speed sensor)
	B089 coolant temperature sensor defective	Chapter 9000 Reg. E – B089 coolant temperature sensor
	Y095/Y096/Y097/Y098/Y100/Y101 injector defective	Chapter 9000 Reg. E – Y095/Y096/Y097/Y098/Y100/Y101 injector
The engine does not run on all cylinders (1 cylinder on flywheel)	**Fuel filter clogged,** fuel low pressure below approx. 5 bar , (B087 fuel low pressure sensor)	Chapter 2060 Reg. A – Fuel system,
	air in the fuel system	Chapter 2060 Reg. A – Fuel system,
	Injection line leaking	Chapter 2060 Reg. A – Fuel system,
	High-pressure pump worn	Chapter 2060 Reg. A – Fuel system,
	Y095/Y096/Y097/Y098/Y100/Y101 injector defective	Chapter 9000 Reg. E – Y095/Y096/Y097/Y098/Y100/Y101 injector
	Incorrect valve play	Chapter 2010 Reg. F – Adjusting the valve
	Piston rings/cylinder liner worn (check compression pressure)	See the Deutz TCD 2013 engine workshop manual

Faults	Cause	Note
Engine has no or too low oil pressure (warning message on A007 instrument panel)	**Wrong engine oil**	See the fuels and lubricants list
	Engine oil level too low	See the operating manual
	Engine incline too large	See the operating manual
	Engine oil pressure DBV has opened	See chapter 2312 Reg. A – Engine lubrication diagram See chapter 9000 Reg. E – B090 engine oil pressure sensor
	Lubrication pump worn	See chapter 2312 Reg. A – Engine lubrication diagram See chapter 9000 Reg. E – B090 engine oil pressure sensor
	B090 engine oil pressure sensor defective	See chapter 9000 Reg. E – B090 engine oil pressure sensor
Oil consumption of the engine is too high	**Wrong engine oil**	See the fuels and lubricants list
	Engine oil level too high	See the operating manual
	Engine incline too large	See the operating manual
	Piston rings/cylinder liner worn (check compression pressure)	See the Deutz TCD 2013 engine workshop manual
Engine emits blue smoke (burning of engine oil)	**Engine oil level too high**	See the operating manual
	Engine incline too large	See the operating manual
	Engine operating temperature too low	Chapter 2000 Reg. A – Coolant circuit Chapter 9000 Reg. E – B077 electr. viscous fan (magnetic clutch speed sensor)
	Piston rings/cylinder liner worn (check compression pressure)	See the Deutz TCD 2013 engine workshop manual
	Engine air bleed clogged (overpressure in the crankcase)	Chapter 2210 Reg. A – Crankcase air bleed
Engine emits white smoke (burning of water)	**R002 heater flange** defective (coolant water temperature below 5°C)	Chapter 9000 Reg. E – R002 heater flange
	Water in fuel (water sedimentor) (monitored by the B091 water in fuel sensor)	Chapter 9000 Reg. E – B091 water in fuel sensor
	Incorrect fuel	See the fuels and lubricants list
	Incorrect valve play	Chapter 2010 Reg. F – Adjusting the valve
	Y095/Y096/Y097/Y098/Y100/Y101 injector defective	Chapter 9000 Reg. E – Y095/Y096/Y097/Y098/Y100/Y101 injector

Faults	Cause	Note
Engine emits black smoke (burning of diesel)	**Air filter clogged**	See the operating manual
	Y095/Y096/Y097/Y098/Y100/Y101 injector defective	Chapter 9000 Reg. E – Y095/Y096/Y097/Y098/Y100/Y101 injector
	Incorrect fuel	See the fuels and lubricants list