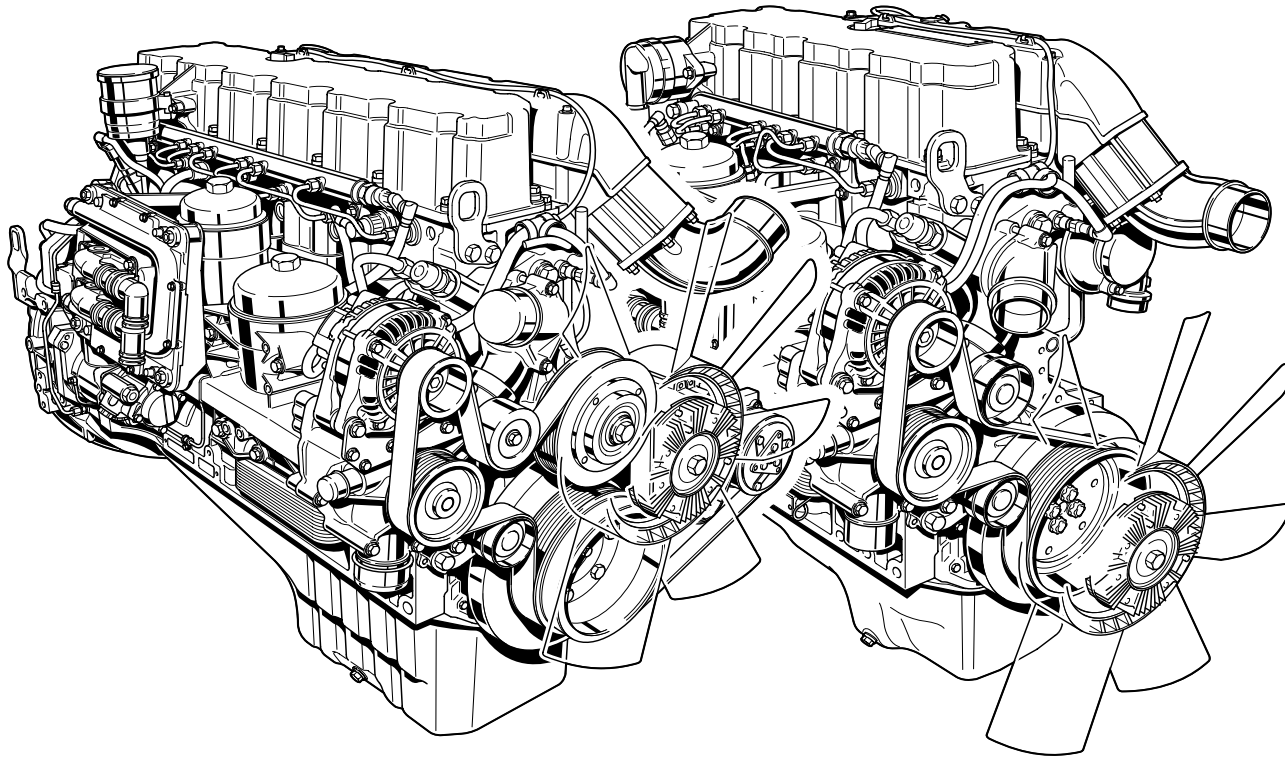




Instruction Manual

TCD 2012 L04/06 4V

TCD 2013 L04/06 4V



© 2005



Read and observe the information in this instruction manual. You will avoid accidents, retain the manufacturer's warranty and have a fully functional, ready to use engine at your disposal.

- This engine is exclusively for the purpose according to the scope of delivery - defined and built by the equipment manufacturer (use for the intended purpose) Any use above and beyond this is considered improper use. The manufacturer will not be liable for damages resulting from this. The user will bear the sole risk in this case.
- Use for the intended purpose also includes observance of the operating, maintenance and repair instructions specified by the manufacturer. The engine may only be used, maintained and repaired by persons who are familiar with it and instructed in the dangers.

- The pertinent rules for the prevention of accidents and other generally recognised safety and industrial medicine rules must be observed.
- When the engine is running there is a danger of injury caused by:
 - rotating / hot components
 - engines with extraneous ignition
 - ignition systems (high electrical voltage)Contact must be avoided!
- The manufacturer will not be liable for damages resulting from unauthorised modification to the engine.
Equally, manipulations to the injection and control system can affect the engine's performance and the exhaust characteristics. Compliance with environmental regulations will no longer be guaranteed in this case.
- Do not alter, obstruct or block the area of the cool air supply to the fan.
The manufacturer will accept no liability for damages resulting from this.
- Only DEUTZ original parts may be used when carrying out maintenance/repair work on the engine. These have been designed especially for your engine and ensure a trouble-free operation.
Failure to observe this will lead to voiding of the warranty!

- Maintenance/cleaning work on the engine may only be carried out when the engine is not running and has cooled down.
When doing this, make sure that the electrical system is switched off (remove ignition key). The specifications for accident prevention with electrical systems (e.g. VDE-0100/-0101/-0104/-0105 Electrical protective measures against dangerous touch voltages) must be observed.
Cover all electrical components tightly when cleaning with liquids.
- Do not work on the fuel system while the engine is running - **Danger to life.**
 - Wait (1 minute) for the engine to come to a standstill (pressure release), as system is under high pressure: there is a - **Danger to life.**During the first trial run do not stand in the danger area of the engine (danger due to high pressure of leaks) - **Danger to life.**
 - In case of leaks immediately contact the workshop.
 - When working on the fuel system ensure that the engine is not unintentionally started during repairs. **Danger to life.**

Instruction Manual
TCD 2012 L04/06 4V
TCD 2013 L04/06 4V

0312 2443 en

Engine number:

--	--	--	--	--	--	--	--

Please enter the engine number here. This will simplify the handling of customer service, repair and spare parts queries (see Section 2.1).

Illustrations and data in this instruction manual are subject to technical changes in the course of improvements to the engines. Reprinting and reproductions of any kind, even in part, require our written permission.



Foreword

Dear customer,

The liquid-cooled engines made by DEUTZ are developed for a wide variety of applications. An extensive range of variants ensures that the respective special requirements are met.

Your engine is equipped according to the installation, i.e. not all the parts and components described in this instruction manual are installed on your engine.

We have done our best to clearly identify the differences, so that you can easily find the operating, maintenance and repair instructions relevant to your engine.

Please read these instructions before you start your engine and observe the operating and maintenance instructions.

We are at your service for any questions you may have in this matter.

Your

DEUTZAG

Contents

1. General

2. Engine description

- 2.1 Engine type
 - 2.1.1 Company plate
 - 2.1.2 Location of company plate
 - 2.1.3 Engine number
 - 2.1.4 Cylinder numbering
- 2.2.1 Operation side
TDC 2012 L04 4V
- 2.2 Engine diagrams
- 2.2.2 Starter side
TDC 2012 L04 4V
- 2.2.3 Operation side
TDC 2012 L06 4V
- 2.2.4 Starter side
TDC 2012 L06 4V
- 2.2.5 Operation side
TDC 2013 L06 4V
- 2.2.6 Starter side
TDC 2013 L06 4V
- 2.2.7 Operation side
Agri Power
- 2.2.8 Starter side
Agri Power
- 2.2 Engine diagrams
- 2.3.1 Lube oil diagram
TCD 2013 L06 4V (example)
- 2.4 Fuel circuit
 - 2.4.1 Fuel diagram
- 2.5 Coolant circuit
 - 2.5.1 Coolant diagram
 - 2.5.2 Exhaust gas recirculation diagram
- 2.6 Electrics
 - 2.6.1 Electrical cable connections for monitoring

3. Operation

- 3.1 Initial commissioning
 - 3.1.1 Filling engine oil
 - 3.1.2 Filling fuel
 - 3.1.3 Filling / bleeding cooling system
 - 3.1.4 Other preparations
- 3.2 Starting
 - 3.2.1 Electrical starting
- 3.3 Operation monitoring
 - 3.3.1 Engine oil pressure
 - 3.3.2 Coolant temperature
 - 3.3.3 Coolant level
 - 3.3.4 Lube oil level
- 3.4 Shutting down
 - 3.4.1 Electrical shutdown
- 3.5 Operating conditions
 - 3.5.1 Winter operation
 - 3.5.2 High ambient temperature, high altitude

4. Operating substances

- 4.1 Lube oil
 - 4.1.1 Quality
 - 4.1.2 Viscosity
- 4.2 Fuel
 - 4.2.1 Quality
 - 4.2.2 Winter fuel
- 4.3 Coolant
 - 4.3.1 Water quality for coolant
 - 4.3.2 Coolant preparation
 - 4.3.3 Cooling system preservative

5. Maintenance

- 5.1 Maintenance schedule
- 5.2 Maintenance diagram
- 5.3 Maintenance work carried out

6. Care and maintenance work

- 6.1 Lubrication system
 - 6.1.1 Oil change intervals
 - 6.1.2 Checking oil level, changing engine oil
 - 6.1.3 Changing oil filter insert
 - 6.1.4 Cleaning / changing oil filter (cup) fehlt
- 6.2 Fuel system
 - 6.2.1 Changing fuel filter
 - 6.2.2 Cleaning / changing fuel filter (cup)
 - 6.2.3 Changing / bleeding fuel pre-filter, filter insert
- 6.3 Cooling system
 - 6.3.1 Cleaning intervals
 - 6.3.2 Cleaning cooling system
 - 6.3.3 Emptying / filling / bleeding cooling system
- 6.4 Combustion air filter
 - 6.4.1 Cleaning intervals
 - 6.4.2 Emptying cyclone pre-separator
 - 6.4.3 Dry air filter
- 6.5 Belt drive
 - 6.5.1 Checking V-rib belt
 - 6.5.2 Changing V-rib belt
 - 6.5.3 Checking wear limit of v-rib belt fehlt
- 6.6 Setting work
 - 6.6.1 Checking valve clearance, setting if necessary
 - 6.6.2 Checking control piston clearance at engine brake, setting if necessary
- 6.7 Add-on parts
 - 6.7.1 Battery
 - 6.7.2 Three-phase current generator
 - 6.7.3 Transportation suspension

Contents

7. Faults, causes and remedies

7.1 Fault table

7.2 Enginemanagement

7.2.1 Engine protection function of the
electronic engine controller EMR3

7.2.2 Using the diagnosis button

7.2.3 Table of fault blink codes

8. Engine corrosion protection

8.1 Corrosion protection

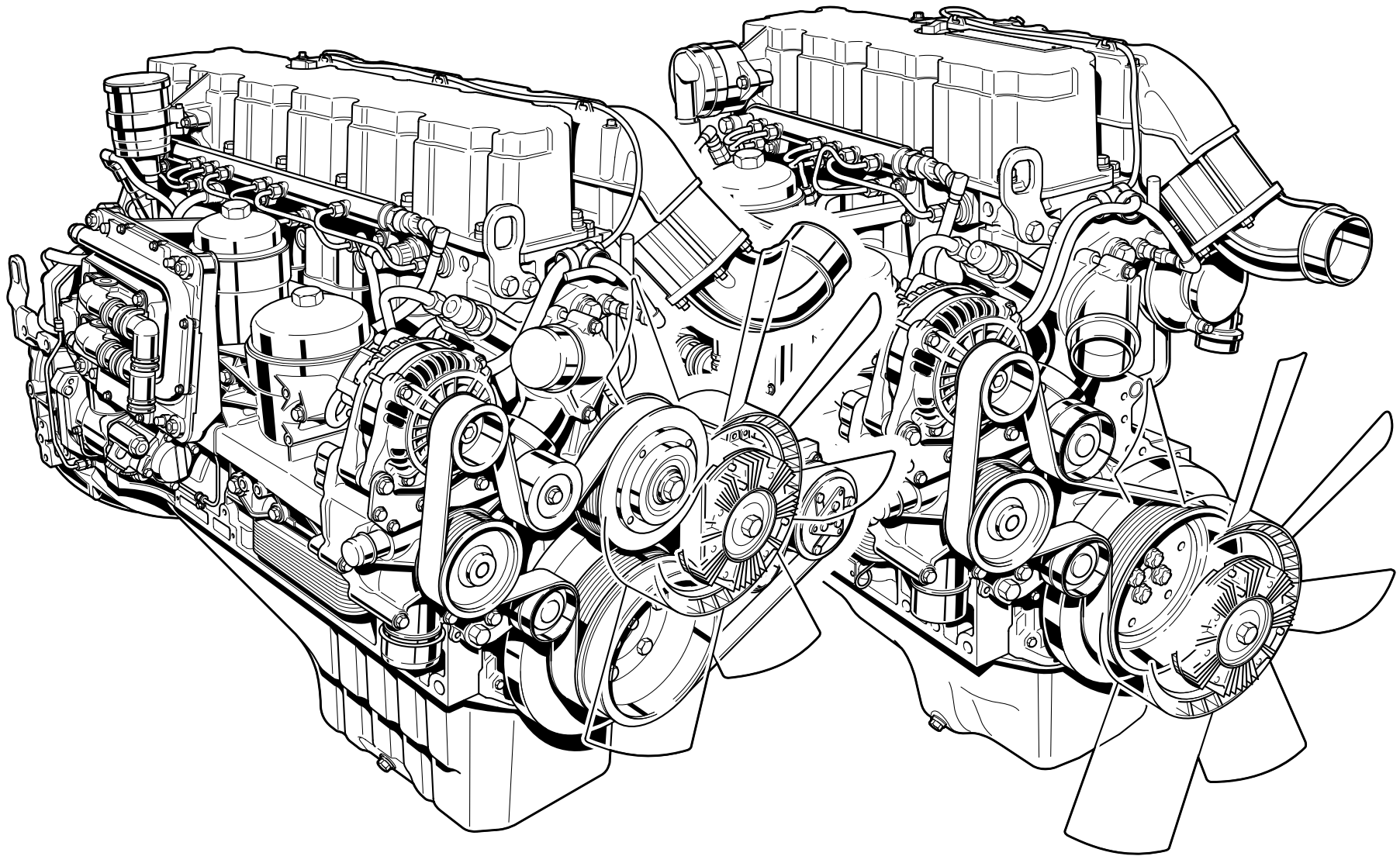
9. Technical data

9.1 Engine and setting data

9.2 Screw tightening torques

9.3 Tools

10. Service



DEUTZ engines

are the product of years of research and development. The profound know-how gained in connection with high quality requirements is the guarantee for manufacturing of engines with a long life, high reliability and low fuel consumption. Naturally the high requirements for protection of the environment are also met.

Maintenance and care

are decisive for whether the engine satisfactorily meets the demands put on it. Compliance with the prescribed maintenance times and the careful execution of maintenance and care work are therefore essential. Difficult operating conditions deviating from normal operation must be observed especially.

Service

Please consult one of our service representatives responsible for operating faults and spare parts questions. Our trained specialist personnel ensures fast, professional repairs using original parts in the event of damage. The Technical Circulars listed in this operating manual are obtainable from your DEUTZ partner. Please turn to the end of this manual for further service information.

Take care when the engine is running

Only carry out maintenance work or repairs with the engine switched off. Ensure that the engine cannot be started unintentionally - danger of accidents!
Re-install any removed protective equipment upon completion of the work.
Observe industrial safety regulations when operating the engine in enclosed spaces or underground.
When working on the running engine, work clothing must be close fitting.
Only re-fuel with the engine switched off.

Danger



This symbol is used for all safety instructions which, if not observed, present a direct danger to life and limb for the person involved. Observe these carefully. Also pass on the safety instructions to your operating personnel. Furthermore, the legislation for „general regulations for safety and the prevention of accidents“ must be observed.

Warning



Danger for component/engine. Failure to comply can lead to destruction of the component/engine. Must be observed.

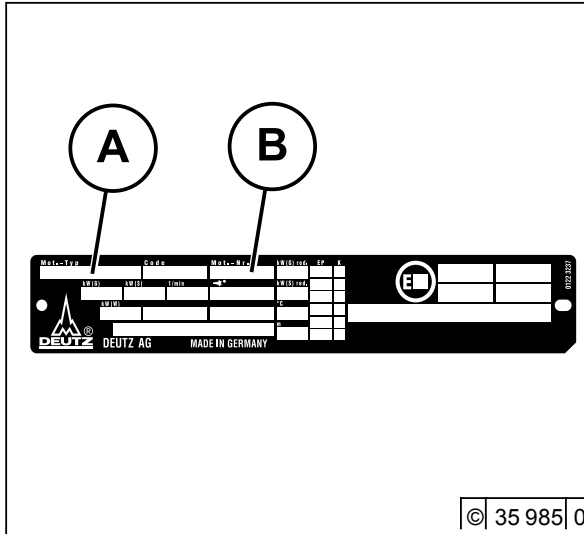
- 2.1 Engine type**
- 2.2 Engine diagrams**
- 2.3 Lube oil circuit**
- 2.4 Fuel circuit**
- 2.5 Coolant circuit**
- 2.6 Electrics**

Engine description

2.1 Engine type

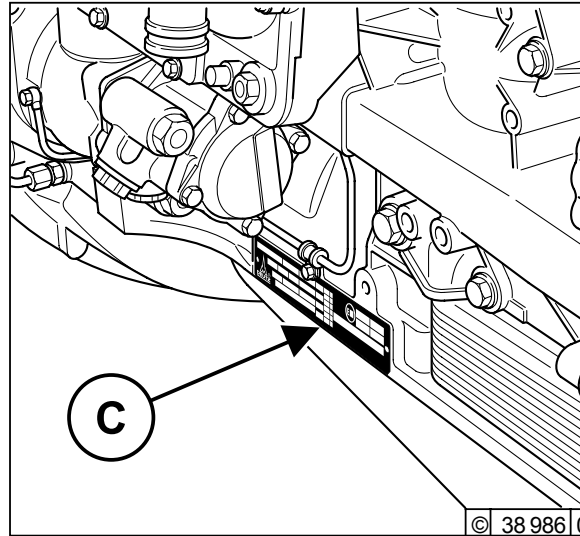
2

2.1.1 Company plate

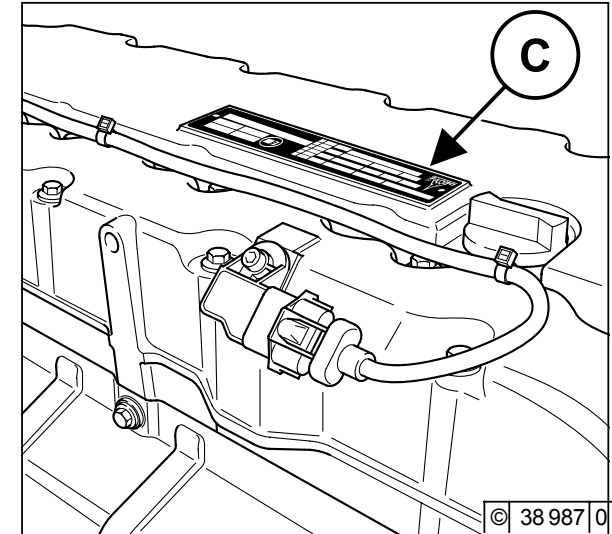


The engine type **A**, engine number **B** and the power data are stamped on the company plate. The engine type and number must be stated when purchasing spare parts.

2.1.2 Location of company plate



The company plate **C** is fixed on the crankcase.

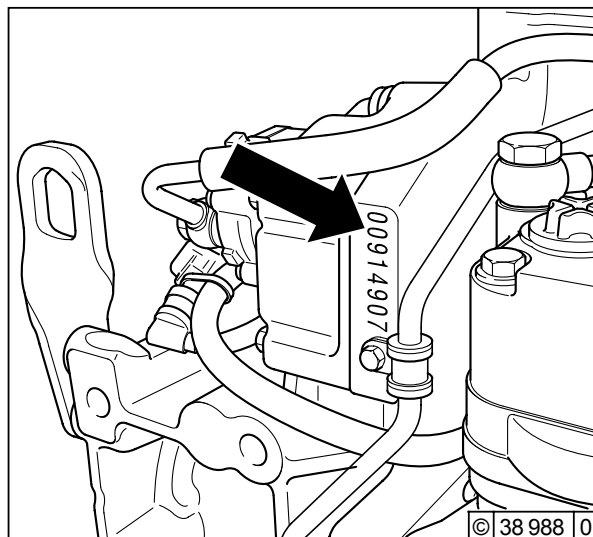


Or company plate **C** is fixed on the cylinder head cover.
Or both plates are attached.

2.1 Engine type

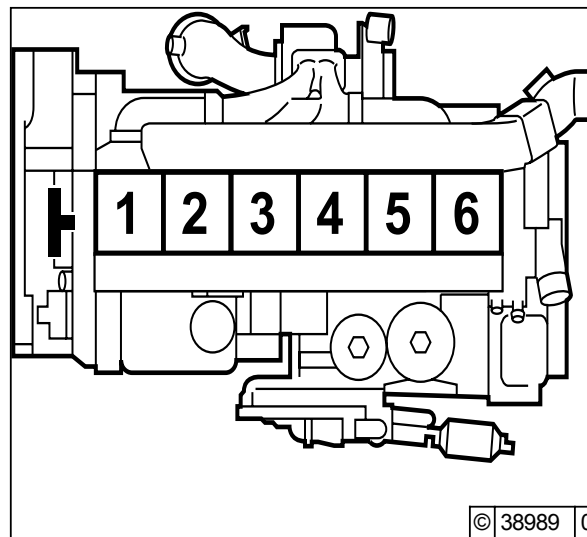
Engine description

2.1.3 Engine number



The engine number is stamped on the crankcase (**arrow**) and on the company plate.

2.1.4 Cylinder numbering



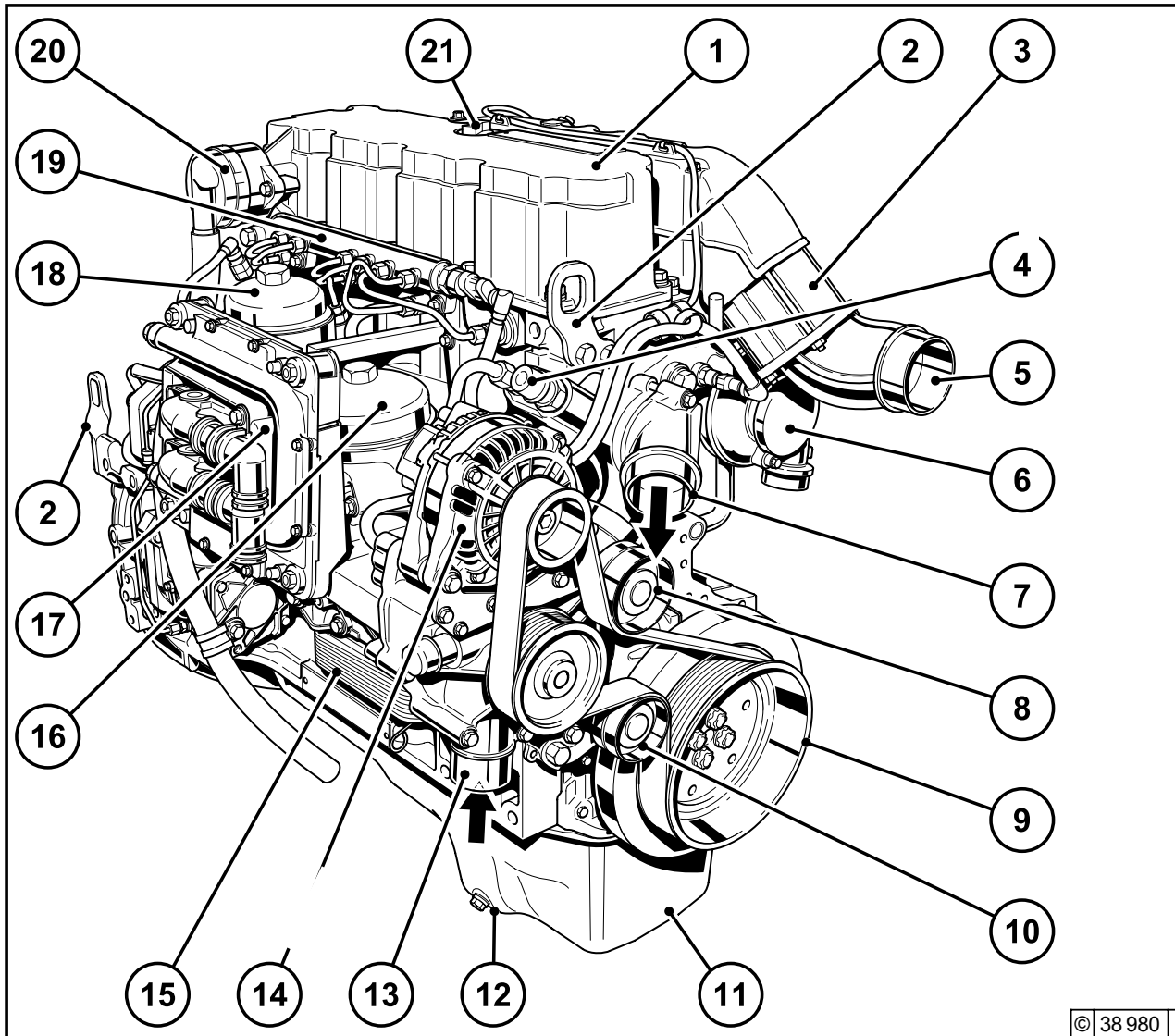
The cylinders are counted consecutively, starting from the flywheel.

Engine description

2.2 Engine diagrams

2

2.2.1 Operation side TCD 2013 L04 4V



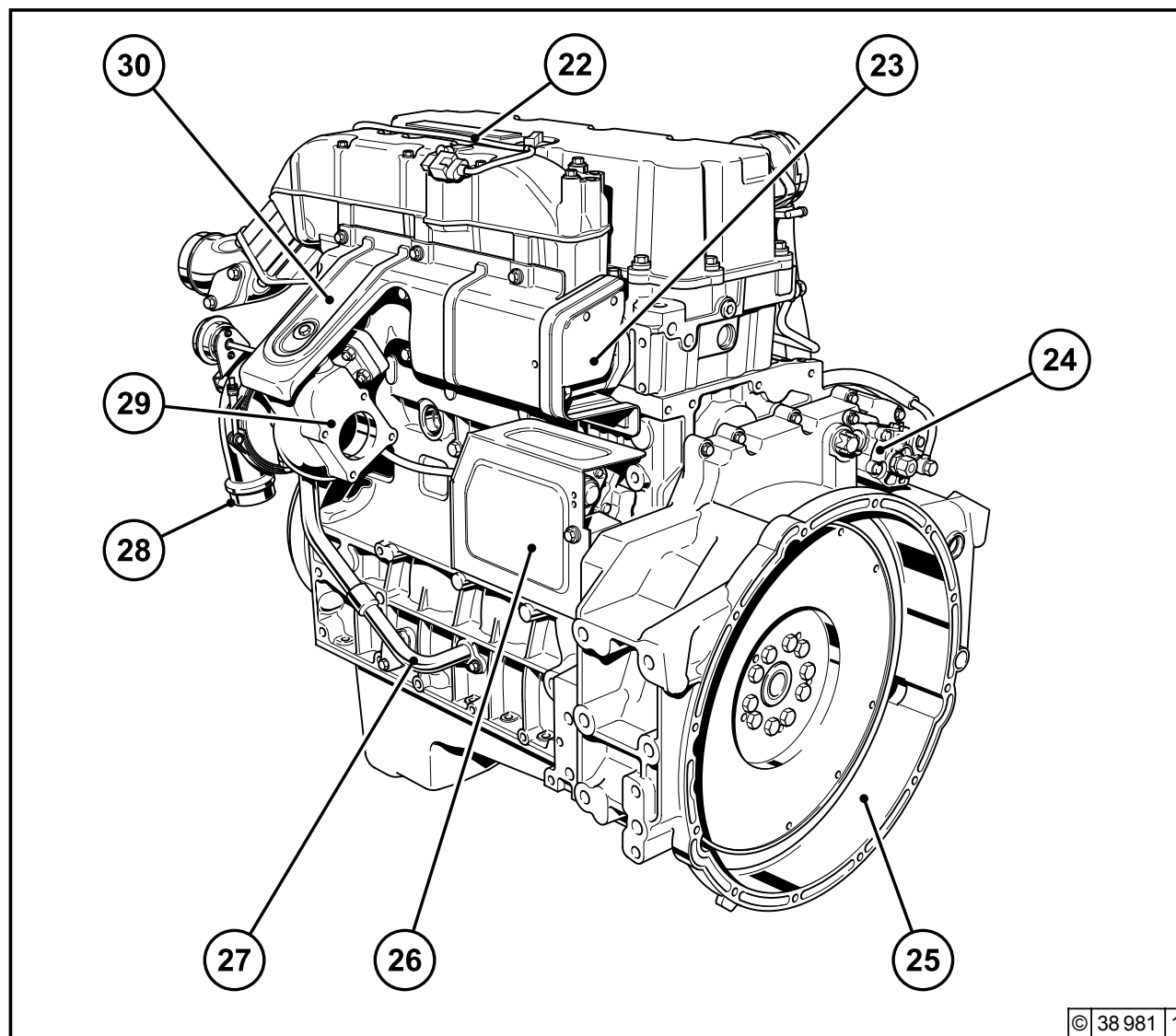
- 1 Cylinder head cover
- 2 Transportation eyelets
- 3 Heating flange
- 4 Cabin heater connection
- 5 Intake elbow to charge air cooler
- 6 Connection to air filter
- 7 Coolant outlet adapter
- 8 Deflection pulley
- 9 Belt pulley on crankshaft
- 10 Tension pulley
- 11 Oil tray
- 12 Oil drain screw
- 13 Coolant inlet adapter
- 14 Generator
- 15 Oil cooler
- 16 Exchangeable lube oil filter
- 17 Engine control unit
- 18 Exchangeable fuel filter
- 19 Rail with pressure reducing valve and pressure sensor
- 20 Crankcase ventilation (open system)
- 21 Oil filler neck

2.2 Engine diagrams

Engine description

2

2.2.6 Starter side TCD 2013 L04 4V



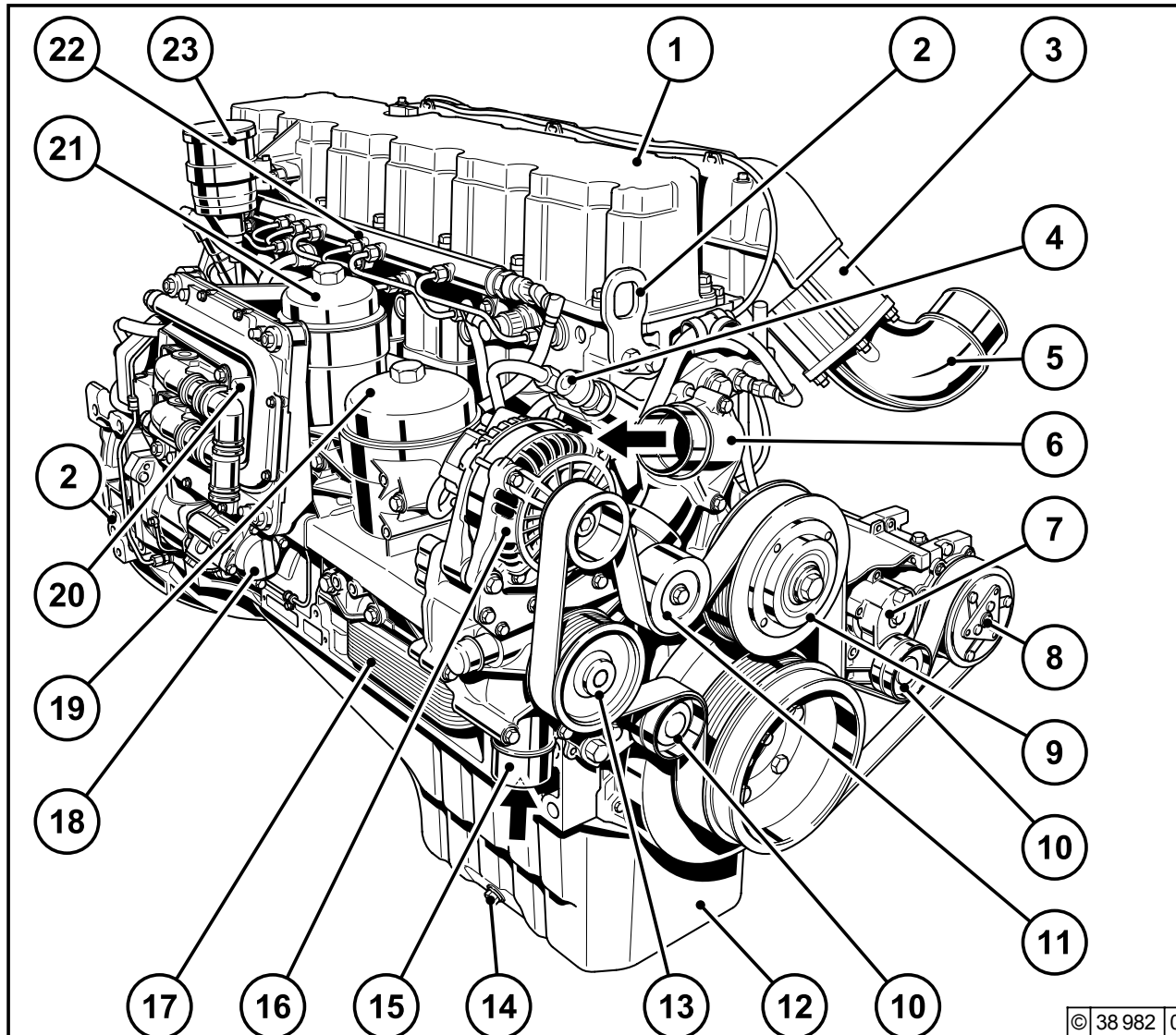
- 22 Charge air temperature line to transmitter
- 23 Exhaust manifold
- 24 Compressor (optional)
- 25 SAE housing
- 26 Starter cover
- 27 Oil return line from turbocharger
- 28 Inlet combustion air turbocharger
- 29 Turbocharger exhaust gas outlet
- 30 Screening plate (thermal protection)

Engine description

2.2 Engine diagrams

2

2.2.3 Operation side TCD 2013 L06 4V



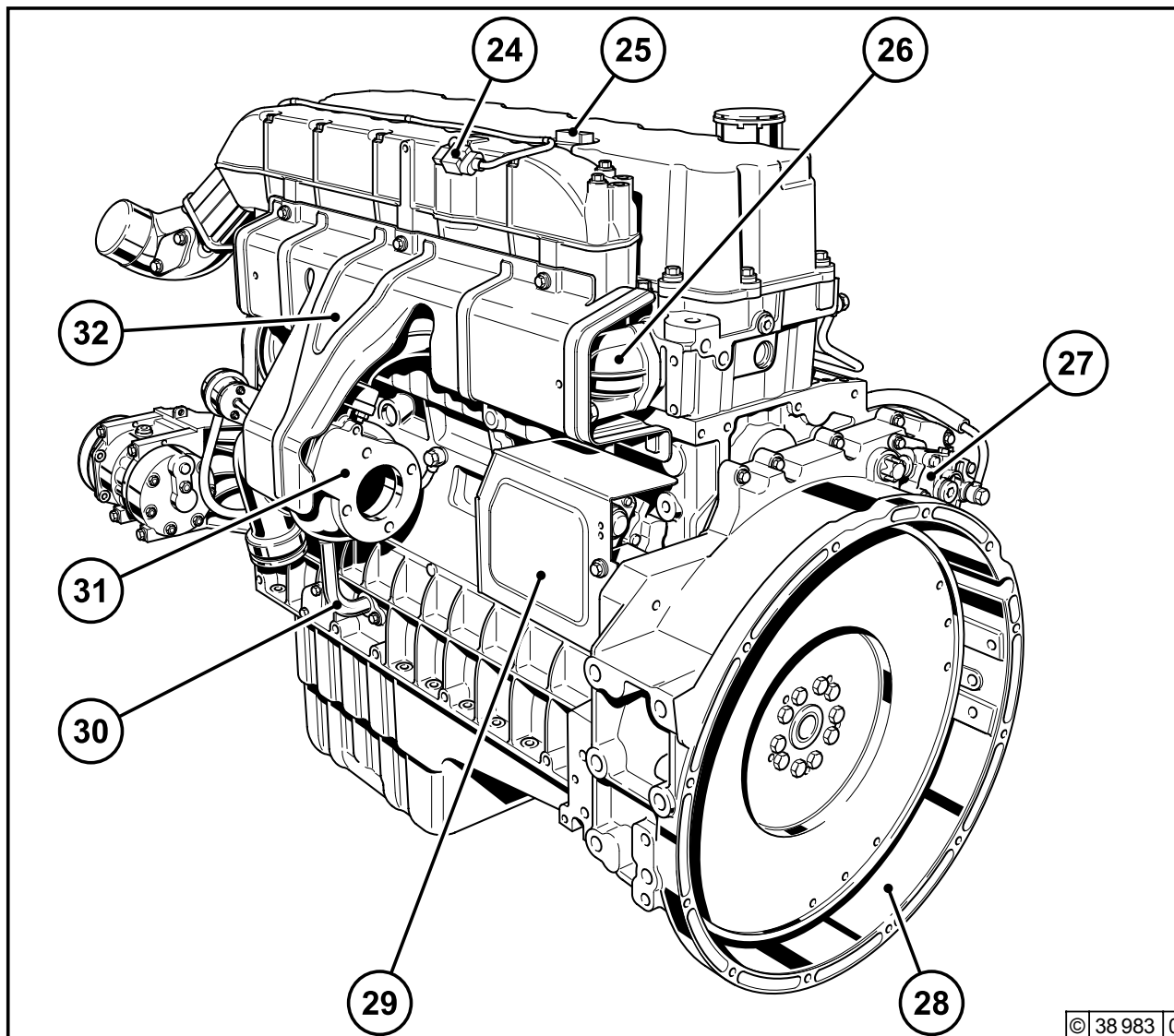
- 1 Cylinder head cover
- 2 Transportation eyelets
- 3 Heating flange
- 4 Cabin heater connection
- 5 Intake elbow from charge air cooler
- 6 Thermostat housing (coolant outlet)
- 7 Spring-loaded tension pulley
- 8 Compressor (optional)
- 9 Belt pulley for fan attachment
- 10 Tension pulley (s)
- 11 Deflection pulley
- 12 Oil tray
- 13 Belt pulley coolant pump
- 14 Oil drain screw
- 15 Coolant inlet adapter
- 16 Generator
- 17 Oil cooler
- 18 Hydraulic pump or compressor installation (optional)
- 19 Exchangeable lube oil filter
- 20 Engine control unit with fuel cooling
- 21 Exchangeable fuel filter
- 22 Rail with pressure reducing valve and pressure sensor
- 23 Crankcase ventilation (open system)

2.2 Engine diagrams

Engine description

2

2.2.4 Starter side TDC 2013 L06 4V



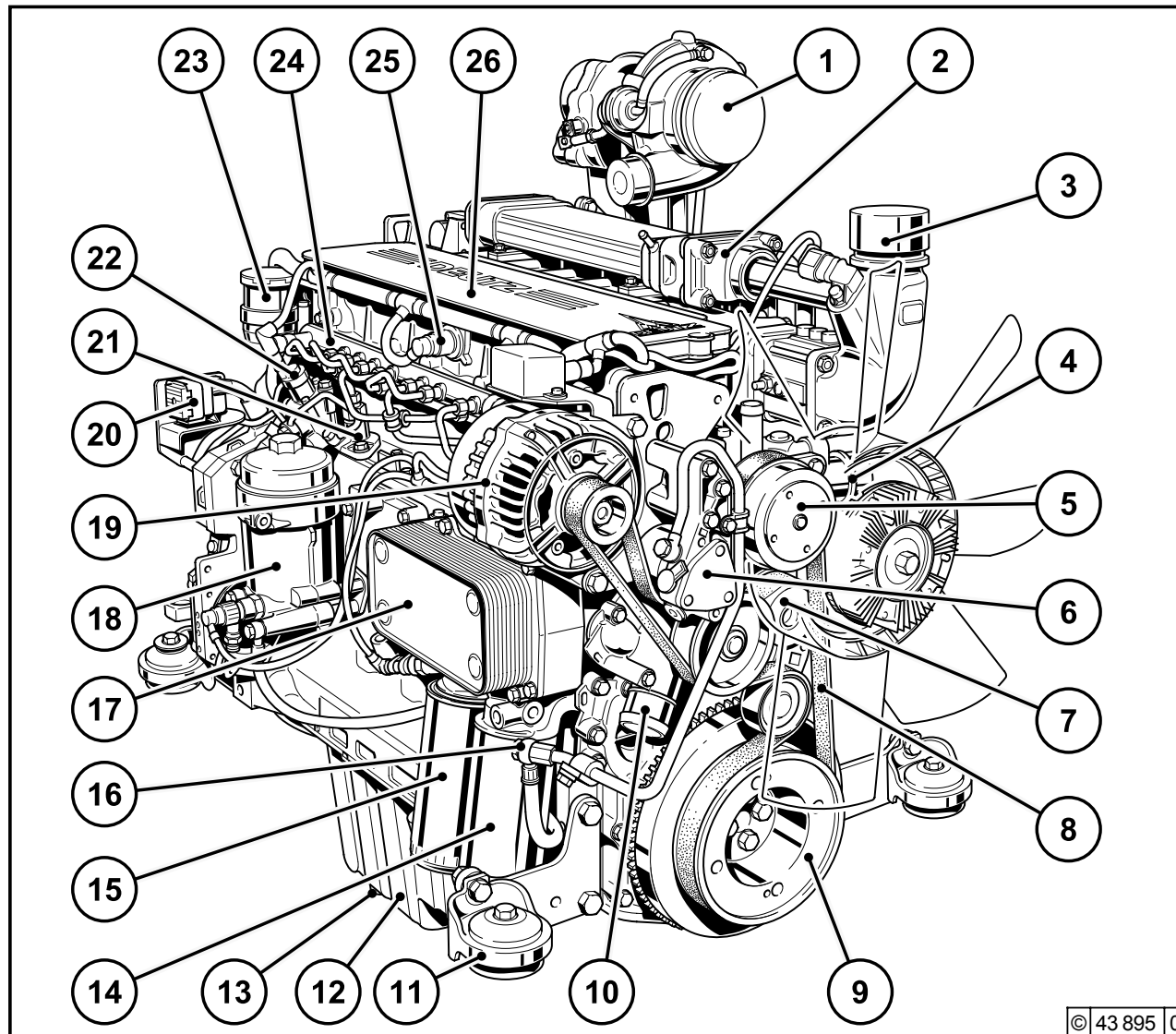
- 24 Pressure and temperature transmitter, charge air
- 25 Oil filler neck
- 26 Exhaust manifold
- 27 Compressor (optional)
- 28 SAE housing
- 29 Starter cover
- 30 Oil return line from turbocharger
- 31 Exhaust turbocharger
- 32 Screening plate (thermal protection).

Engine description

2.2 Engine diagrams

2

2.2.5 Operation side Agri Power TCD 2012 L04 4V

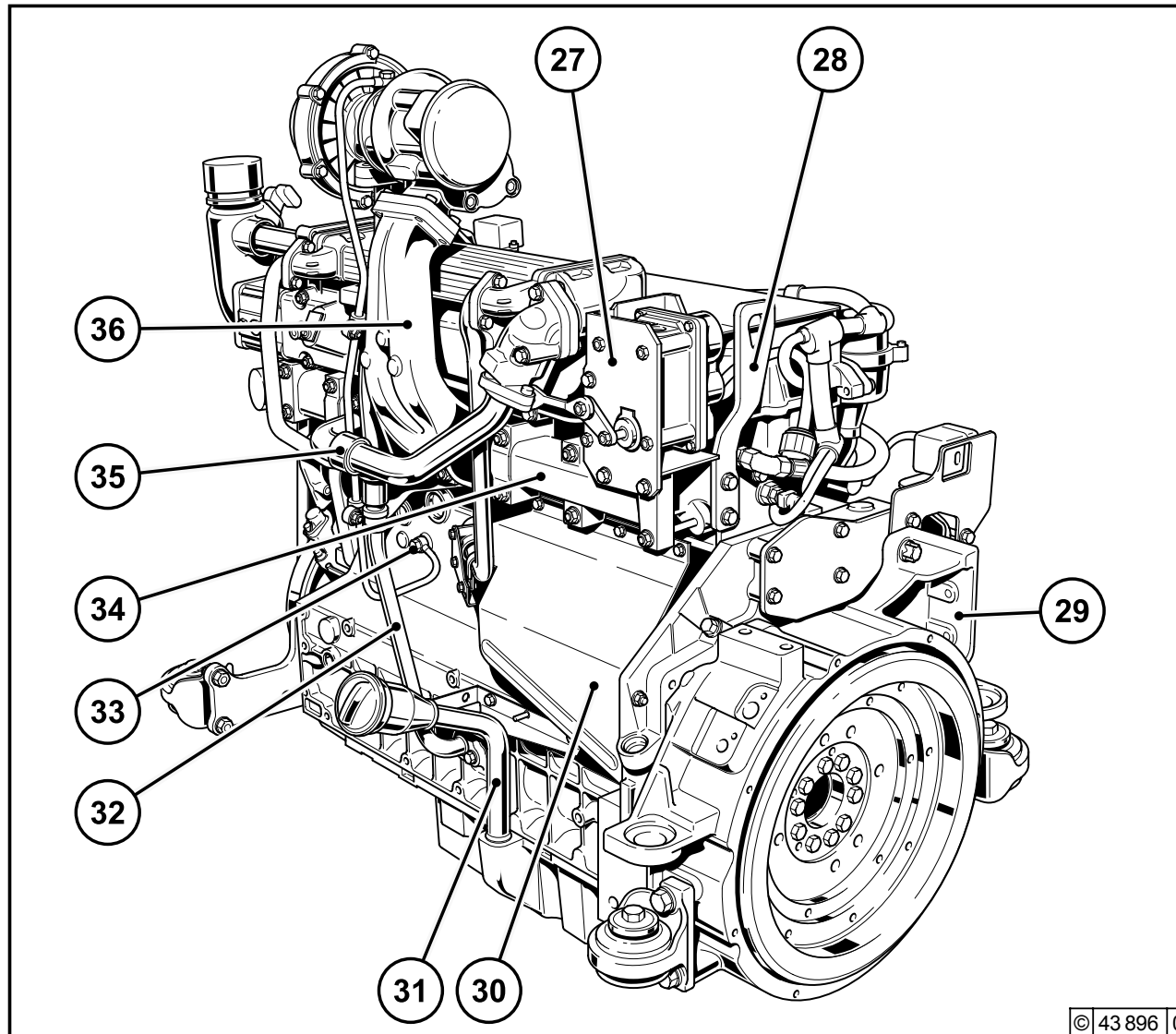


- 1 Exhaust turbocharger
- 2 EGR exhaust gas recirculation
- 3 Intake elbow from charge air cooler
- 4 Coolant return from cooler
- 5 Coolant pump
- 6 Fuel supply pump
- 7 Spring-loaded tension pulley
- 8 V-rib belt
- 9 Belt pulley for drive
- 10 Coolant inlet adapter from cooler
- 11 Mounting foot (engine suspension)
- 12 Oil tray
- 13 Oil drain screw
- 14 Fuel filter
- 15 Lube oil filter
- 16 Fuel connection from tank
- 17 Lube oil cooler
- 18 Fuel pre-filter
- 19 Generator
- 20 Central connector
- 21 **ECU Electronic Control Unit**
- 22 High-pressure pump
- 23 Crankcase ventilation
- 24 Rail with pressure reducing valve
- 25 Charge air sensor
- 26 Cylinder head cover

2.2 Engine diagrams

Engine description

2.2.6 Operation side Agri Power TCD 2012 L04 4V



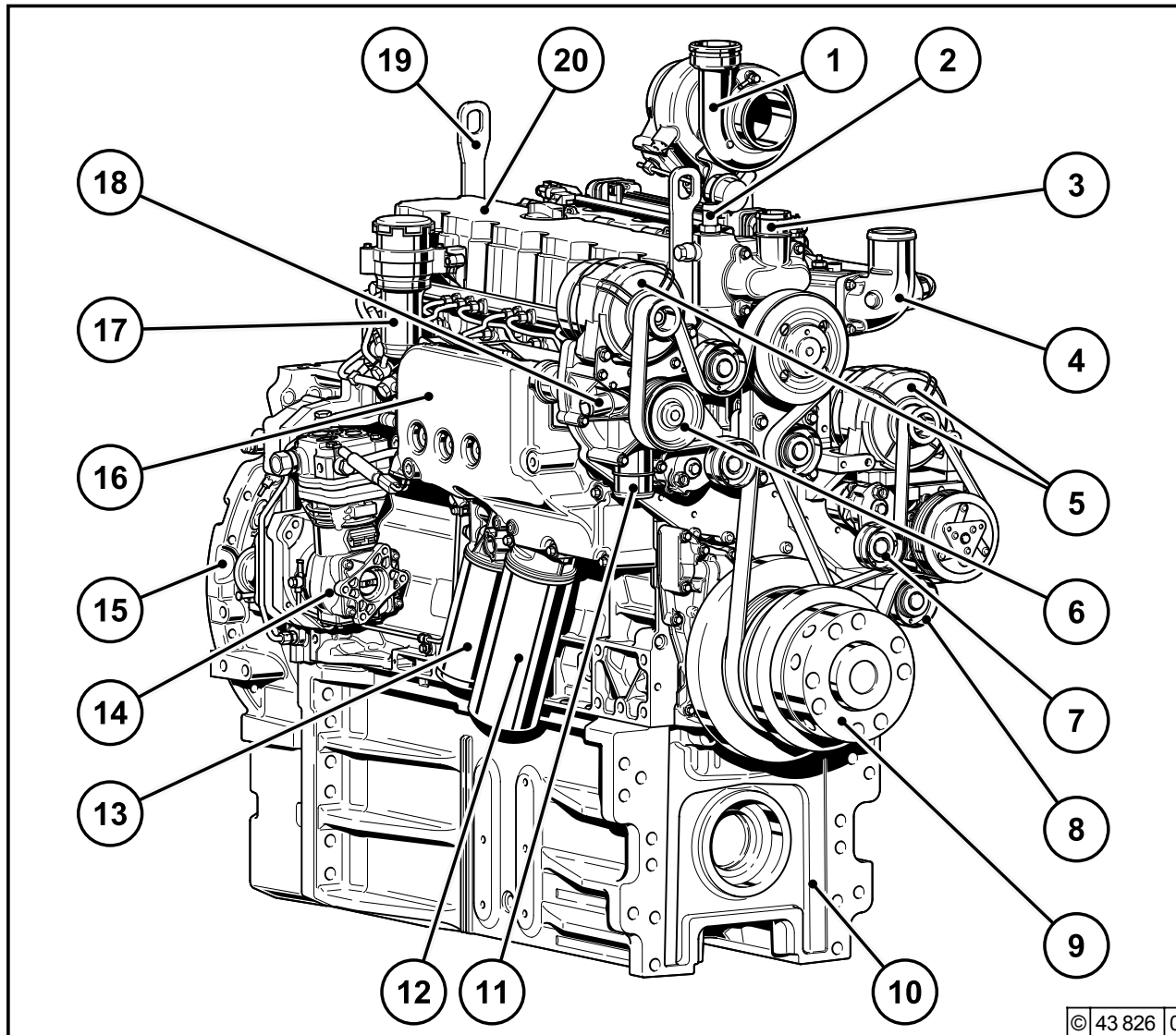
- 27 **EGR exhaustgasRecirculation**
Throttle lever for exhaustgasrecirculation
- 28 Transportation eyelets
- 29 SAE housing
- 30 Starter with cover
- 31 Lube oil filler neck
- 32 Lube oil return from turbocharger
- 33 Oil pressure pipe to turbocharger
- 34 Exhaust manifold
- 35 Cooling line to exhaust gas recirculation system
- 36 Exhaust manifold

Engine description

2.2 Engine diagrams

2

2.2.7 Operation side TCD 2013 L06 4V Agri Power



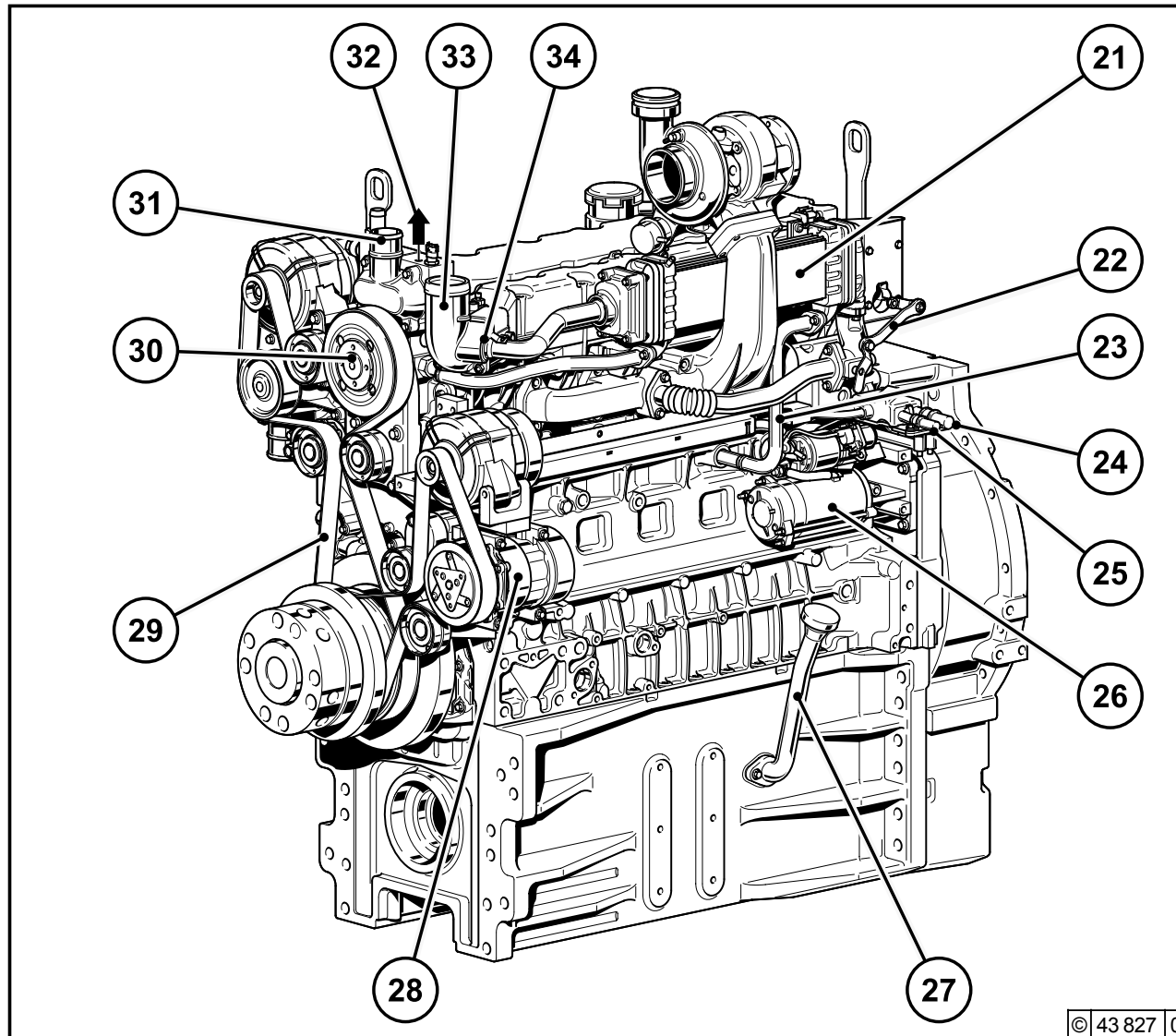
- 1 Exhaust turbocharger
- 2 Coolant return from heater
- 3 Coolant outlet to cooler
- 4 Intake elbow from charge air cooler
- 5 Generator
- 6 Coolant pump
- 7 Spring-loaded tension pulley
- 8 Deflection pulley
- 9 Front power takeoff
- 10 Oil tray
- 11 Coolant inlet adapter from cooler
- 12 Lube oil filter
- 13 Fuel filter
- 14 Compressor (optional)
- 15 SAE housing
- 16 Lube oil cooler
- 17 Crankcase ventilation socket
- 18 Coolant outlet adapter to heater
- 19 Engine suspension
- 20 Cylinder head cover

2.2 Engine diagrams

Engine description

2.2.8 Starter side TCD 2013 L06 4V Agri Power

2



- 21 **EGR** exhaustgasrecirculation system
- 22 Throttle lever for exhaustgasrecirculation
- 23 Cooling line to exhaust gas recirculation system
- 24 Fuel inlet to engine
- 25 Fuel outlet to fuel container
- 26 Starter
- 27 Lube oil filler neck
- 28 Compressor
- 29 V-rib belt
- 30 Fan bearing /coolant pump
- 31 Thermostat housing coolant outlet to cooler
- 32 Ventilation line to cooler
- 33 Charge air supply to charge air cooler
- 34 Coolant return from **EGR**

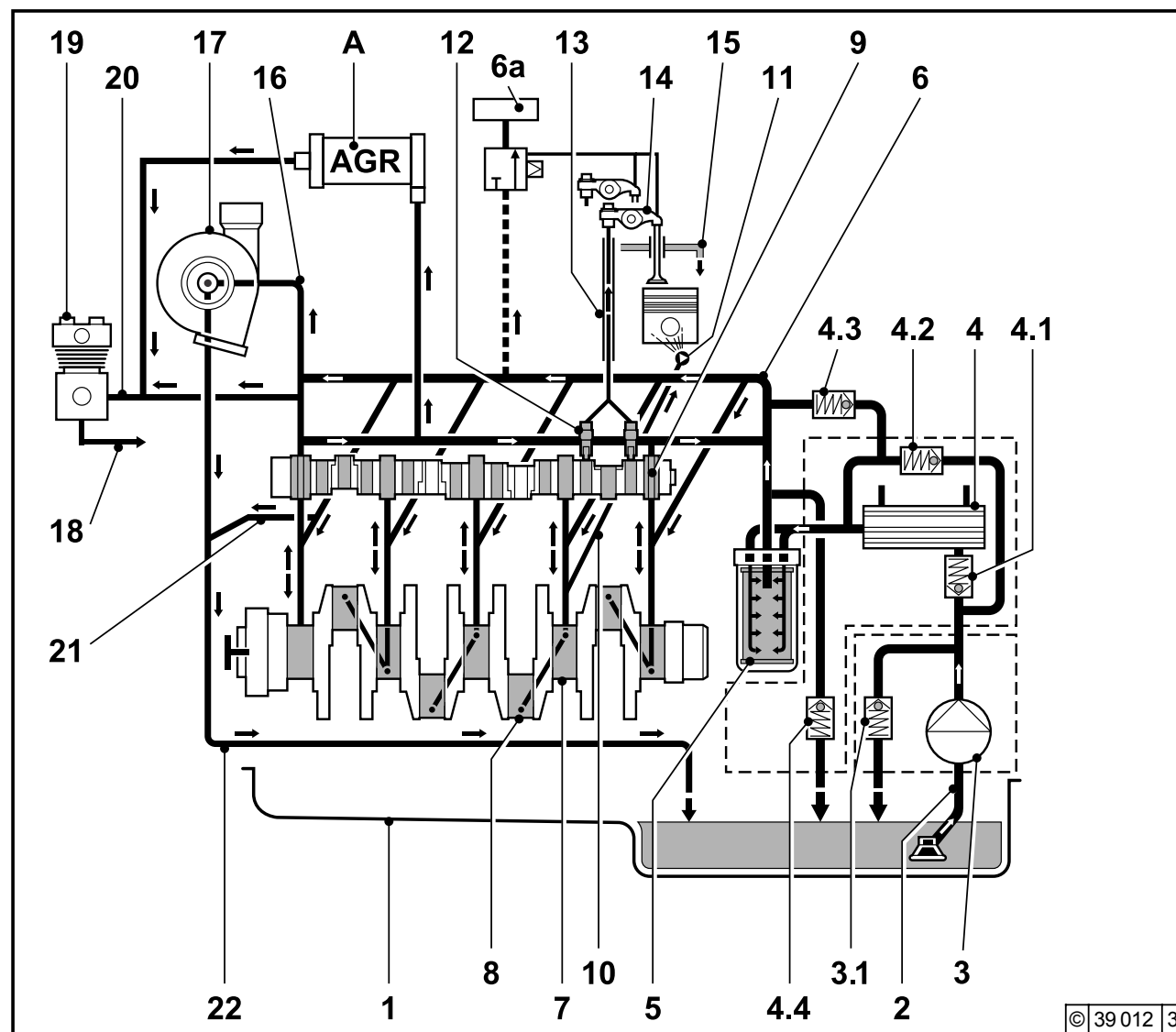
Engine description

2.3 Lube oil circuit

2

2.3.1 Lube oil diagram

TCD 2013 L06 4V (example)

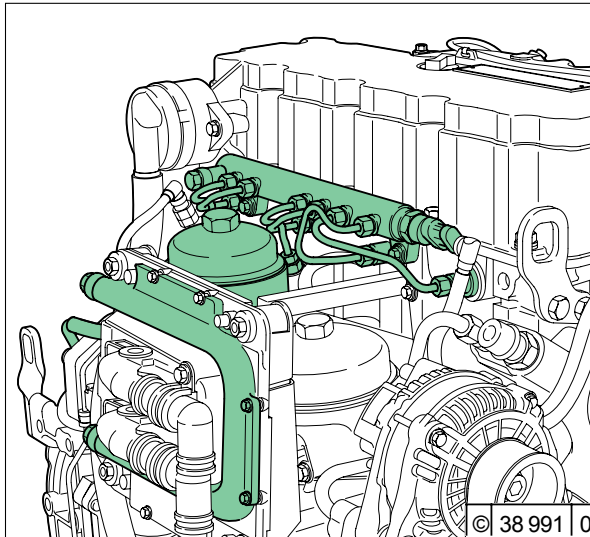


2.4 Fuel circuit

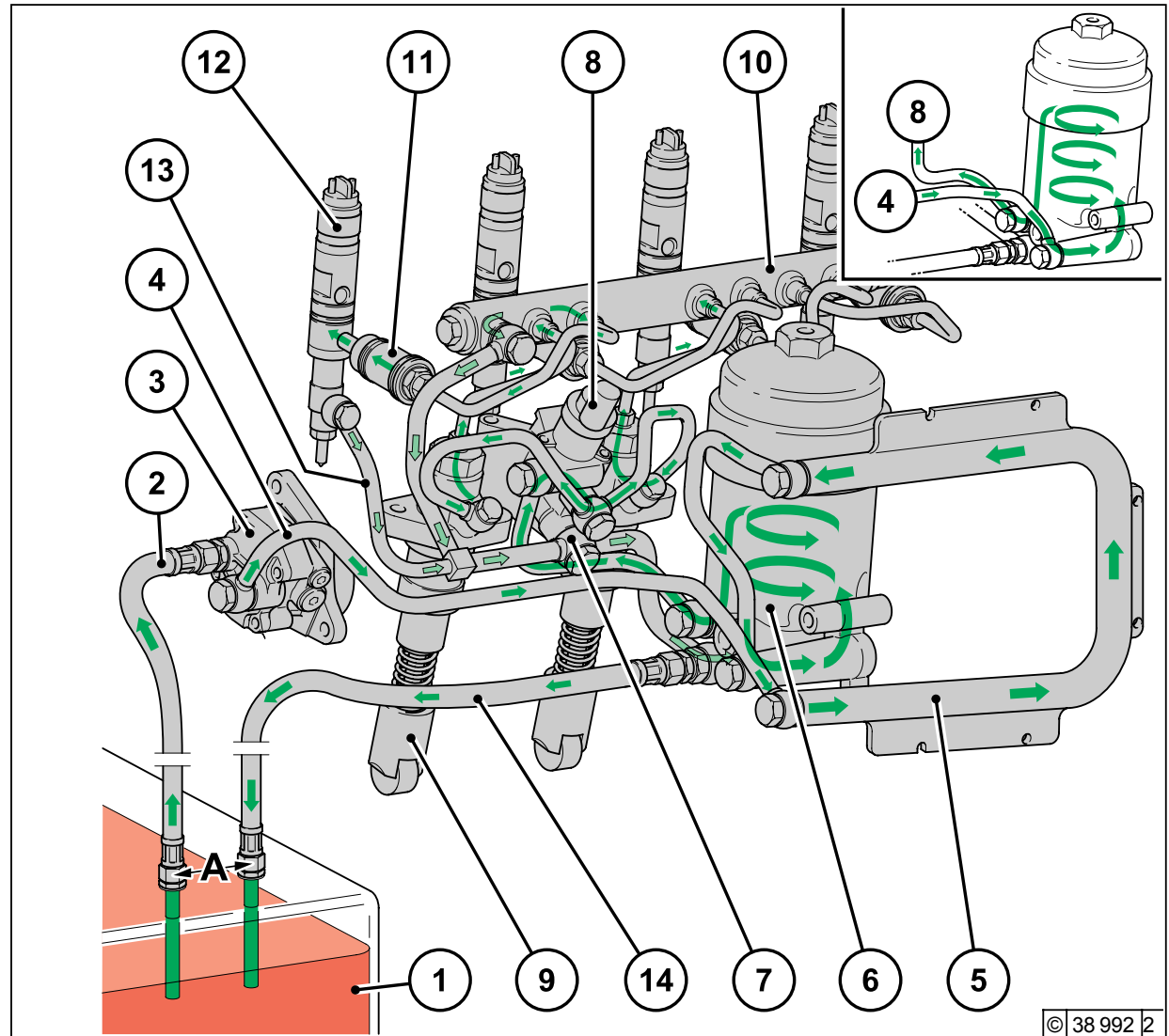
Engine description

2.4.1 Fuel diagram

2



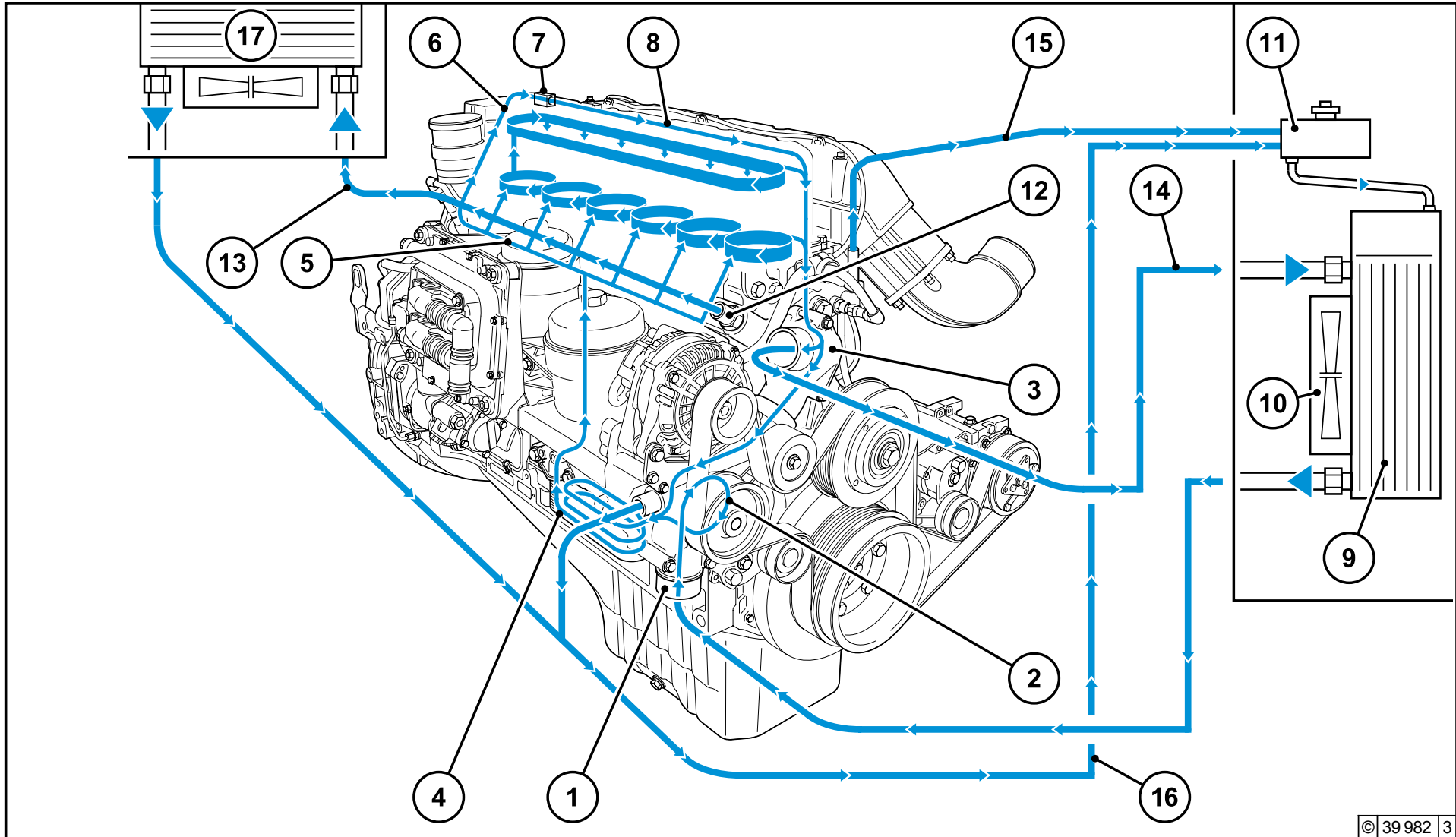
- 1 Fuel container
 - 2 Line to fuel pump
 - 3 Fuel pump
 - 4 Line to fuel filter
 - 5 Fuel cooling for engine control unit
(without cooler, upper right in diagram)
 - 6 Fuel filter
 - 7 Line to injection pumps
 - 8 Fuel to control unit
 - 9 Tappet rollers on camshaft
 - 10 **DCRRail**
 - 11 Injection line to injection valve
 - 12 Injectors
 - 13 Fuel leak oil line
 - 14 Return line to container
- A Keep distance as large as possible



Engine description

2.5 Coolant circuit

2



2.5 Coolant circuit

Engine description

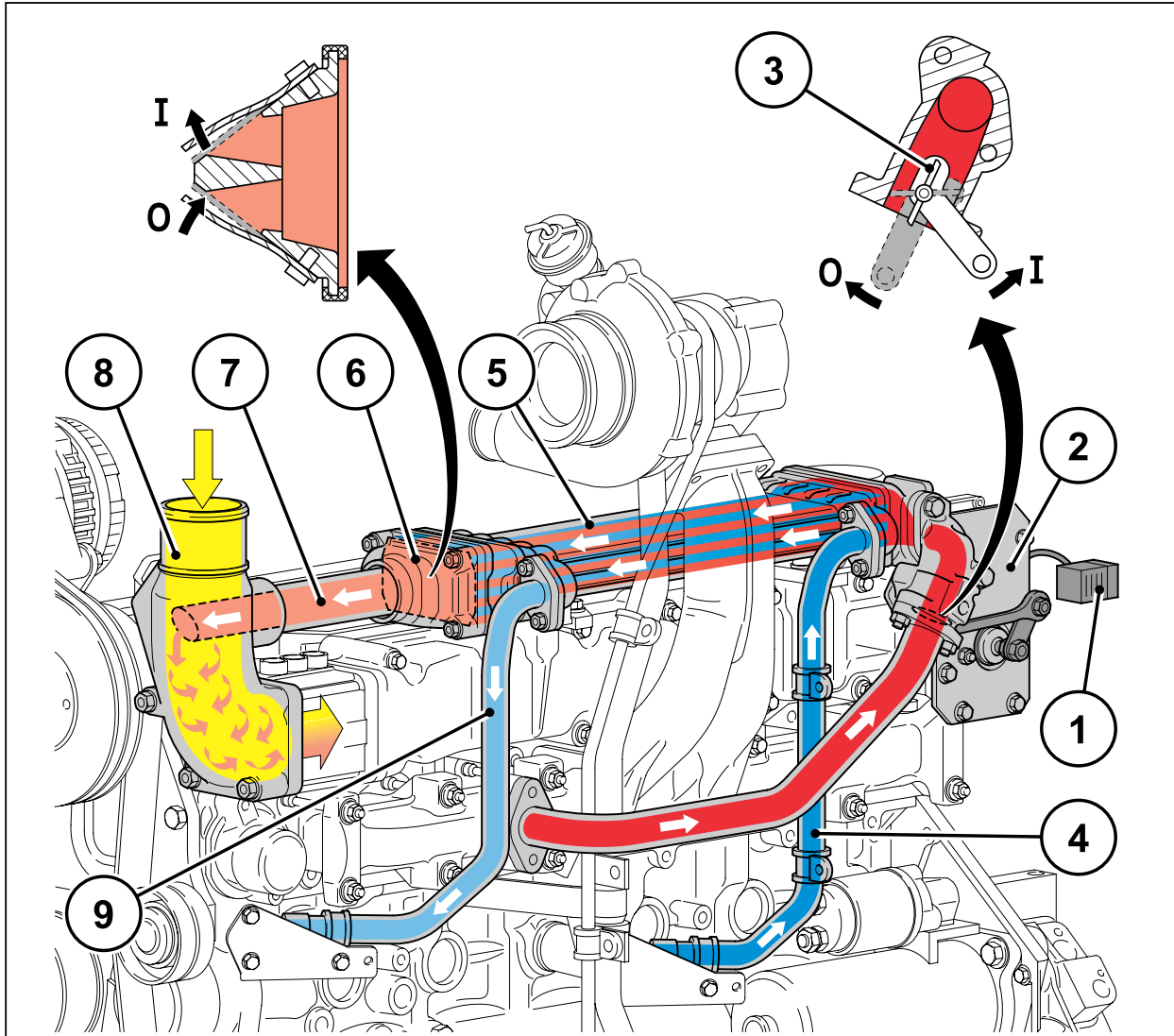
- 1 Coolant inlet to engine
- 2 Coolant pump
- 3 Thermostat housing
- 4 Lube oil cooler (plate cooling)
- 5 Cylinder head cooling and EGR cooling
- 6 Coolant supply to engine brake
- 7 Engine brake cooling
- 8 Return line to thermostat
- 9 Heat exchanger (customer)
- 10 Fan (customer)
- 11 Compensation tank (customer)
- 12 Heating connection
- 13 Compensation tank return line
to heater connection
- 14 Thermostat compensation tank return
- 15 Engine ventilation to compensation tank
- 16 Return line from engine heat exchanger

Engine description

2.5 Coolant circuit

2

2.6.1 Exhaust gas recirculation diagram



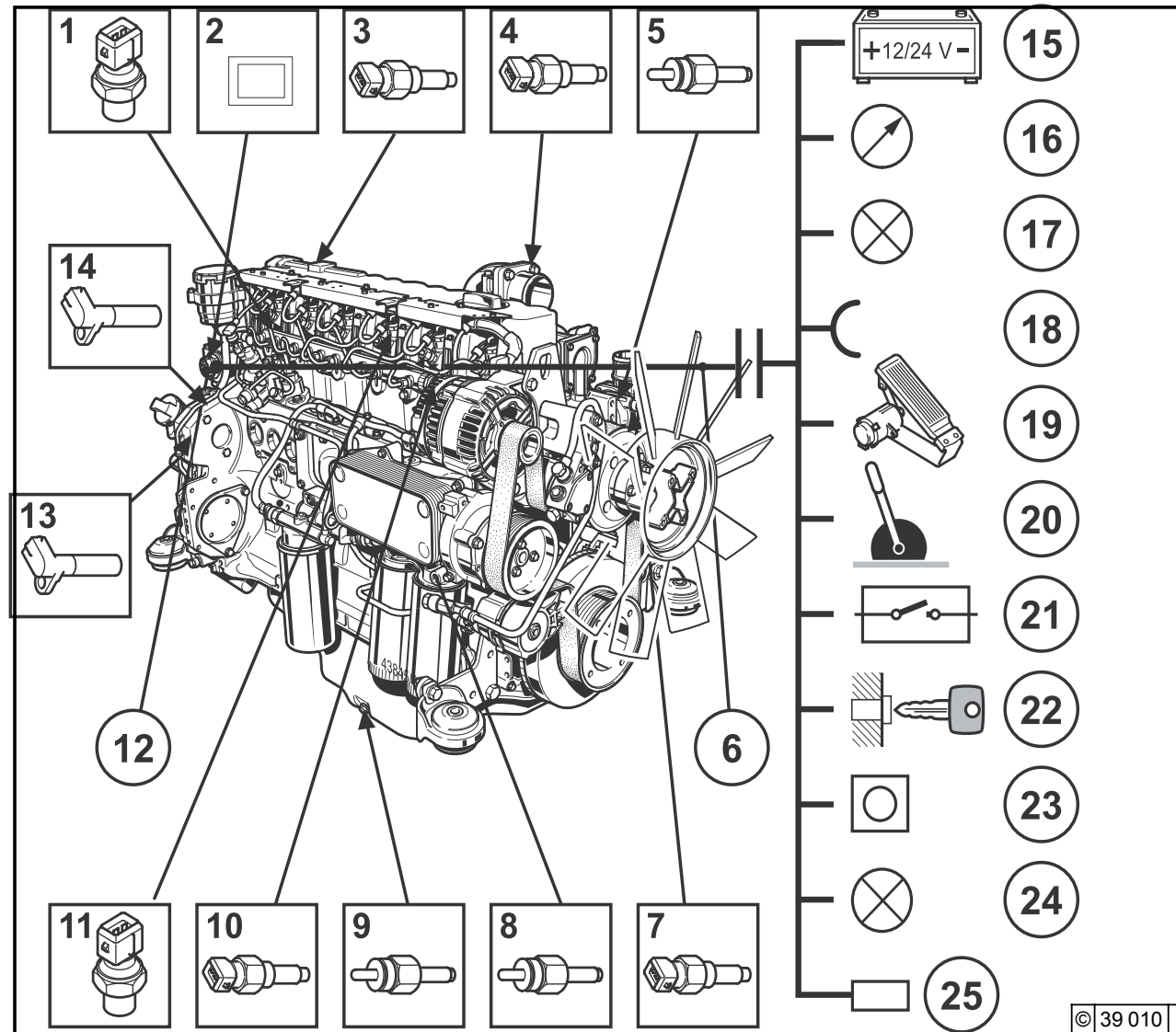
- 1 Coolant inlet to engine
- 2 Coolant pump
- 3 Thermostat housing
- 4 Lube oil cooler (plate cooling)
- 5 Cylinder head cooling and EGR cooling
- 6 Coolant supply to engine brake
- 7 Engine brake cooling
- 8 Return line to thermostat
- 9 Heat exchanger (customer)
- 10 Fan (customer)
- 11 Compensation tank (customer)
- 12 Heating connection
- 13 Compensation tank return line to heater connection
- 14 Thermostat compensation tank return
- 15 Engine ventilation to compensation tank
- 16 Return line from engine heat exchanger

2.6 Electrics

Engine description

2

2.6.1 Electrical cable connections for monitoring (example)



- 1 Fuel pressure
- 2 Shutdown magnet (solenoid valve) example
- 3 Charge air pressure/temperature sensor
- 4 Coolant temperature
- 5 Cold start aid
- 6 Rail pressure (fuel pressure)
- 8 Oil temperature transmitter engine pre-heating heating
- 7 Oil pressure transmitter
- 9 Oil level transmitter
- 10 Oil pressure sensor
- 11 Injectors engine brake (optional)
- 12 E.M.SII
- 13 Pick-up on SAE housing
- 14 Speed sensor
- 15 Energy supply
- 16 Multifunction displays
- 17 Outputs (configurable)
- 18 Inputs (configurable) (PWM/digital/analogue)
- 19 Accelerator pedal
- 20 Hand throttle (optional)
- 21 Switch functions
- 22 Key switch Start/stop
- 23 Diagnosis button
- 24 Fault light with blink code
- 25 Diagnosis interface/ CAN-Bus

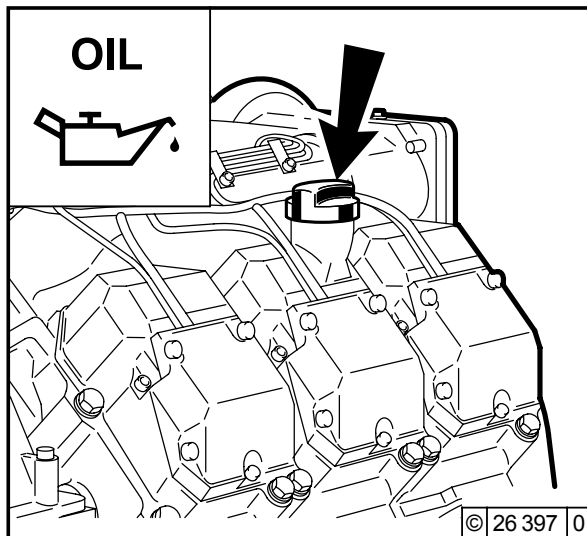
- 3.1 Initial commissioning**
- 3.2 Starting**
- 3.3 Operation monitoring**
- 3.4 Shutting down**
- 3.5 Operating conditions**

Operation

3.1 Initial commissioning

3

3.1.1 Filling engine oil



The engines are generally supplied without oil filling.

Fill engine with lube oil through the oil filler (1) on the cylinder head cover. Alternatively, you can fill on the wheel box (2) or on the side of the crankcase.

For oil filling amount see 9.1.

For quality and viscosity of oil see 4.1.



Oil may not be filled into the dust collecting tank of the pre-separator, if this is present.

3.1.2 Filling fuel



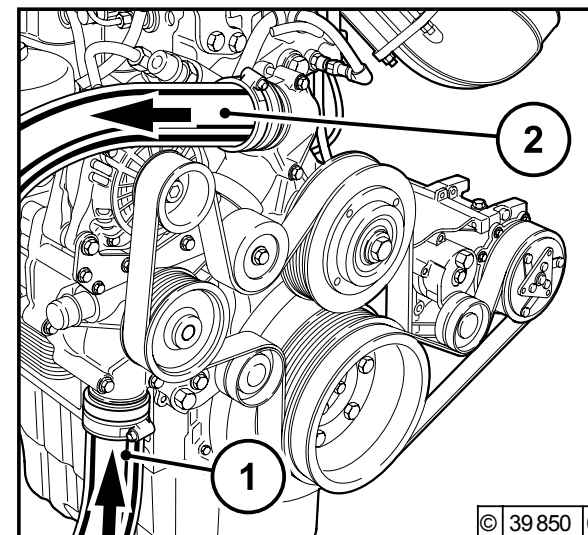
Only use clean, standard, branded diesel fuel. For fuel quality see 4.2.

Depending on the outdoor temperature, use either summer or winter diesel fuel.



Only re-fuel when the engine is not running!
Pay attention to cleanliness!
Do not spill any fuel!

3.1.3 Filling / bleeding cooling system



- Connect the coolant outlet 2 and coolant inlet 1 to the cooling system. Connect the lead line from the compensation tank to the water pump or to coolant inlet pipe 1.
- Connect vent lines from the engine and if necessary from the cooler to the compensation tank.
- Fill the cooling system through the compensation tank
- Close the compensation tank with the valve.
- Start the engine and warm up until the thermostat opens (line 2 heats up).
- Run engine run with open thermostat for 2–3 minutes.

3.1 Initial commissioning

Operation

3.1.4 Other preparations

- Check the coolant level in the compensation tank and top up the coolant if necessary.
- Repeat the process with engine start if necessary.
- Check battery and cable connections, see 6.7.1.
- **Trial run**
 - After preparations carry out a short trial run of approx. 10 min. Do not fully load the engine.
- **During and after the trial run**
 - Check engine for tightness.
- **With engine not running**
 - Check oil level, re-fill oil if necessary, see 6.1.2.
 - Re-tighten V-belts, see 6.5.
- **Running-in**
 - It is recommended to check the oil level twice a day during the running-in phase.
 - After the running-in phase, checking once a day is sufficient.



Never operate the engine without coolant (not even briefly).

Operation

3.2 Starting

3

3.2.1 Electrical starting



Before starting make sure that there is nobody in the engine/work machine danger area. After repairs: Check that all protective equipment is mounted and all tools have been removed from the engine.

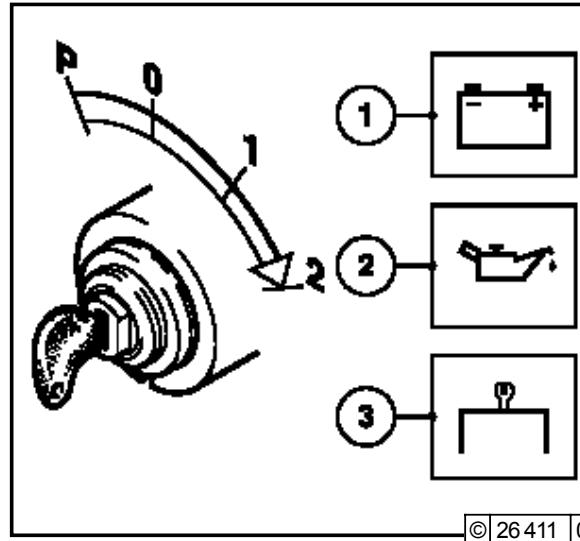
When starting with heating plugs/heating flange, do not use additional start aids (e.g. injection with start pilot)! Danger of accidents!

- Engine is electronically controlled by
Example: EMR3 (electronic engine control)
 - engine is programmed and supplied with the necessary function configurations.
- As far as possible separate engine from driven devices by disconnecting.
- Engine connector plug must be connected by the customer (e.g. in driver's cab/device) to at least:
 - Supply voltage
 - Torque output
 - Speed output.
- Warm up the engine for approx. 30 seconds at a low idling speed.
- Do not run up the engine immediately to high idling speed / full load operation from cold.

If the starter is connected by a relay on the EMR3,

- the maximum starting time is limited by the EMR3.
- the pause between two start attempts is given by the EMR3.

without cold start aid



- If the touch start function is programmed, a short start command with the ignition key suffices in position 2 or, if available, by a start button.
The start is then continued automatically by the EMR3.
- For special applications, the EMR3 can be programmed by data record so that the control unit performs other automatic start attempts if the engine fails to start.

Start uninterruptedly for max. 20 s. If the engine does not start, repeat the start procedure after a 1 minute pause. If the engine has not started after two attempts, find the cause in the fault table (see 7.1).

- Insert key
 - Step 0 = no operating voltage.
- Turn key to the right
 - Step 1 = operating voltage,
 - Warning lights light up.
- Turn the key further to the right against the spring load.
 - Step 2 = start
- Release key as soon as the engine starts up.
 - Warning lights go out.

Start the engine for a maximum of 20 seconds uninterrupted. If the engine does not start up, wait for one minute and then repeat the starting process. If the engine does not start up after two starting processes, determine the cause as per fault table (see 7.1).

If the engine does not start and the diagnostic lamp flashes, the EMR3 system has activated the start lock to protect the engine.

The start lock is released by switching off the system with the ignition key for about 30 seconds.

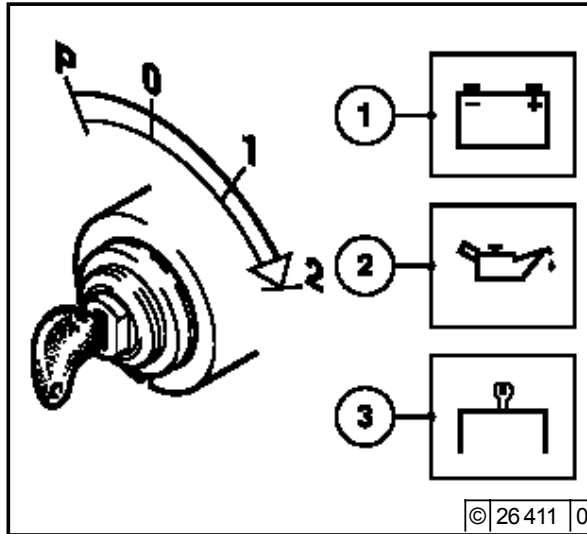
3.3 Operation monitoring

Operation

3

with cold start aid

Heating plug/heating flange



- Insert key.
 - Step 0 = no operating voltage.
- Turn key to the right.
 - Step 1 = operating voltage,
 - Warning lights 1+2+3 light up.
 - Pre-heat until heating indicator goes out. If the pre-heating indicator flashes, there is an error, e.g. pre-heating relay sticking which can fully discharge the battery at standstill.
 - Engine is ready for operation.
- Turn the key further to the right against the spring load to
 - Step 2 = start
- Release key as soon as the engine starts up.
 - Warning lights go out.

Caution: Engine must start within 30 seconds, if not, repeat the starting process.

Operation

3.3 Operation monitoring

3

The EMR3 system monitors the engine condition and itself.

The states are indicated by the diagnostic lamp.

Lamp test:

- The diagnostic lamp lights for about 2s after ignition (ignition lock stage 1).

Steady light:

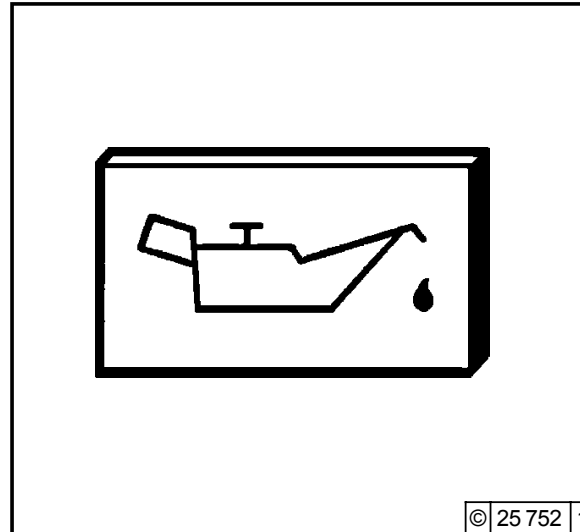
- There is an error in the system or a variable of the engine (temperature, pressure, etc.) is in the warning area. Depending on the error, the performance of the engine may be reduced by the EMR3 to protect the engine so that it is not in danger.

Fast flashing:

- **Attention, the engine is in danger and must be switched off.**
- **Depending on the application, the control unit switches the engine off automatically.**
- The control unit may also specify an idle speed to cool the engine before shutting down.
- There may be a start lock after stopping the engine.
- Additional control lamps e.g. for oil pressure or oil temperature may be on.
- The override key can bypass the reduction in performance to avoid critical situations, as well as delay the automatic shutdown or bypass a start lock. This overwriting of the engine protection functions is logged in the control unit.
- The start lock is released by switching off the system with the ignition key for about 30 seconds.

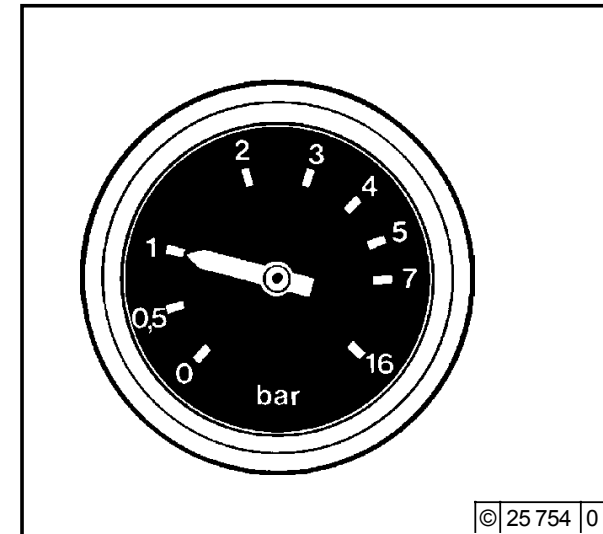
3.3.1 Engine oil pressure

Oil pressure light



- The oil pressure light comes on for about 2s after switching on the system.
- The oil pressure light must be off when the engine is running.

Oil pressure gauge



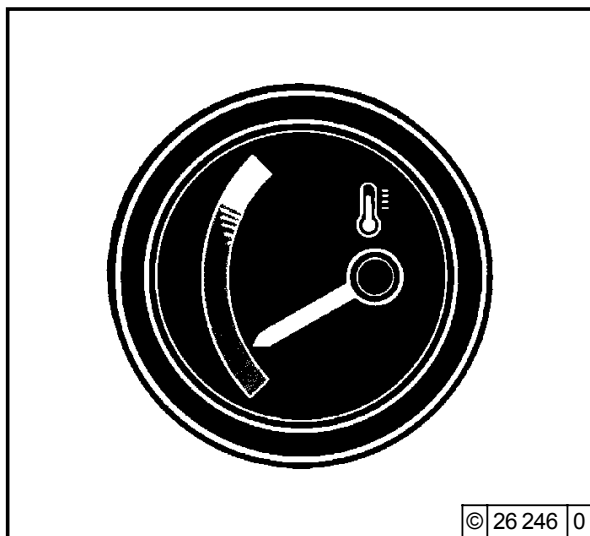
- Needle of oil pressure measuring instrument must show the minimum oil pressure (see 9.1).

3.4 Shutting down

Operation

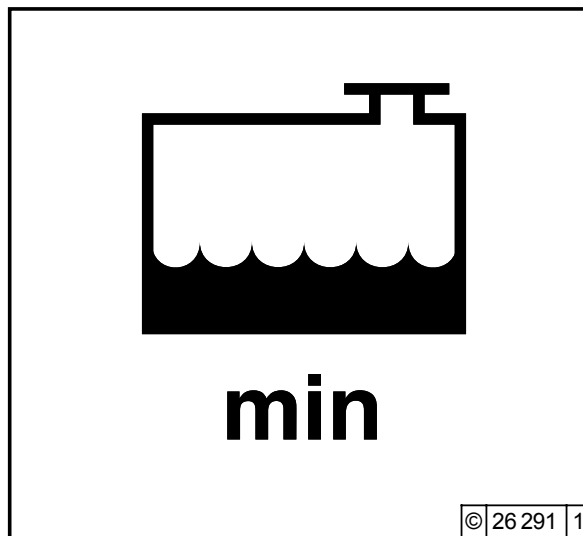
3

3.3.2 Coolant temperature



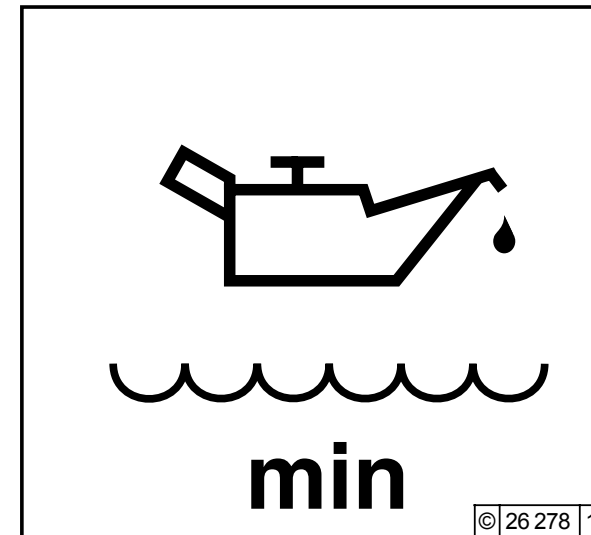
- The needle of the temperature display should always be in the green area, and only as an exception in the yellow/green area. If the needle rises into the orange area the engine is getting too hot. Switch off the engine and determine the cause as per fault table (see 7.1).

3.3.3 Coolant level



- Light on coolant level display comes on (contact is via float switch/ level probe if coolant level is at minimum):
Switch off the engine and determine the cause as per fault table (see 7.1).
- Function check of coolant level:
Key in step 1 or 2
(Float switch or level probe)
Warning light comes on for approx. 2 seconds
 - Coolant level OK:
Light goes out
 - Coolant level not OK:
Light comes on again.

3.3.4 Lube oil level



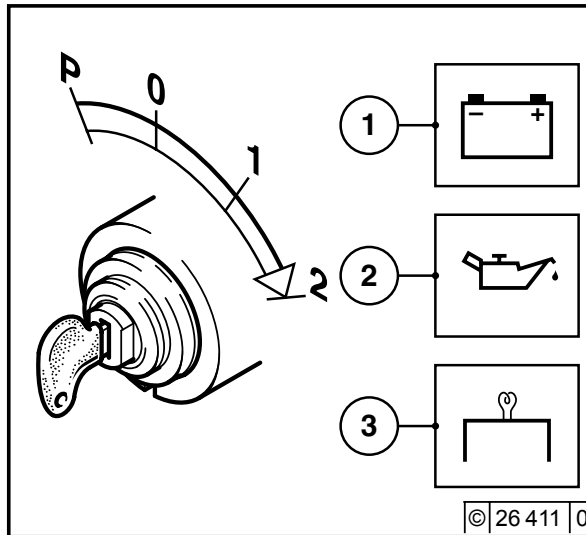
- Light on lube oil level display comes on (contact is via float switch / level probe if lube oil level is at minimum):
Switch off the engine and determine the cause as per fault table (see 7.1).
- Function check of lube oil level :
Key in step 1 or 2
(Float switch or level probe)
Warning light comes on for approx. 2 seconds
 - Lube oil level OK :
Light extinguished.
 - Lube oil level not OK :
Light comes on again.

Operation

3.5 Operating conditions

3

3.4.1 Electrical shutdown



- Turn the key to the left (to step 0) and remove. Warning lights go out.

Note:

The control unit remains active for about another 40 seconds to save the system data (log) and then switches itself off.



Avoid shutting down from full load operation if possible (coking/blockage of the remaining oil in the turbocharger bearing housing).

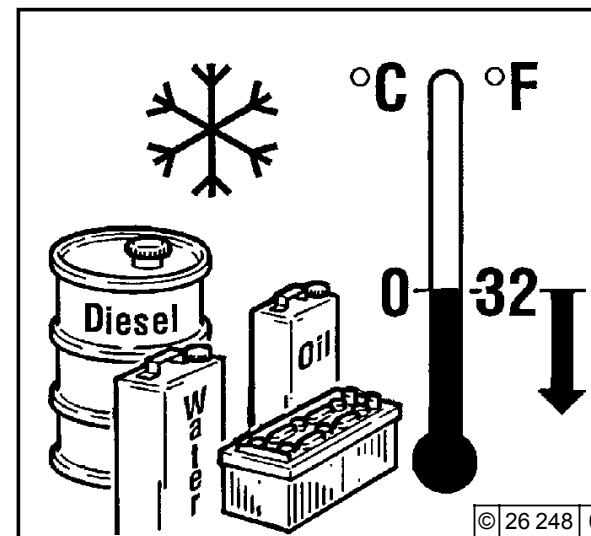
Lube oil is no longer supplied to the turbocharger!

Run the engine after relieving the load for about one minute at low idling speed.

3.5 Operating conditions

3.5.1 Winter operation

- Lube oil viscosity
 - Select the viscosity (SAE class) according to the ambient temperature before starting the engine, see 4.1.2.
 - Observe shorter oil change times when operating below -10 °C, see 6.1.1.
- Diesel fuel
 - Below 0 °C use winter fuel, see 4.2.2.
- Coolant
 - Mixing ratio anti-freeze / water for lowest temperature (max. - 35 °C), see 4.3.1.
- Additional maintenance work
 - Check the fuel container weekly for contamination, clean if necessary.
 - If necessary, adjust the oil filling of the oil bath air filter (as engine oil) according to the outside temperature.
- Cold start aids
 - When there is a frost, start with heating flange if necessary (see 3.2.1). The heating flange not only lowers the starting limit temperature, but also simplifies starting at temperatures which don't actually require a starting aid.
- Battery
 - A well-charged battery is a prerequisite for a good cold start, see 6.7.1.
 - Heating the battery to approx. 20 °C (dismantle and store in a warm room) lowers the starting limit temperature by 4-5 °C.

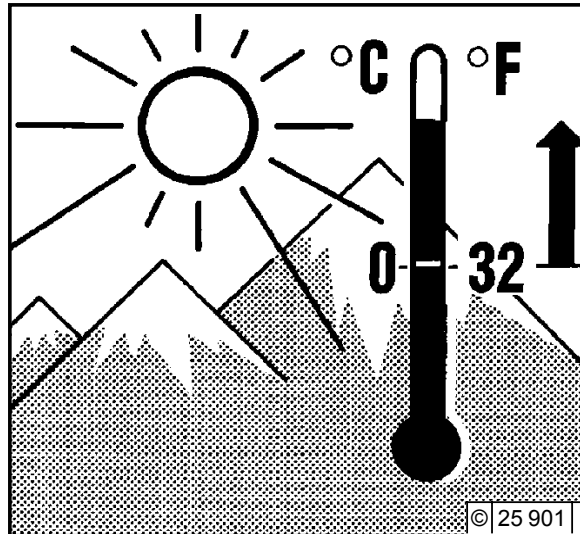


Operation

3

3.5.2 High ambient temperature, high altitude

- When the altitude or ambient temperature increases, the air density decreases. This impairs the maximum engine performance, exhaust quality, temperature level and, in extreme cases, the starting performance. For transient operation, usage up to 1000 m altitude and a temperature of 30°C is permissible.
- In case of doubt regarding engine usage, ask your engine or device supplier whether necessary fuel stop reduction has been carried out in the interest of operational safety, service life and exhaust quality (smoke), or contact your service representative.



4.1 Lube oil

4.2 Fuel

4.3 Coolant

Operating substances

4.1 Lube oil

4

4.1.1 Quality

Lube oils are classified by **DEUTZ** into quality classes according to their performance capability. Oils according to other comparable specifications can be used.

	Permissible oils:		
Deutz	DQC I-02	DQC II-05	DQC III*+DQC IV#
ACEA	E2-96	E3-96/E5-02/ E7-04	E4-99/ E6-04
API	CF/CF-4	CH-4/CG-4	-
DHD	-	DHD-1	-

DQC III-05 * Annex 1

DQC IV-05 # **only fully synthetic**

The exact assignment of permissible oil quality and oil change intervals to the engines is listed in chapter 6.1.1.

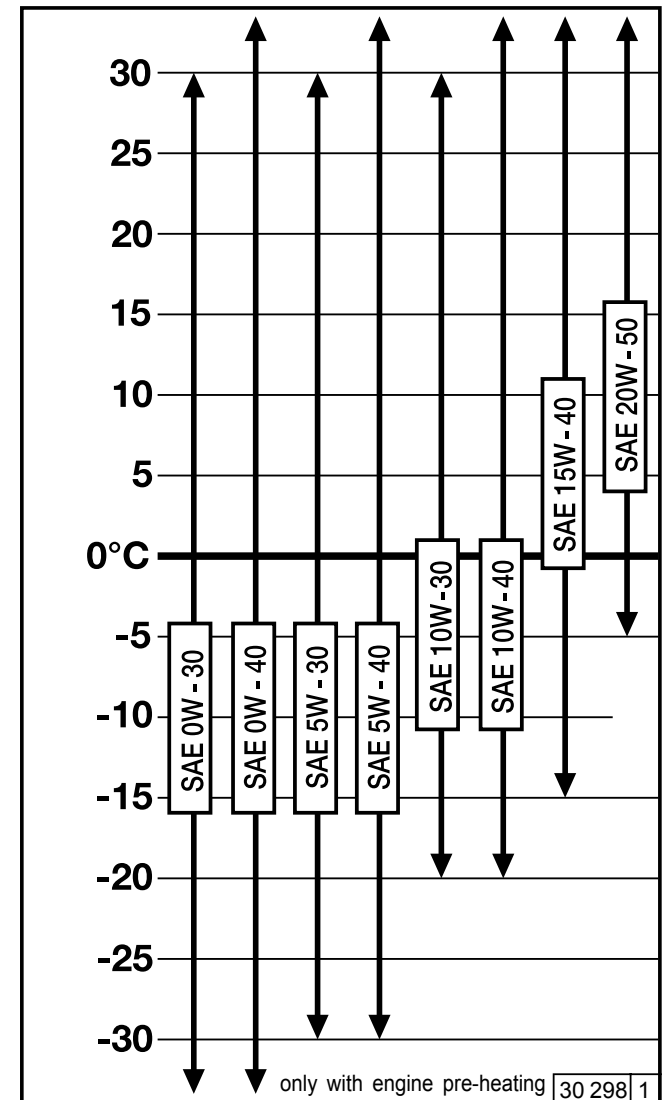
In case of doubt, please ask your service representative.

*For oil change intervals see 6.1.1
For oil filling amounts see 9.1

4.1.2 Viscosity

Since lube oil changes its viscosity (viscidty) depending on temperature, the ambient temperature of the location of engine operation is decisive for the selection of viscosity class (SAE class). Refer to the oil viscosity diagram on the right to achieve optimal operating performance.

Falling below the temperature limits occasionally can impair the cold start ability, but will not lead to engine damages. In order to minimise wear, the operating limits should not be exceeded over a long period of time. Oil changes determined by the time of year can be avoided by using multi-viscosity oils. Multi-viscosity oils, in particular smooth running oils, also have the effect of reducing fuel consumption.



4.1 Lube oil

Operating substances

4

DEUTZ lube oil quality level DQC III				Annex 1
Manufacturer	Lube oil type	SAE class	Availability	
DEUTZ	DEUTZ ÖITLX-10W40	FE 10W-40	Europe	
ADDINOL	ADDINOL SuperTruck MD 1048	10W-40	Europe, Asia	
ADDINOL	Ultra TruckMD 0538	5W-30	Europe, Asia	
AGIP	Agip SigmaUltra TFE	10W-40	worldwide	
Autol	Valve UltraFE	10W-40	Germany	
ARAL	Aral MegaTurboral	10W-40	worldwide	
Aral	SuperTurboral	5W-30	worldwide	
AVIA	TURBOSYNTHHT-E	10W-40	Germany	
BAYWA	BayWa SuperTruck 1040 MC	10W-40	Southern Germany	
BayWa	Turbo4000	10W-40	Southern Germany	
BP OIL	International BP Vanellus E7 Plus	10W-40	Europe	
BP	Vanellus E7Supreme	5W-40	Europe	
Castrol	CastrolSYNTRUCK	5W-40	Europe, North America, Brazil, Argentina, Australia, South Africa	
Castrol	Castrol DYNAMAX	7.5W-40	Europe, North America, Brazil, Argentina, Australia, South Africa	
CEPSA	EUROTRANSHPD	10W-40	Spain, Portugal	
CHEVRON	Chevron Delo400 Synthtic	5W-40	North America	
DEA	DEA CronosSynth	5W-30	Germany, Europe	
DEA	Cronos PremiumLD	10W-40	Germany, Europe	
DEA	Cronos PremiumLD	10W-40	Europe	
ESSO	EssolubeXTS 501	10W-40	Europe	
FUCHS	EUROPE Fuchs Titan Cargo MC	10W-40	worldwide	
Fuchs	Titan UnicPlus MC	10W-40	worldwide	
MOBIL	OIL Mobil Delvac 1 SHC	5W-40	Europe, SE Asia, Africa	
Mobil	Delvac	15W-40	worldwide	
Mobil	Delvac XHP Extra	10W-40	Europe, SE Asia	
Lube oil refinery	Wintershall TFG	10W-40	Europe, Salzbergen	
Shell	International ShellMyrina TX / Shell Rimula Ultra	5W-30	Europe, code	
	Shell MyrinaTX / Shell Rimula Ultra	10W-40	country specific, varies Europe, code country specific, varies	
Texaco	Ursa Super TDX 10W-40	10W-40	Europe	
	Ursa Premium FE 5W-30	5W-30	Europe	
TOTALFINA ELF	TOTAL RUBIA TIR 8600	10W-40	worldwide	
	ELF PERFORMANCE	10W-40	worldwide	
	EXPERTY MX 1010			
	ELF PERFORMANCE	10W-40	Germany, Benelux, Scandinavia, Austria	
	EXPERTY MX 1012			
	FINA KAPPA FIRST	5W-30	Europe	
	FINA KAPPA ULTRA	10W-40	Europe	

This table will be extended if necessary.

Operating substances

4.2 Fuel

4

4.2.1 Quality

Use standard diesel fuels with a sulphur content of less than 0.5 %. If the sulphur content is higher, the oil change intervals must be reduced (see 6.1.1).

The following fuel specifications are permitted:

- **Diesel fuels**
 - DIN EN 590
- **JIS K 2204 grade 1 and 2 ***
- **ASTM D 975-88; 1-D and 2-D ***

* as long as the lubrication properties correspond to diesel fuel EN 590 (positive test results are necessary)

(see TR 0199-99-3005)

If other fuels are used which do not meet the requirements of the technical circular, the warranty will be voided.

Technical circular is obtainable from the DEUTZ Service Organisation.

The certification measurements for the observance of legal emission limits are carried out with the test fuels defined by legislation. These correspond to the diesel fuels described in section 1 in accordance with EN 590 and ASTM D 975. Emission values cannot be guaranteed with the other fuels described in this circular.

4.2.2 Winter fuel

At low ambient temperatures paraffin discharges can lead to blockages in the fuel system and cause operating faults. Use winter fuel at outside temperatures below 0 °C (to -20 °C) (generally offered by petrol stations in good time before the cold season begins).

- Paraffin should be added at temperatures below -20 °C. The mixing ratios required are as per the diagram on the right.
- Special diesel fuels can be used for arctic climates to -44 °C.

If it is necessary to use summer diesel fuel under 0 °C, paraffin can also be added by up to 30% as per the diagram on the right.

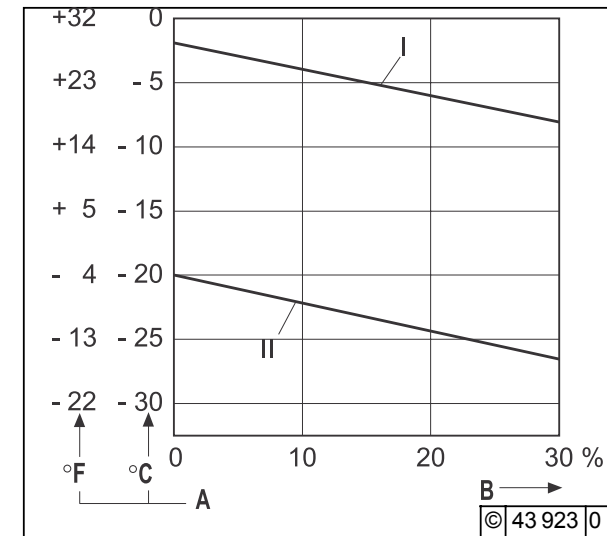


Diagram key:

I	Summer diesel fuel
II	Winter diesel fuel
A	Outside temperature
B	Paraffin mixing proportion



For the engines **TCD 2013 4V** and fuel according to ASTM D 975 1-D/2-D, adding paraffin is not permissible.

Generally, sufficient resistance to cold can also be achieved by adding a flow ameliorant. For questions regarding this please contact your **DEUTZ partner**.



Only carry out mixing in the tank! First pour in the necessary amount of paraffin, then the diesel fuel.

4.3 Coolant

Operating substances

4.3.1 Water quality for coolant

The following values may not be exceeded or fallen short of.

A test case can be requested from DEUTZ Service under the order no. 1213 0382 for checking your water quality.

Analysis values	min.	max.
ph value at 20 °C	6.5	8.5
Chloride ion content[mg/dm ³]	-	100
Sulphate ion content[mg/dm ³]	-	100
Total hardness [°dGH]	3	20

* Carbonate hardness proportion of total hardness min 3 dGH

Contact your local waterworks for information regarding the water quality.

4.3.2 Coolant preparation

Particular attention should be paid to preparing and inspecting the coolant in liquid-cooled engines, as otherwise corrosion, cavitation and freezing damages can occur on the engine.

Preparation of the coolant involves mixing a cooling system preservative to the cooling water.

The cooling system must be monitored regularly, see 5.1. This includes checking the concentration of the cooling system preservative, as well as inspecting the coolant level.

The inspection of the concentration of cooling system preservative can be carried out with standard testing devices. (Example: gefo glycomat®).



Mixing cooling system preservatives of a **nitrite base** with substances of an **amine basis** forms harmful nitrosamines.

4.3.3 Cooling system preservative

Using the cooling system preservative, order no. 01011490/ 01016416/12211500 (nitrite, amine and phosphate free, available in 5/ 20/ 210 litre containers), provides effective protection against corrosion, cavitation and freezing.

The cooling system preservative in the coolant must not fall below or exceed the following concentrations:

Cooling system preservative proportion	Water proportion	Cold protection to
min. 35 %	65%	-22 °C
40 %	60%	-28 °C
max. 45 %	55%	-35 °C

For filling amounts see the table overleaf in combination with the information in chapter 9.1.

The use of other cooling system preservatives, e.g. chemical corrosion preservatives, is possible in exceptional cases, consult DEUTZ Service.

Order the cooling system preservative from: **DEUTZAG**



Cooling system preservatives must be disposed of in an environmentally friendly manner.

- 5.1 Maintenance schedule**
- 5.2 Maintenance diagram**
- 5.3 Maintenance work carried out**

Maintenance

5.1 Maintenance schedule

5

check= ● set=○ clean=▲ renew= ■										Industrial engines	
↓ check 2x daily before or during the 1st trial run, during the running-in phase or when commissioning new and overhauled engines.										The engine maintenance times given are maximum permissible job times. Depending on the usage circumstances, shorter maintenance times may be necessary. Observe the instruction manual of the equipment manufacturer. # Maintenance only to be carried out by authorised service personnel	
↓ every 10 oh or daily											
E10	E20	in operating hours (oh) every year(s)						Activity			
		E30 500	E40 1,000	E45 1,500	E50 3,000	E60 6,000	E70 12,000	1	2		Section
●	●									Lube oil level, if necessary re-fill	6.1.2
		■								Lube oil (oil change intervals depending on engine application and oil quality), see TR0199-99-3002	6.1.1/ 6.1.2
		■								Oil filter cartridge	6.1.3
			■							Fuel filter cartridge	6.2.1
						●				Electronic injector check via EMR3	#
●			■ ¹⁾							Fuel filter insert ¹⁾ (fuel pre-filter)	4.2
●		●							■	Coolant (additive concentration)	4.3.1/2/3
●	●	●								Coolant level	—
●	●		■							Intake air filter (if available, maintenance as per maintenance display)	6.4.3 /6.4.4
●			●					▲		Charge air cooler (drain lube oil/condensation)	
							▲			EGR(option)* Check non-return valve (option)	
						●			■	EGR (option) Check cap and adjustment mechanism for clearance, renew if necessary.	
							▲			Cooler EGR (option)	
			●							Check function of heating flange	
			●							Battery and cable connections	6.7.1
●			●							Engine monitoring, warning system	3.3 #
				○						Valve clearance	6.6.1
●					●	■				V-belt/tension pulley (renew when wear limit reached)	6.5.1/6.5.3
			●							Crankcase pressure bleed valve (option)	#
●	●									Engine tightness (visual inspection for leaks).	—
●			●							Engine mounting (renew in case of damage)	9.2
●			●							Fastenings, hose connections / clamps	—
							■			General overhaul	#

EGR* exhaust gas recirculation (system); If the warning system (light/siren) is activated, the fuel pre-filter must be emptied immediately.

¹⁾ The intervals can be reduced, depending on the degree of soiling of the fuel used.

5.1 Maintenance schedule

Maintenance

5

check= ● set= ○ clean= ▲ renew= ■							Enhancements or modifications for engines with EPA acceptance	Section
max. permissible job times in operating hours (oh) every								
E10	⇓ check 2x daily before or during the 1st trial run, during the running-in phase or when commissioning new and overhauled engines.						The engine maintenance times given are maximum permissible job times. Depending on the usage circumstances, shorter maintenance times may be necessary. Observe the instruction manual of the equipment manufacturer. # Maintenance only to be carried out by authorised service personnel	
	⇓ every 10 oh or daily							
	in operating hours (oh) every					Activity		
	E30 500	E40 6.000	E70 12.000	1	2			
		●	▲				Charge air cooler (drain lube oil/condensation)	#
		●	▲				Charge air cooler inlet surface (clean if necessary)	#
			▲			■	Crankcase pressure bleed valve (option)	#

Maintenance

5.1 Maintenance schedule

5

check= ● set= ○ clean= ▲ renew= ■										Vehicle engines			
↓ check 2x daily before or during the 1st trial run, during the running-in phase or when commissioning new and overhauled engines.										Service group I		<30 000km 20 approx.km/h	
										The engine maintenance times given are maximum permissible job times. Depending on the usage circumstances, shorter maintenance times may be necessary. Observe the instruction manual of the equipment manufacturer. # Maintenance only to be carried out by authorised service personnel			
↓ every 200 km or daily										group	Yearly op. performance km	Average Drive speed approx.km/h	
OPERATIONAL PERFORMANCE IN(km)year(s)										I	<30 000	20	
										II	>30 to 100 000	40	
										III	>100 000	60	
E10	E20	E30	E40	E45	E50	E60	E70	1	2	Activity	Section		
●	●									Lube oil level, if necessary re-fill	6.1.2		
		■								Lube oil (oil change intervals depending on engine application and oil quality), see TR 0199-99-3002	6.1.1/ 6.1.2		
		■								Oil filter cartridge	6.1.3		
			■							Fuel filter cartridge	6.2.1		
						●				Electronic injector check via EMR3	#		
●		■ ¹⁾								Fuel filter insert ¹⁾ (fuel pre-filter)	4.2		
●		●							■	Coolant (additive concentration)	4.3.1/2/3		
●	●	●								Coolant level	—		
●	●		■							Intake air filter (if available, maintenance as per maintenance display)	6.4.3 /6.4.4		
●			●					▲		Charge air cooler (drain lube oil/condensation)			
							▲			EGR(option)* Check non-return valve (option)			
						●			■	EGR(option) Check cap and adjustment mechanism for clearance, renew if necessary.			
							▲			Cooler EGR (option)			
			●							Check function of heating flange			
			●							Battery and cable connections	6.7.1		
●			●							Engine monitoring, warning system &	3.3 #		
				○						Valve clearance	6.6.1		
●					●	■				V-belt/tension pulley (renew when wear limit reached)	6.5.1/6.5.3		
			●							Crankcase pressure bleed valve (option)	#		
●	●									Engine tightness (visual inspection for leaks).	—		
●			●							Engine mounting (renew in case of damage)	9.2		
●			●							Fastenings, hose connections / clamps	—		
							■			General overhaul	#		

5.1 Maintenance schedule

¹⁾ The intervals can be reduced, depending on the degree of soiling of the fuel used.

Maintenance

5.1 Maintenance schedule

5

check= ● set= ○ clean= ▲ renew= ■ ↓ check 2x daily before or during the 1st trial run, during the running-in phase or when commissioning new and overhauled engines ↓ every 200 km or daily										Vehicle engines Service group III >100 000 km 60 approx. km/h The engine maintenance times given are maximum permissible job times. Depending on the usage circumstances, shorter maintenance times may be necessary. Observe the instruction manual of the equipment manufacturer. # Maintenance only to be carried out by authorised service personnel	
OPERATIONAL PERFORMANCE IN (km) every year(s) Service group III								Service Yearly op. group performance km	Average Drive speed approx. km/h		
E10	E20	E30	E40	E45	E50	E60	E70	I	II	III	
		30.000	60.000	90.000	120.000	360.000	1000000	<30 000	>30 to 100 000	>100 000	
								20	40	60	
										Activity	Section
●	●									Lube oil level, if necessary re-fill	6.1.2
		■								Lube oil (oil change intervals depending on engine application and oil quality), see TR 0199-99-3002	6.1.1/ 6.1.2
		■								Oil filter cartridge	6.1.3
			■							Fuel filter cartridge	6.2.1
						●				Electronic injector check via EMR3	#
●			■ ¹⁾							Fuel filter insert ¹⁾ (fuel pre-filter)	4.2
●		●								Coolant (additive concentration)	4.3.1/2/3
●	●	●								Coolant level	—
●	●		■							Intake air filter (if available, maintenance as per maintenance display)	6.4.3/6.4.4
●			●							Charge air cooler (drain lube oil/condensation)	
							▲			EGR(option)* Check non-return valve (option)	
						●				EGR(option) Check cap and adjustment mechanism for clearance, renew if necessary.	
							▲			Cooler EGR (option)	
			●							Check function of heating flange	
			●							Battery and cable connections	6.7.1
●			●							Engine monitoring, warning system &	3.3 #
				○						Valve clearance	6.6.1
●					●	■				V-belt/tension pulley (renew when wear limit reached)	6.5.1
			●							Crankcase pressure bleed valve (option)	#
●	●									Engine tightness (visual inspection for leaks).	—
●			●							Engine mounting (renew in case of damage)	9.2
●			●							Fastenings, hose connections / clamps	—
							■			General overhaul	#

EGR* Exhaust gas recirculation (system); If the warning system (light/siren) is activated, the fuel pre-filter must be emptied immediately.

¹⁾ The intervals can be reduced, depending on the degree of soiling of the fuel used.

Maintenance

5.1 Maintenance schedule

5.1.1 Standard maintenance schedule

Intervals at/after	Deutz maintenance and service schedules	Activity	Execution by:
50 oh	E 10	after commissioning and E 50-E 70	authorised specialists
daily	E 20	daily inspection round	the user / authorised specialists
500 oh	E 30	inspection	authorised specialists
1000 oh	E 40	intermediate overhaul	authorised specialists
1500 oh	E 45	extended intermediate overhaul	authorised specialists
3 000 oh	E 60	partial overhaul	authorised specialists
6000 oh	E 60	partial overhaul	authorised specialists
10 000 oh (2012)	E 70	overhaul	authorised specialists
13 000 oh (2013)	E 70	overhaul	authorised specialists

*) approximate value, depends on the type of engine application and/or regular engine maintenance.
Please contact your responsible DEUTZ Service partner.

5.2 Maintenance diagram

Maintenance

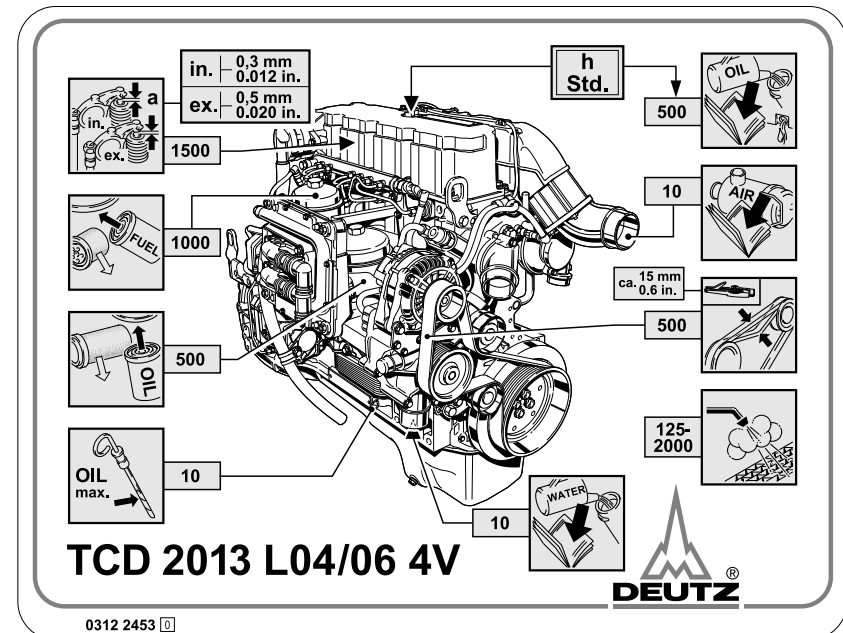
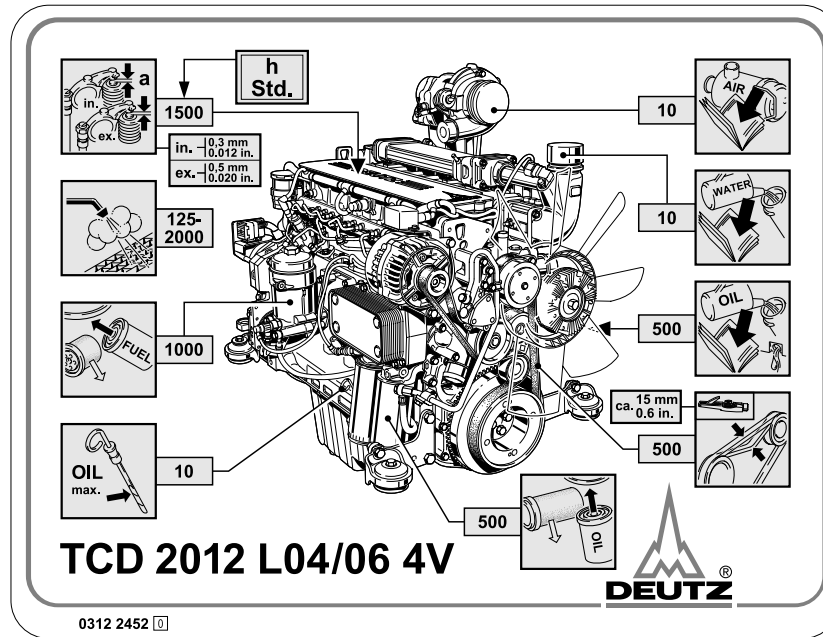
5

The maintenance diagram shown on this page is supplied with every engine in self-adhesive form. It should be stuck onto a well visible location on the engine or equipment.

Check that this is the case!

If not, request a replacement from your engine or equipment supplier!

The maintenance schedule is decisive for standard maintenance, see 5.1.



All maintenance work should only be carried out when the engine is not running.

5.3 Maintenance work carried out

Maintenance

5

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
50-150*			-		
125			250		
375			500		
625			750		
875			1000		
1125			1250		
1375			1500		
1625			1750		
1875			2000		
2115			2250		
2375			2500		
			2750		

* after commissioning new and overhauled engines

The maintenance work carried out methodically can be recorded in the table and confirmed.

Maintenance

5.3 Maintenance work carried out

5

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
2875			3000		
3125			3250		
3375			3500		
3625			3750		
3875			4000		
4125			4250		
4375			4500		
4625			4750		
4875			5000		
5125			5250		
5375			5500		
5625			5750		
The maintenance work carried out methodically can be recorded in the table and confirmed.					

5.3 Maintenance work carried out

Maintenance

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
5875			6000		
6125			6250		
6375			6500		
6625			6750		
6875			7000		
7125			7250		
7375			7500		
7625			7750		
7825			8000		
8125			8250		
8375			8500		
8625			8750		

The maintenance work carried out methodically can be recorded in the table and confirmed.

Maintenance

5.3 Maintenance work carried out

5

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
8875			9000		
9125			9250		
9375			9500		
9625			9750		
9875			10000		
10125			10250		
10375			10500		
10625			10750		
10875			10000		
10125			10250		
10375			10500		
10625			10750		

The maintenance work carried out methodically can be recorded in the table and confirmed.

- 6.1 Lubrication system**
- 6.2 Fuel system**
- 6.3 Cooling system**
- 6.4 Combustion air filter**
- 6.5 Belt drive**
- 6.6 Setting work**
- 6.7 Add-on parts**

Care and maintenance work

6.1 Lubrication system

6

6.1.1 Oil change intervals

- The oil change times depend on the engine application and the quality of the lube oil.
- If the oil change times are not reached within a year, the oil change should be carried out at least **1x yearly**.
- The following conditions apply for the table
 - Sulphur content max. 0.5 % of weight for diesel fuel.
 - Constant ambient temperature ³ -10 °C (+14 °F)
- For fuels
 - with sulphur content > 0.5 to 1%
or
 - Constant ambient temperatures < -10 °C (+14 °F)
or
 - with bio-diesel fuels according to DIN 51606- FAME the oil change times should be halved.
- For fuels with a sulphur content higher than 1% ask your responsible **service representative**.
- If the lube oil change intervals are planned in terms of operating hours, the lube oil change intervals for installed engines 6.1.1.1 apply.

6.1 Lubrication system

Care and maintenance work

6.1.1.1 Lube oil change intervals for installed engines

Deutz lube oil quality class		DQC I-02	Lube oil quality		
			DQC II-05	DQC III-05	DQC IV-05
ACEA specification		E2-96	E3-96/E5-02/E07-04	E4-99/E6-04 see 6.1.1.3	E4-99/E6-04 only fully synthetic
API specification		CF/CF-4	CG-4/CH-4/CI-4	-	-
worldwide specification		-	DHD-1	-	-
special DEUTZ release list		-	-	see chap. 4.1.2.1	-
Standard lubricant code designation for building machines and building vehicles		EO... EO...A, EO...B	EO...C	-	-
Engine series	Engine version		Lube oil change intervals in oh		
TCD	All engines with:				
2012 L04/064V	Crankcase ventilation:				
	open	-	500	500	500
	closed	-	-	500	500
2013 L04/064V	Crankcase ventilation:				
	open	-	500	500	500
	closed	-	-	500	500

Care and maintenance work

6.1 Lubrication system

6

6.1.1.2 Lube oil change intervals for vehicle engines

				Lube oil quality				
Deutz lube oil quality class				DQC I-02	DQC II-05	DQC III-05	DQC IV-05	
ACEA specification				E2-96	E3-96/E5-02/E07-04	E4-99/E6-04 see 6.1.1.3	E4-99/E6-04 only fully synthetic	
API specification				CF/CF-4	CG-4/CH-4/CI-4	-	-	
worldwide specification				-	DHD-1	-	-	
special DEUTZ release list				-	-	see chap. 4.1.2.1	-	
Application	Engine version		Crankcase	Lube oil change intervals in km				
	TCD 2012/2013 L04/ 06 4V		ventilation					
Building site	average driving speed km/h	TCD 2012 4V	open	-	20 000	20 000	20 000	
			closed	-	-	20 000	20 000	
vehicles / city buses/		25	TCD 2013 L06 4V					
			Coach bus	closed	-	30 000	50 000	50 000
			Inter city bus	closed	-	20 000	30 000	30 000
			City busbus	closed	-	15 000	20 000	20 000
City transport		TCD 2013 L04 4V	closed	-	25 000	45 000	45 000	
			TCD 2013 L06 4V	closed	-	30 000	50 000	50 000
Local transport		40	TCD 2012 4V	open	-	30 000	30 000	30 000
				closed	-	-	30 000	30 000
			TCD 2013 L04 4V	closed	-	40 000	60 000	60 000
				TCD 2013 L06 4V	closed	-	50 000	75 000
Long distance transport	60	TCD 2012 4V	open	-	40 000	40 000	40 000	
			closed	-	-	40 000	40 000	
		TCD 2013 L04 4V	closed	-	60 000	80 000	80 000	
			TCD 2013 L06 4V	closed	-	75 000	100 000	100 000

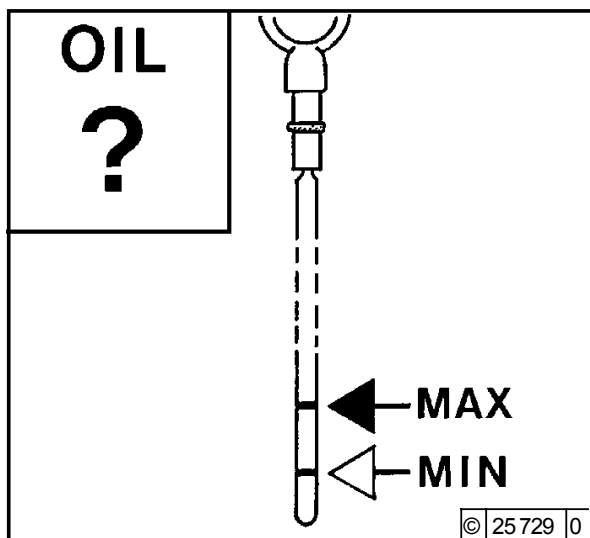
6.1 Lubrication system

Care and maintenance work

6

6.1.2 Checking oil level / changing engine oil

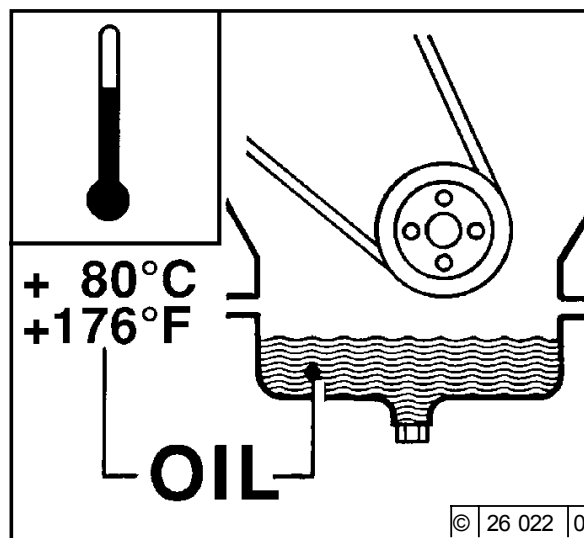
6.1.2.1 Checking oil level



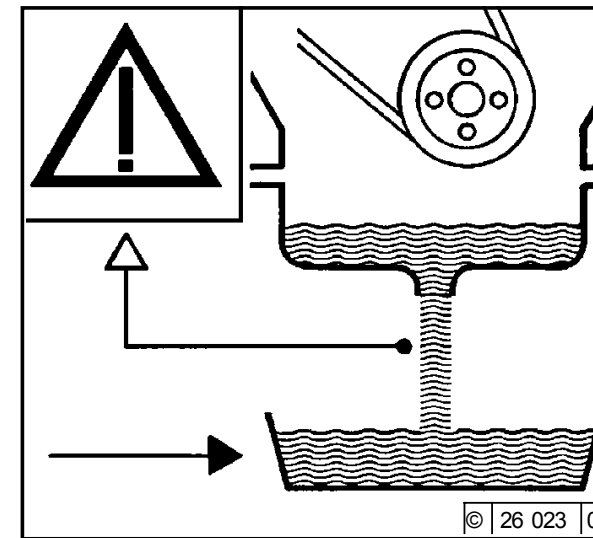
- Position the engine or vehicle so as to be level.
- – **Engine warm:**
Switch off the engine, wait for 5 minutes and check oil level.
- – **Engine cold:**
Check oil level.
- Extract oil dipstick.
- Wipe with a fibre-free, clean cloth.
- Insert until it stops and extract again.
- Check oil level and re-fill to „MAX“ if necessary.
– If the oil level lies just above the „MIN“-line marking, re-filling is necessary.

The oil level may not fall short of the „MIN“ line marking.

6.1.2.2 Changing engine oil



- Warm up engine.
- Position the engine or vehicle so as to be level.
– Lube oil temperature approx. 80 °C.
- Switch off engine.



- Position oil drip cup under the engine.
- Unscrew oil drain screw.
- Drain off oil.
- Screw in oil drain screw with new sealing ring and tighten. (For tightening torque see 9.2).
- Pour in lube oil.
– For quality / viscosity data see 4.1.
– For filling quantities, see 9.1.
- Check oil level, see 6.1.2.1.



Caution when draining hot oil: danger of scalding!
Collect the used oil, do not allow to seep into floor!

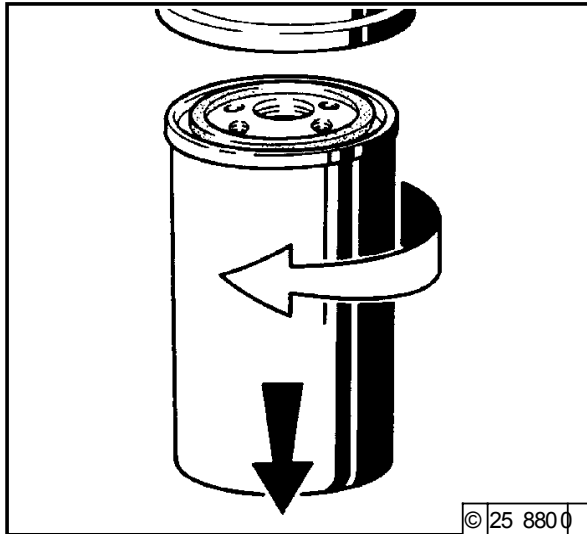
Dispose of according to instructions!

Care and maintenance work

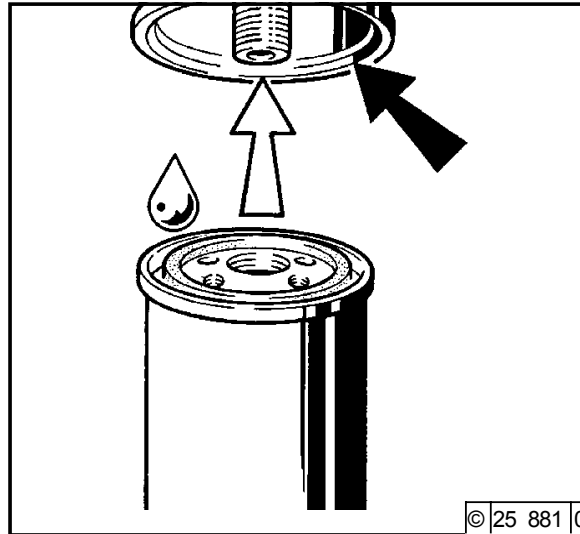
6.1 Lubrication system

6

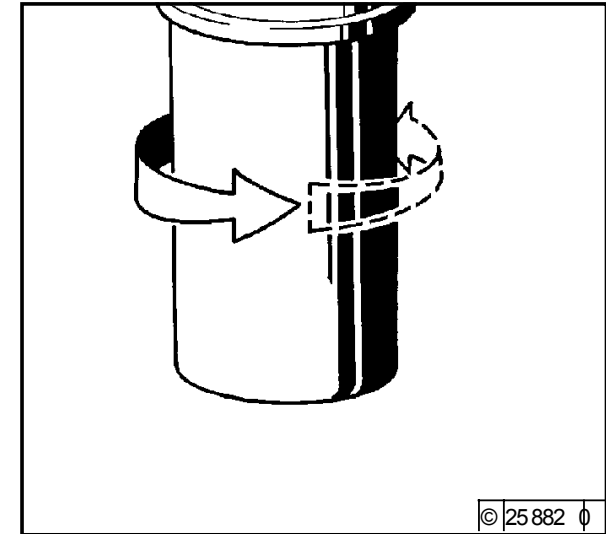
6.1.3 Changing oil filter insert



- When anti-rotation lock is installed: Loosen clamping screws and remove tightening clamps from below.
- Loosen lube oil filter cartridge with standard tool and unscrew.
- Collect any oil which may run out.



- Clean the sealing surface of the filter support for any possible dirt.
- Lightly oil the rubber seal of the new lube oil cartridge.
- Screw on the cartridge by hand until the seal makes contact.



- Tighten lube oil filter cartridge three quarters of a turn (approx. 10 Nm).
- If there is an anti-rotation lock: Position the tightening clamps and tighten with clamping screws.
- Check oil level, see 6.1.2.
- Check oil pressure, see 3.3.1.
- Check the seal of the lube oil filter cartridge for tightness.



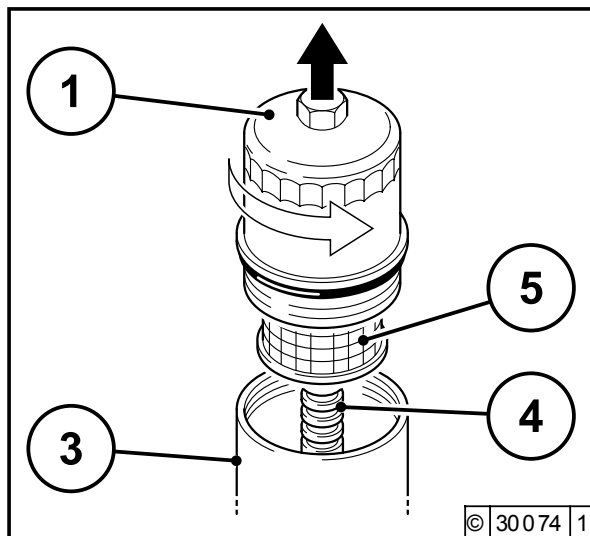
Careful with hot oil:
danger of scalding!

6.1 Lubrication system

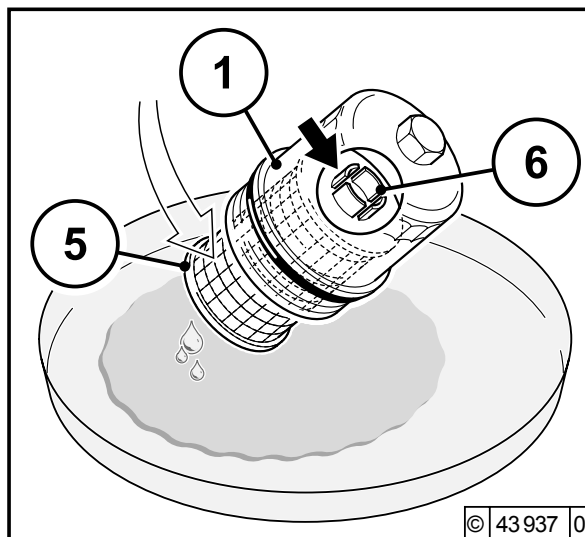
Care and maintenance work

6

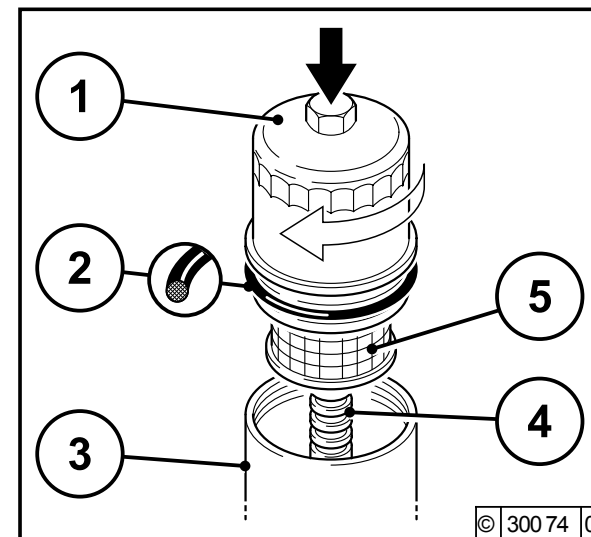
6.1.4 Cleaning / changing oil filter (cup)



- Switch off engine.
- Loosen lube oil filter cover 1 with two or three turns and wait for 30 seconds.
- Unscrew lube oil filter cover 1 with paper filter cartridge 5 in anti-clockwise direction.
- Carefully loosen paper filter cartridge 5 from the guide 4, which is inserted in the housing 3, from above.



- Collect any lube oil which may run out.
- Crease the paper filter cartridge 5 in the collection vessel slightly at the side until the cartridge is released from the clip 6.
- Clean the sealing surface of the filter support and the lube oil filter cover 1 as well as the guide 4 of any dirt there may be



- Change the round sealing ring 2 and lightly oil.
- Press new paper filter cartridge 5 into the clip 6 and insert carefully in the guide 4 together.
- Screw the lube oil filter cover 1 tight in clockwise direction (25 Nm).
- Start the engine.
- Check lube oil filter assembly for leaks.
- Check engine oil level and top up if necessary.



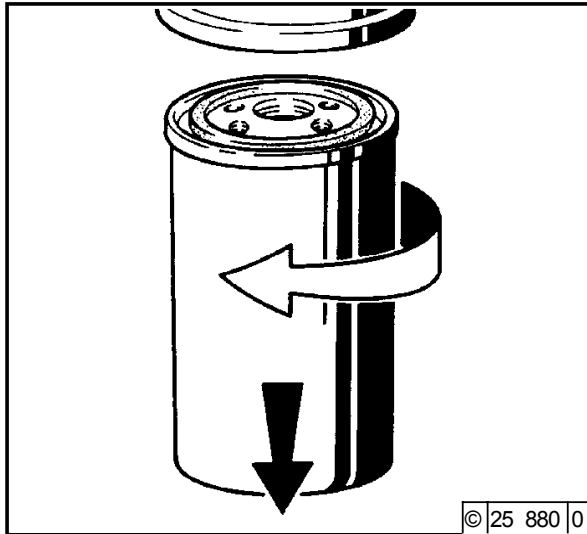
Careful with hot oil:
Danger of scalding
Dispose of used oil in an
environmentally friendly way.

Care and maintenance work

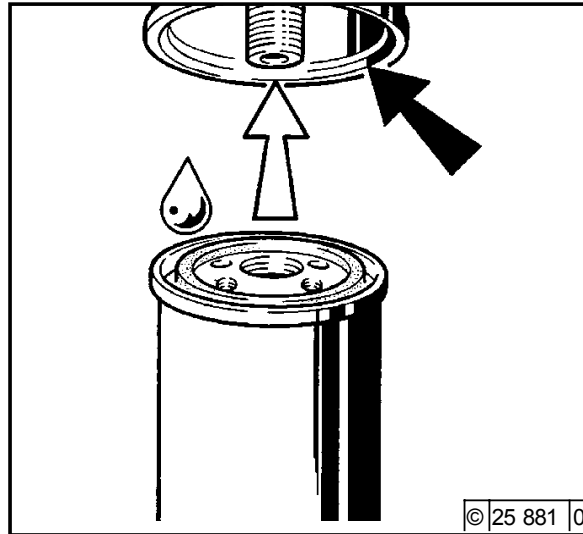
6.2 Fuel system

6

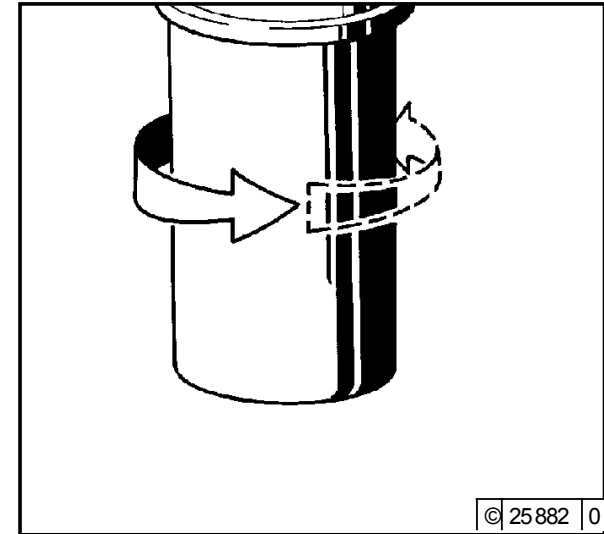
6.2.1 Changing fuel filter



- Close fuel stopcock.
- Loosen fuel filter cartridge with standard tool and unscrew.
- Collect any fuel which may run out.
- Clean the sealing surface of the filter support for any dirt there may be.
- Lightly oil the rubber seal of the new DEUTZ original fuel filter cartridge or wet with diesel fuel.



- Screw on the cartridge by hand until the seal makes contact.
- Tighten the fuel filter cartridge with one more half turn.
- Open fuel stopcock.
- Check for tightness.



Only work on the fuel system when the engine is switched off. Wait at least 30 seconds. No open fire! Do not smoke! Pay attention to cleanliness as the fuel system (Rail) is very sensitive!!!

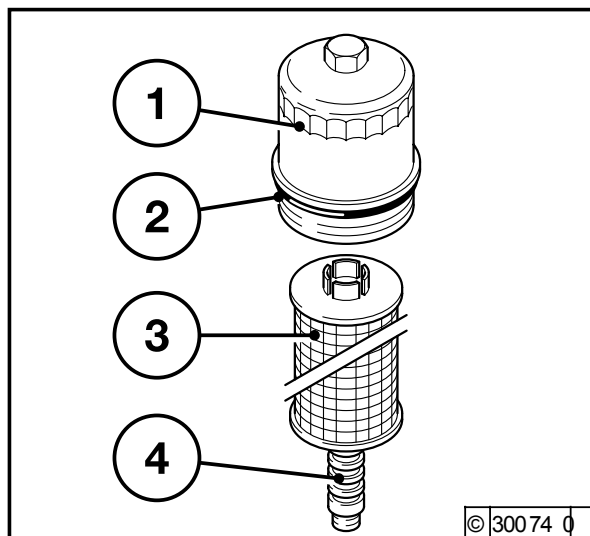


It is necessary to bleed the fuel system.

6.2 Fuel system

Care and maintenance work

6.2.2 Cleaning / changing fuel filter (cup)



- Switch off engine
- Loosen fuel filter cover 1 and unscrew in anti-clockwise direction.
- Carefully loosen paper filter cartridge 3 from the guide 4 from above.
- Collect any fuel which may run out.
- Change paper filter cartridge 3.
- Clean the sealing surface of the filter support and the fuel filter cover 1 as well as the guide 4 of any dirt there may be.

- Change the rubber seal 2 and lightly oil.
- Carefully place new paper filter cartridge 3 in the guide 4.
- Tighten the fuel filter cover 1 in clockwise direction (25 Nm).
- Start engine.
- Check fuel filter attachment for tightness.



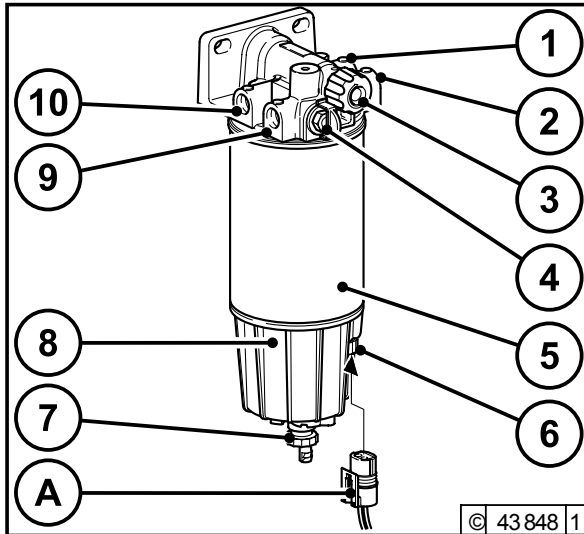
Only work on the fuel system when the engine is switched off (at least 30 seconds).
No open fire! Do not smoke!
Dispose of used fuel in an environmentally friendly manner.

Care and maintenance work

6.2 Fuel system

6

6.2.3 Changing / bleeding fuel pre-filter, filter insert



Filter change:

- Close fuel stopcock (for high tanks).
- Position fuel collecting vessel beneath fuel pre-filter.
- Loosen drain cock (7) and drain water + fuel completely.
- Unscrew filter cartridge (5) together with water collecting vessel (8) in anti-clockwise direction and remove.
- Loosen water collecting vessel (8) from old filter cartridge (5) in anti-clockwise direction and remove.
- Empty remaining fuel into the fuel collecting vessel and clean water collecting vessel (8).
- Screw water collecting vessel (8) onto the new filter cartridge (5) in clockwise direction.

- Clean any dirt from the sealing surface of the new filter cartridge (5) and the reverse side of the filter head
- Wet the sealing surfaces of the filter cartridge (5) slightly with fuel and screw back onto the filter head in clockwise direction (17-18 Nm)
- Open the fuel stopcock and bleed the system (see „Bleeding fuel system“).
- Dispose of collected fuel and old filter cartridge (5) properly.

Bleeding fuel system:

- Unlock the bayonet plug of the fuel hand pump (3) by pressing and turning anti-clockwise at the same time. The pump plunger is now pushed out through the spring.
- ☞ Turn the shutdown lever of the thermostat valve (4) by approx. 45° in clockwise direction until it is felt to engage.
- Pump until a very strong resistance is felt and pumping becomes very slow.
- Now pump a few more times. (The return line must be filled).
- Turn the shutdown lever of the thermostat valve (4) by approx. 45° in anti-clockwise direction until it is felt to engage.
- Lock the bayonet plug of the fuel hand pump (3) by pressing and turning clockwise at the same time.

- 1 Fuel supply to pump
- 2 Fuel return from control block FCU (Fuel Control Unit)
- 3 Fuel hand pump with bayonet plug for locking and unlocking
- 4 Thermostat valve with shutdown lever
- 5 Filter cartridge
- 6 Connection facility for electrical water level sensor
- 7 Drain cock
- 8 Water collecting vessel (bowl)
- 9 Fuel inlet from fuel tank
- 10 Fuel return to fuel tank



Only work on the fuel system when the engine is switched off. No open fire! Do not smoke! Dispose of used fuel in an environmentally friendly manner.

6.3 Cooling system

Care and maintenance work

6.3.1 Cleaning intervals

- The cooling system soiling depends on the type of engine application.
- The risk of soiling is increased by oil and fuel residues on the engine. Therefore pay particular attention to tightness when operating under high dust exposure.
- Increased soiling occurs, for example, during:
 - Building site application from high dust content of air.
 - Harvesting application from high proportion of chaff and chopped straw, for example, in the area of the work machine.
- Due to the various application conditions, the cleaning intervals must be defined according to each case. Therefore, the cleaning intervals given in the table below can be used as guidelines.

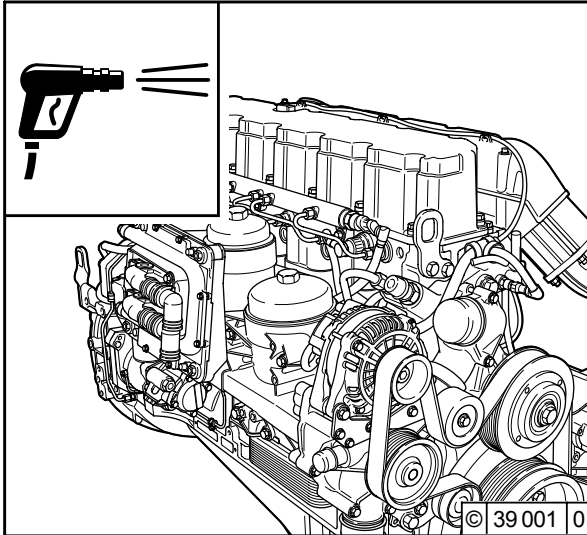
Checking or cleaning intervals	
Guideline	Engine application
2000	Ships, electronic units in enclosed spaces, pumps.
1000	Vehicles on paved roads
500	Tractors, fork lift trucks, drivable electronic units.
250	Vehicles on building sites and unpaved roads, building machines, compressors, mining equipment.
125	Agricultural machinery, tractors with harvesting application.

Care and maintenance work

6.3 Cooling system

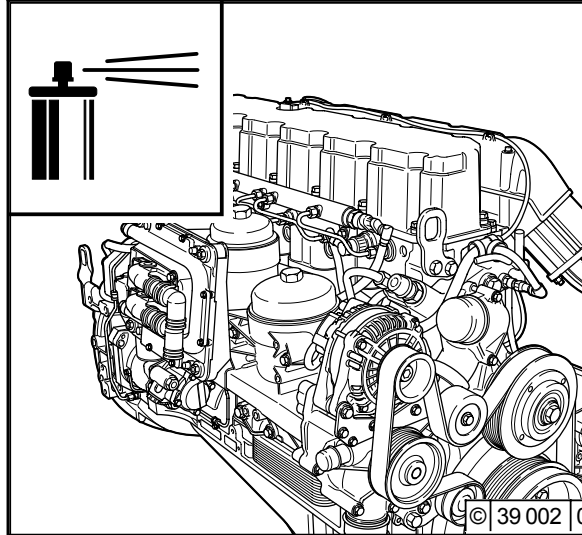
6

6.3.2 Cleaning cooling system



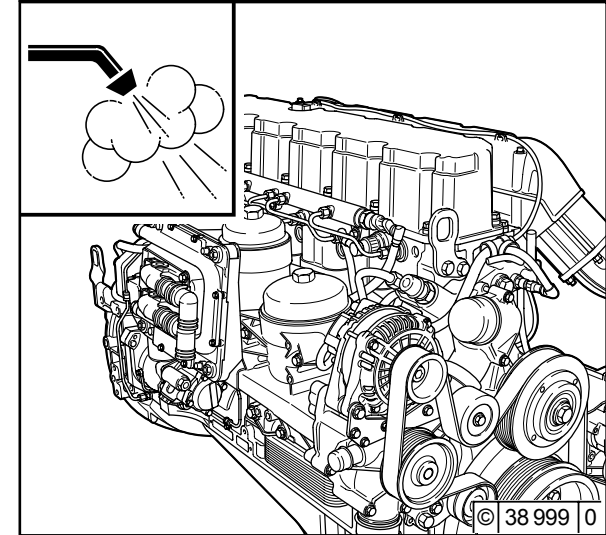
Cleaning with compressed air

- Blast out the engine with compressed air. Do not damage any components.
- Rinse out the loosened dirt with a water jet.



Cleaning with cold cleaner

- Spray the engine with standard cold cleaner and leave to work for approx. 10 minutes.
- Spray the engine clean with an acute water jet (do not spray the water jet directly at sensitive engine parts, e.g. generator, cabling, electronic components, fan drive).

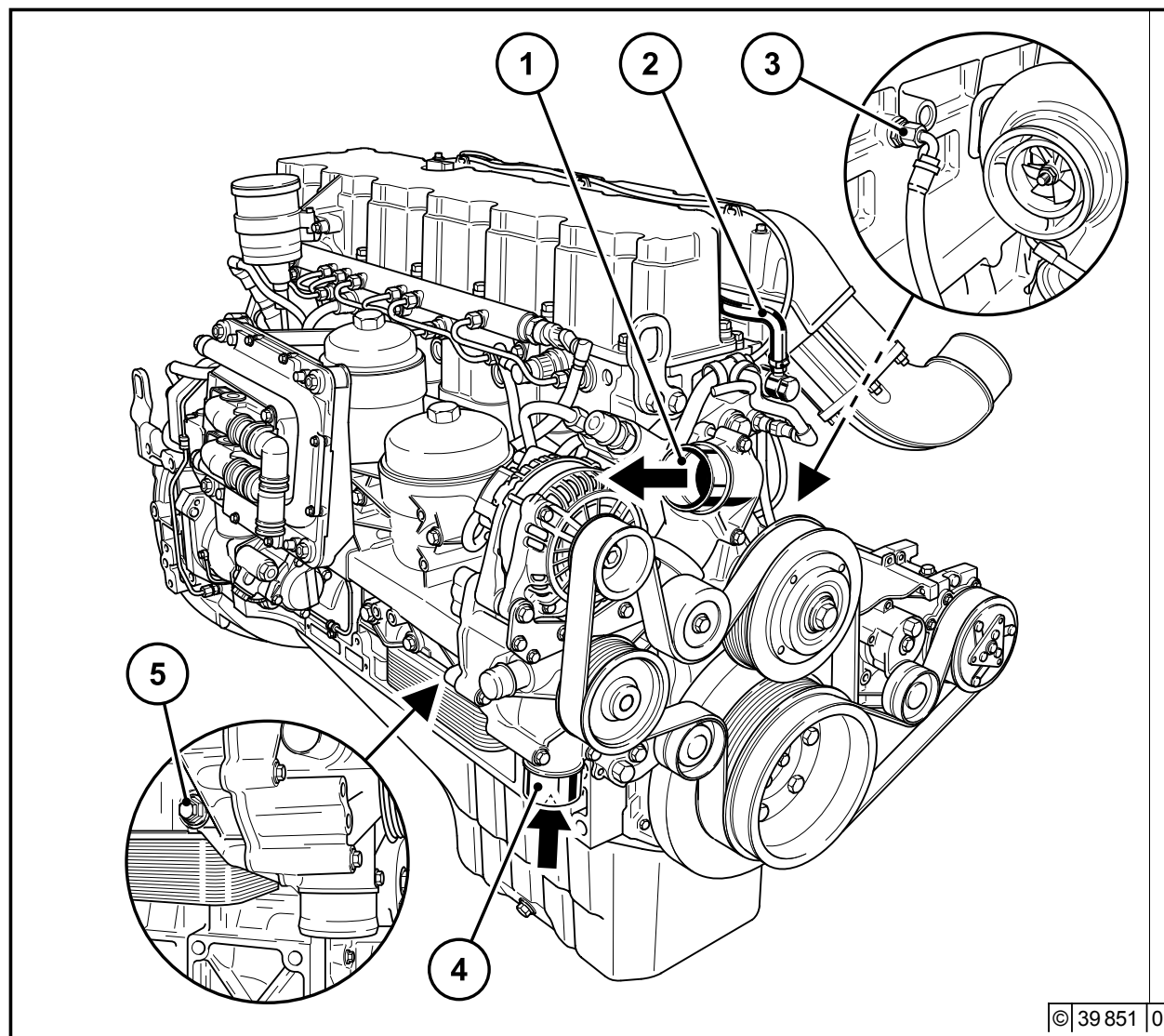


6.3 Cooling system

Care and maintenance work

6

6.3.3 Emptying / filling / bleeding cooling system



Emptying cooling system:

- Position collecting dish underneath locking screw 5 and coolant supply 4.
- Remove locking screw 5 on the crankcase and pull off hose on 4.
- Loosen bleed screw 2.
- Drain off coolant.
- Re-tighten locking screw 5 and hose on 4 and bleed screw 2.
- If locking screw 3 is not accessible, emptying may be carried out on the engine oil cooler (coolant channel).

Filling / bleeding cooling system:

- Open cooler cover.
- Loosen bleed screw item 2.
- Pour in coolant until the maximum mark or the filling limit (system heating valve must be open, if present).
- Tighten bleed screw item 2 + locking screw item 5.
- Close cooler cover.
- Start engine and warm up until the thermostat opens.
- Switch off engine.
- Check the coolant level with the engine cold and re-fill if necessary.
- Close cooler cover item 1.

Bleeding

- The cooling system, which was built according to our installation guides, is bled automatically after filling.



Caution when draining hot coolant: danger of scalding! Collect coolant when draining off.
Dispose of according to instructions!

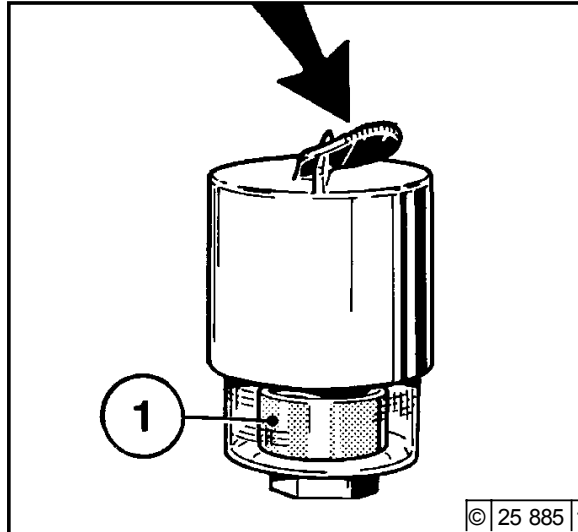
Care and maintenance work

6.4 Combustion air filter

6

6.4.1 Cleaning intervals

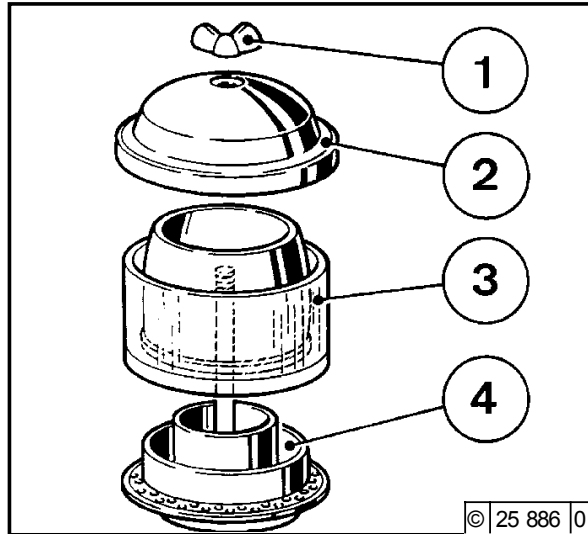
- The soiling of the combustion air filter depends on the dust content of the air and the selected filter size. If a high dust exposure is to be expected, a cyclone separator can be connected to the combustion air filter.
- The cleaning intervals cannot be generally defined. They must be defined depending on each case.
- If dry air filters are used, cleaning should only be carried out according to the maintenance display or maintenance switch.
- Filter maintenance is required when on the:
 - **Maintenance display**
the red service field 1 is fully visible when the engine is not running.
 - **Maintenance switch**
the yellow warning light comes on when the engine is running.
- After completion of the maintenance work push the reset button on the maintenance display. The maintenance display is ready for operation again.



6.4 Combustion air filter

Care and maintenance work

6.4.2 Emptying cyclone pre-separator



- Loosen wing nut 1 and lift housing cover 2.
- Remove the dust container 3 from the base of the cyclone 4 and empty. Clean foliage, straw and the like from the cyclone base.
- Place the dust container 3 on the base 4 and tighten the housing cover 2 with wing nut 1.

Never fill the dust container with oil, replace damaged containers!

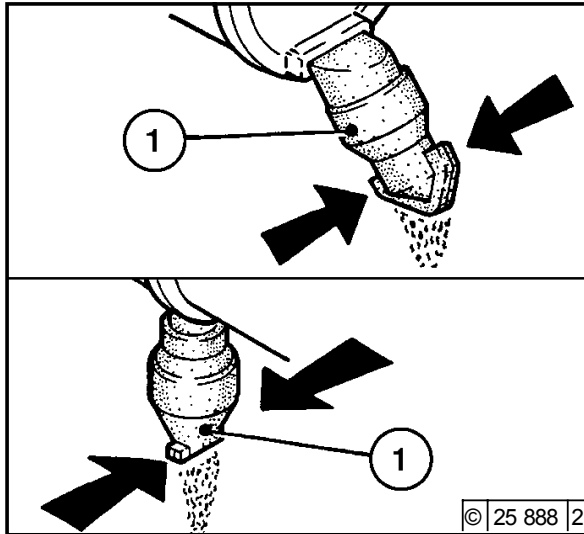
Care and maintenance work

6.4 Combustion air filter

6

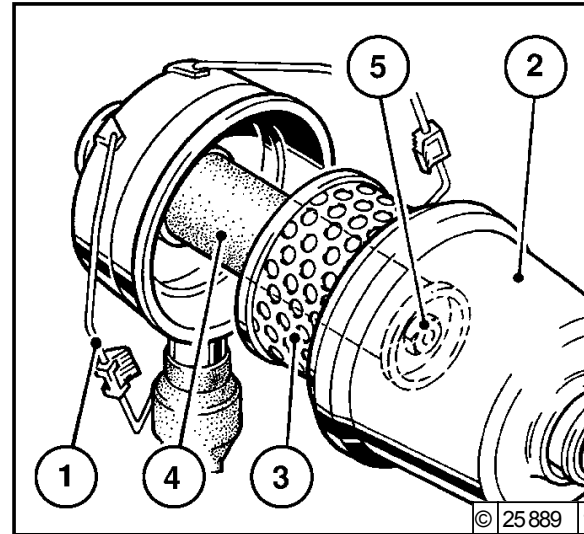
6.4.3 Dry air filter

Dust discharge valve



- Empty the dust discharge valve 1 by squeezing the discharge slot in the direction of the arrow.
- Clean the discharge slot occasionally.
- Remove any stuck on dust residues by squeezing the upper area of the valve.

Filter cartridge



- Open clamping bracket 1.
- Remove filter hood 2 and pull out filter cartridge 3.
- Clean filter cartridge, renew after a year at the latest.
- Clean filter cartridge 3.
 - Blast out from the inside out with dry compressed air (max. 5 bar), or
 - beat out (only in extreme cases). Do not damage the cartridge, or
 - Wash according to manufacturer's specifications.
- Check filter cartridge for damage to the filter paper (shine light through) and check seals. Exchange if necessary.

- Renew the safety cartridge 4 after 5 filter maintenances, after 2 years at the latest (never clean!).
To do this:
 - Loosen the hexagonal nut 5 and pull out the cartridge 4.
 - Insert new cartridge, re-mount hexagonal nut and tighten.
- Insert filter cartridge 3, close hood 2 and secure clamping bracket 1.

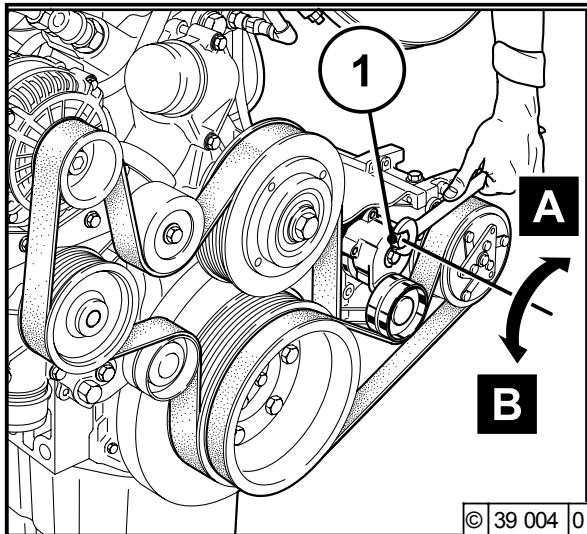


Never clean filter cartridge with petrol or hot liquids!

6.5 Belt drive

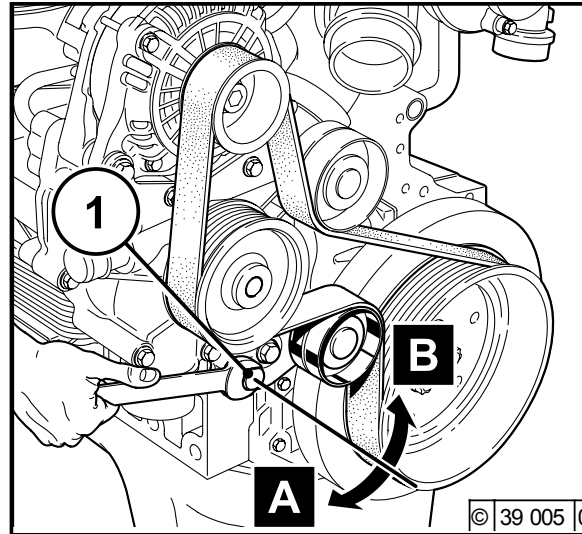
Care and Maintenance work

6.5.1 Changing V-belt V-rib belt



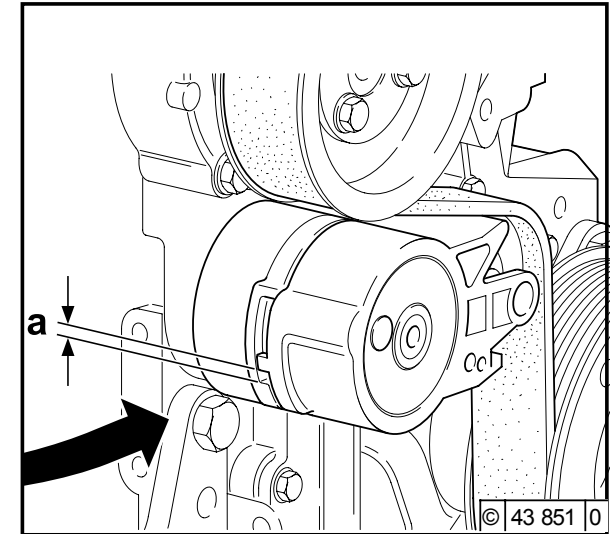
- Push tension pulley in the direction of the arrow until V-rib belt is free.
- First remove the V-rib belt from the smallest pulley.
- Put on new V-rib belt
- Loosen tension pulley in the opposite direction of the arrow until the V-rib belt is taut Whilst doing this, check that the V-rib belt is positioned correctly in your guide.

6.5.2 Changing V-belt V-rib belt



- Push tension pulley in the direction of the arrow until V-rib belt is free.
- First remove the V-rib belt from the smallest pulley.
- Put on new V-rib belt
- Loosen tension pulley in the opposite direction of the arrow until the V-rib belt is taut Whilst doing this, check that the V-rib belt is positioned correctly in your guide.

6.5.3 Checking V-rib belt wear limit



- The wear limit of the V-rib belt is checked as follows:
- Check the distance between the projection of the moving tension arm and the contact with the fixed tensioner housing.
- If „a“ is less than 3 mm the V-rib belt should be changed.



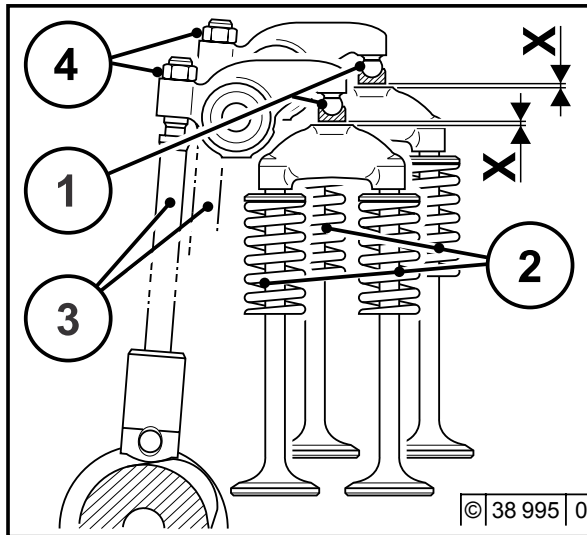
Only check/tighten/change V-belts when the engine is not running. If necessary, re-mount V-belt guard.

Care and maintenance work

6.6 Setting work

6

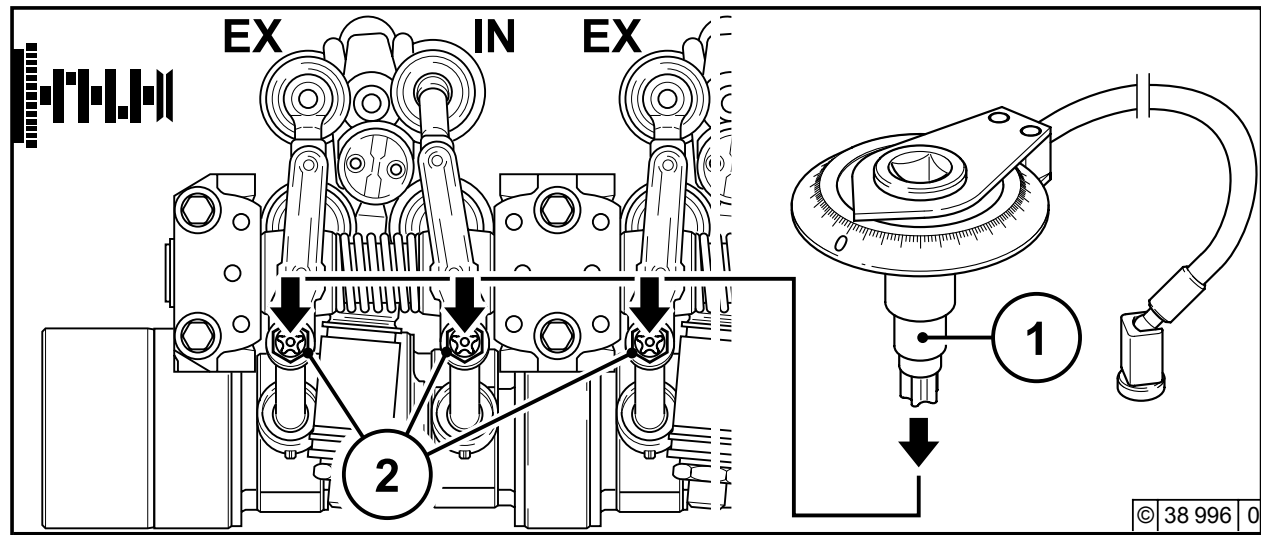
6.6.1 Checking valve clearance, setting if necessary



- Loosen bleed valve and swing aside.
- Remove cylinder head cover.
- Before setting the valve clearance allow the engine to cool down for at least 30 minutes: Oil temperature below 80 °C.
- Place the turning device over the fastening screws of the belt pulley.
- Turn over engine until the valve overlap is achieved, cylinder no. 1
- Crankshaft setting as per setting diagram, see 6.6.1.1.

Note: Valve overlap means:

Exhaust valve is not yet closed. Inlet valve begins to open. For valve setting diagram see 6.6.1.1, the table on the right.



Setting instructions:

IN= inlet valve

EX = exhaust valve

- Perform test and setting work on every cylinder.
- Re-mount cylinder head cover (if necessary with new gasket).
- Swing the bleed valve into position and fasten

Example: BF4M 2013

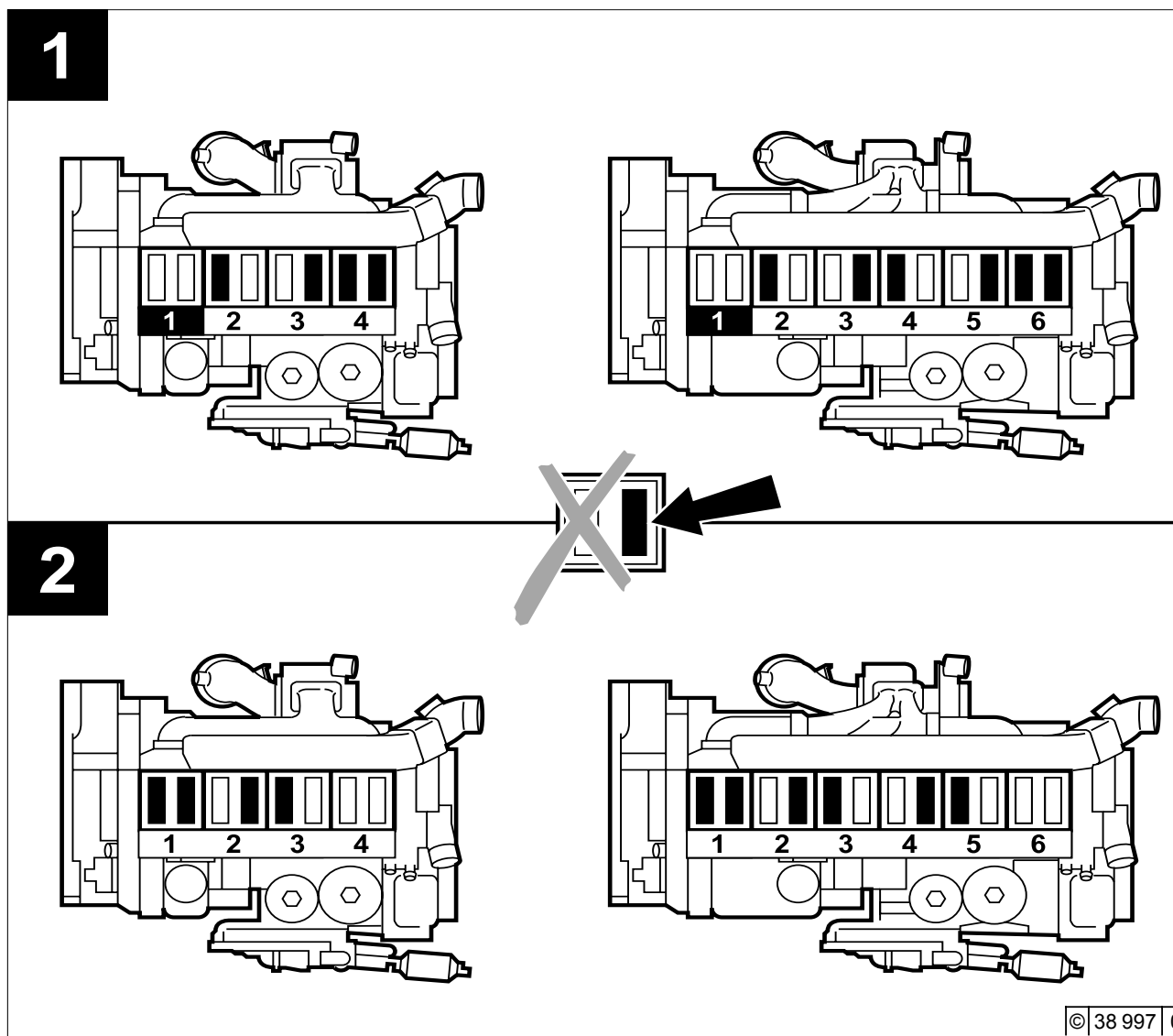
Valve clearance setting

- | | |
|--------------|---|
| 1. Work step | 1. Set cylinder to overlap, set cylinder 4. |
| 2. Work step | 3. Set cylinder to overlap, set cylinder 2. |
| 3. Work step | 4. Set cylinder to overlap, set cylinder 1. |
| 4. Work step | 2. Set cylinder to overlap, set cylinder 3. |

6.6 Setting work

Care and maintenance work

6.6.1.1 Valve clearance setting diagram



Setting the valves: (black identification)

- Perform valve clearance setting on appropriate cylinder with valve clearance setting device part no. 8190.

Loosen all lock nuts 2 of the rocker arm assembly to be set. Turn setting screw 1 back with the valve clearance setting device one turn in anti-clockwise direction.

On the valve to be set, turn setting screw 1 in clockwise direction so as to be free of clearance.

That means, there must not be any clearance between the rocker arm and valve and no pressure may be applied to the valve.

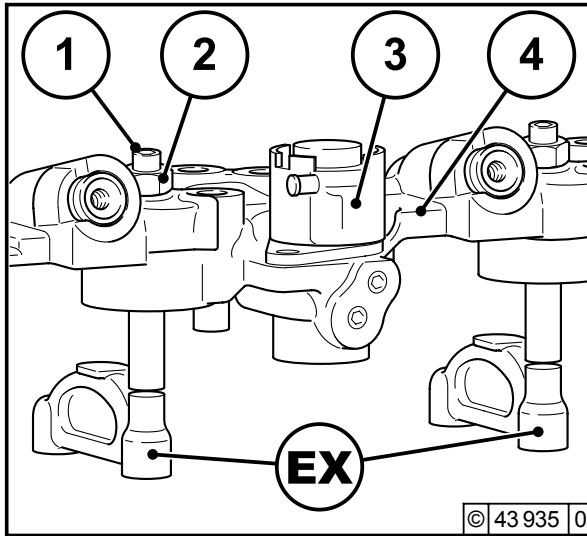
- Set needle of measuring plate to (⑤), not twisting the knurled handle any more.
- Hold the measuring plate exactly in this position and turn the setting screw 1 in anti-clockwise direction with the knurled handle until the needle is on the „in“ or „ex“ marking.
- Hold the knurled handle exactly in this position and tighten lock nut 2 with a torque wrench (20 Nm).
- Put on seal (poss. new seal).
- Visual inspection of screws and rubber elements, renew if necessary.
- Put on valve mechanism cover and tighten screws according to tightening specification: 9 Nm (see 9.2).

Care and maintenance work

6.6 Setting work

6

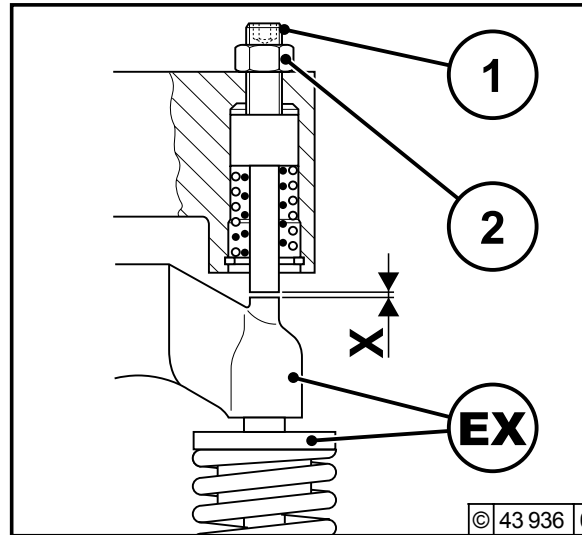
6.6.2 Checking control piston clearance at engine brake, setting if necessary



- After the valve clearance has been set.
- Control unit for engine brake is already mounted.
- Set the clearance on the control unit as follows.
- Turn engine until reaching the valve overlap is reached, cylinder no. 1
- Set control piston clearance on every exhaust valve.
- Proceed as for valve clearance.

Note

Valve overlap means:
Exhaust valve is not yet closed. Inlet valve begins to open, see valve setting diagram.



- Set control piston clearance if necessary, by:
 - Loosening the lock nut 2.
 - Mount the control piston clearance X on setting screw 1 (see 6.6.1) with setting device in EX and set as follows:
 - Fix the magnet
 - Turn the setting device without clearance until the control piston contacts with the valve bridge, set scale to „0“.
 - Then turn back angle degree 432° (by hand or torque wrench):
- EX** = exhaust valve 432° for M8 thread (corresponds to 1.5 mm clearance)
 - Tighten lock nut 4.

- Perform test and setting work on every cylinder.
- Replace cylinder head cover (if necessary with new gasket).
- Swing the bleed valve into position and fasten.

IN= Inlet valve
EX= Exhaust valve

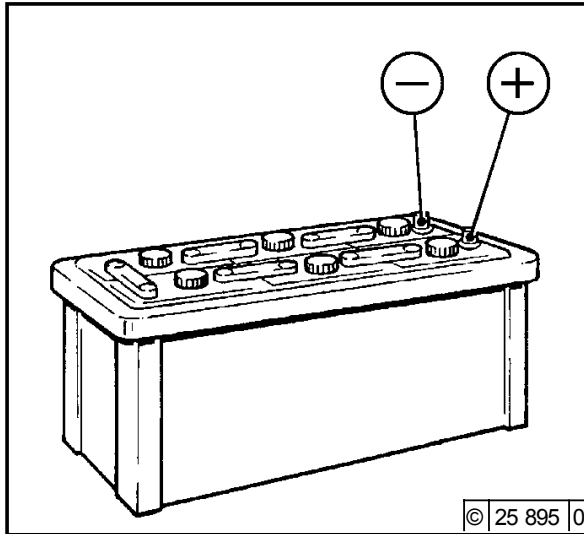
- 1 Setting screw
- 2 Lock nut
- 3 Solenoid valve (electronic control)
- 4 Control board

Care and maintenance work

6.7 Add-on parts

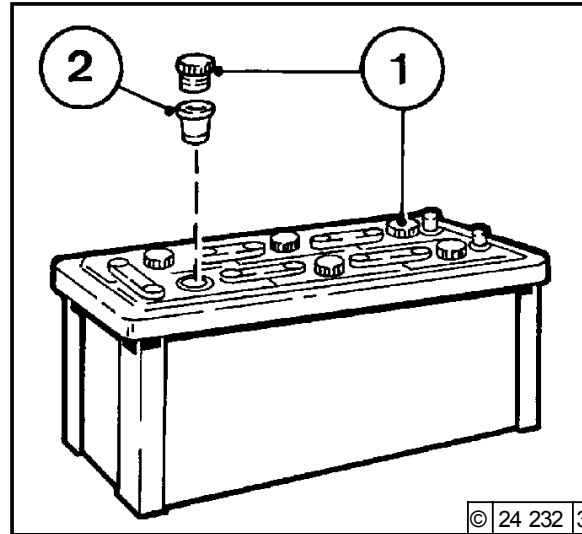
6

6.7.1.1 Testing battery and cable connections



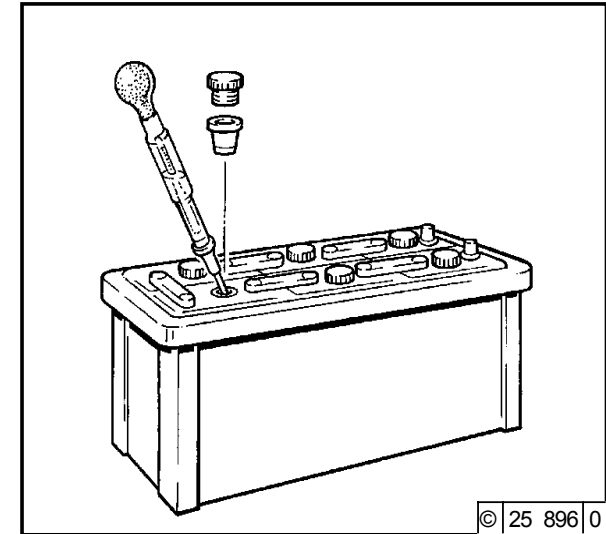
- Keep the battery clean and dry.
- Loosen soiled connection terminals.
- Clean the battery poles (+ and -) and terminals, and grease with an acid-free and acid-resistant grease.
- Ensure that the terminal connections contact well when assembling. Tighten the clamping screws by hand.

6.7.1.2 Checking the acid level



- Remove sealing cap 1.
- If checking inserts 2 are available:
The liquid level should reach to their bottom.
- Without checking inserts:
The liquid level should reach 10-15 mm above the upper edge of the plate.
- If necessary, re-fill with distilled water.
- Screw sealing cap back on.

6.7.1.3 Checking acid density



- Measure the acid density of individual cells with a standard acid testing device.

The measured values (see table overleaf) indicate the charge status of the battery. The acid temperature when measuring should be 20 °C if possible.

6.7 Add-on parts

Care and maintenance work

Acid density in [kg/ l]		in [°Bé (Baumé degree)*]		Charge level
Normal	Tropics	Normal	Tropics	
1,28	1,23	32	27	well charged
1,20	1,12	24	16	half charged, re-charge
1,12	1,08	16	11	discharged, charge immediately

* The data for acid density in °Bé (Baumé degree) is out of date and rarely still in use.



The gases released by the battery are explosive! Avoid sparks and open fire in the vicinity of the battery! Do not allow acid to get on skin or clothes!
Wear protective glasses!
Do not place any tools on the battery!

Care and maintenance work

6.7 Add-on parts

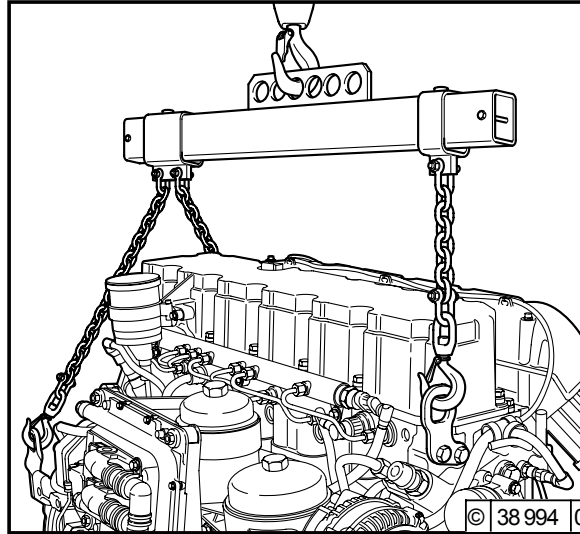
6

6.7.2 Three-phase current generator

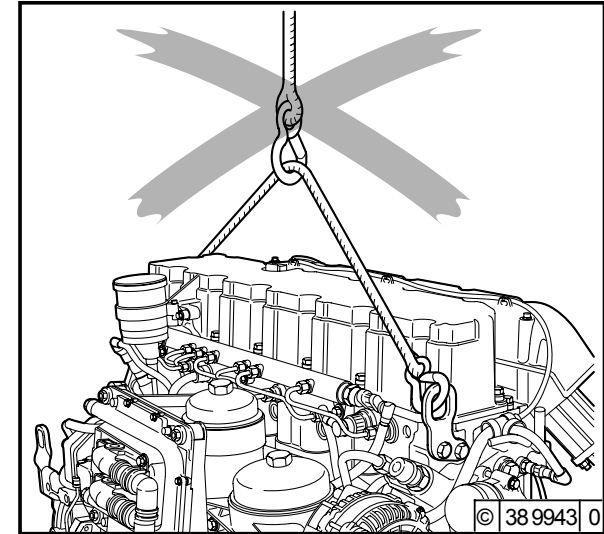
Notes on three-phase current system:

- Do **not** interrupt the connections between the battery, generator and governor when the engine is running.
- If, however, an engine must be started and operated without battery, the connection governor / generator is to be separated before starting.
- Do not swap battery connections.
- Replace defective charging warning light immediately.
- When cleaning engine: Do not spray water/ steam jet directly at generator!
! Warm up the engine so that the water residues evaporate.
- Under no circumstances may the voltage of a three-phase current system be tested by tapping against the earth cable.
- When carrying out electrical welding work, clamp the earth terminal of the welding device directly to the part to be clamped.

6.7.3 Transportation suspension



- Only use the correct suspension equipment for engine transportation. Suspension equipment must be adjustable for the engine centre of gravity.



- Fastening devices cannot be fixed safely over the centre of gravity.
- Fastening devices can slip, engine capsizes.
- Short fastening devices cause bending moments in the suspension. This can damage the suspension.



Only use correct suspension equipment!



Engine can fall.
Danger to life!

7.1 Fault table

7.2 Engine management

Faults, causes and remedies

7

- Faults are often caused by incorrect operation or maintenance of the engine.
- For every fault, check whether or not all operating and maintenance specifications have been observed.
- A corresponding fault table can be found overleaf.
- If you cannot recognise the cause of a fault or cannot remedy a fault yourself, please contact your **DEUTZ Service**.



Before starting make sure that there is nobody in the engine / work machine danger area.
For repairs: Caution: Separate battery connection!

7.1 Fault table

Faults, causes and remedies

7

Faults											Action		
Engine doesn't start up, or starts up with difficulty											Set Change SCh		
Engine doesn't start up and diagnosis light is blinking													
Engines starts up, but runs irregularly or misfires													
Engine gets too hot. Temperature warning system is activated													
Engine lacks power													
Engine lacks power and diagnosis light is lit up													
Engine doesn't work on all cylinders													
Engine has no, or too little, oil pressure													
Engine has too high oil consumption													
Engine smoulders - blue													
- white													
- black													
Cause											Section		
●											Not disconnected (if possible)	Operation	C
●									●		Starting limit temperature not reached		C
●				●							Engine shutdown lever is still in stop position (shutdown magnet defective)		C
			●			●					Oil level too low		F
			●	●			●	●			Oil level too high		L
							●	●	●		Engine is tilted too far (only with mech. regulators)		C / S
●											Set throttle to halfway		C / S
			●	●						●	Air filter soiled / exhaust turbocharger defective		Combustion air
			●	●						●	Air filter maintenance switch / display defective		C
			●	●						●	Charge air line leaking		C / Ch
			●								Cool water pump defective (V-rib belt torn or loose)		C
				●						●	Charge air cooler soiled	Cooling system	C / CI
			●								Coolant heat exchanger soiled		C / CI
●		●	●	●		●					V-rib belt torn or loose (fuel pump in belt drive)		C / W
			●	●							Cool air heating / heat short circuit		C
●											Battery defective or not charged	Electrics	C

7.1 Fault table

© 2005

7.2 Engine management

Faults, causes and remedies

7.2.1 Engine protection function of the electronic engine controller EMR3

Depending on the design of the monitoring functions, the EMR3 can protect the engine from damage in certain fault situations by monitoring compliance with important limit values during operation and checking the correct functioning of the system components. Depending on the severity of a detected fault, the engine may continue running with restrictions, whereby the fault lamp lights steadily or the fault lamp indicates a serious system fault by flashing. **In this case the engine must be switched off as soon as it is safe to do so!**

Depending on the engine configuration, the flashing fault lamp can have the following meaning:

- Request to the operator to shut down
Caution: Failure to heed this will lead to loss of warranty!
- Autom. switching off of the engine after a short pre-warning time, possibly in connection with a start lock
- To cool down the engine before switching off, forced engine operation at low idling speed, automatic switch-off if necessary
- Start lock (see also chap. 3.3)



When the fault is corrected the light goes out. For some faults it is necessary to switch off the ignition, wait for 30 s and then switch the ignition back on.

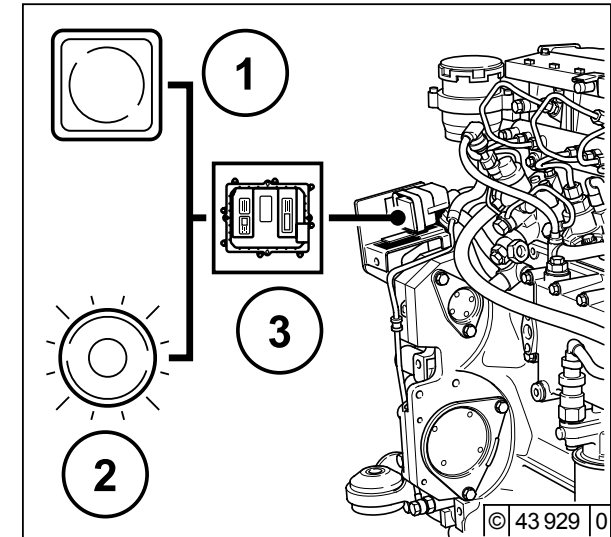
7.2.2 Using the diagnosis button

With the diagnosis button (1) the fault at hand can be read out as a blink code. The diagnosis button (1) and the fault light (2) can be found on the vehicle driving stand.

Faults are indicated by a blinking or continuous illumination of the fault light (2). More precise information regarding all existing faults can be read out in the form of a blink code, only when the engine is not running, in the following manner: After actuating the diagnosis button (1) for at least one second, the fault light (2) goes out and the first fault is, after releasing the key displayed as a blink code. Analyse the blink code as per the table on the following page. After the fault blink code has been displayed the fault light (2) goes out for five seconds.

Then the next existing fault (i.e. the following one in the fault memory) can be shown by actuating the diagnosis button (1) again. If the last existing fault has been shown, by actuating the diagnosis button (1) once more the first fault will be shown again.

7.2.3 Table of fault blink codes



The possible blink codes, their meaning and measures for correcting faults can be found in the table on the following page. The blink code values in the first column indicate the number of preliminary short blink signals (illuminated duration approx. 0.4 s), the number of subsequent long blink signals (illuminated duration approx. 0.8 s) as well as the number of concluding short blink signals. The code 2-1-4 for the fault "overspeed" is made up of two short, one long and four short blink signals, for example. If a fault cannot be corrected by the measures given in the table please contact your service representative responsible.

Faults, causes and remedies

7.2 Engine management

7

Blinkcode			Function / Component	Error
Short	Long	Short		
0.4s	0.8s	0.4s		
2	1	2	Monitoring camshaft/crankshaft	No camshaft signal, no crankshaft signal
2	1	3	Monitoring camshaft/crankshaft	Deviation between the camshaft and crankshaft signal
2	1	4	Engine protection:	Overspeed/override status implausible
2	1	6	Fuel low pressure sensor	Signal faulty
			Monitoring fuel low pressure	Fuel low pressure outside the nominal range
2	1	9	Output to adjuster exhaust valve engine brake	Signal faulty, overtemperature control unit
2	2	2	Input accelerator 1 (PWM)	PWM signal faulty
2	2	3	Charge air pressure sensor	Signal faulty
			Monitoring charge air pressure	Charge air pressure outside the nominal range
2	2	4	Oil pressure sensor	Signal faulty / implausible
2	2	5	Coolant temperature sensor	Signal faulty / implausible in comparison with the oil temperature, CAN signal invalid
2	2	6	Input accelerator 1 (analog)	Signal faulty / implausible
2	2	7	Fuel temperature sensor	Signal faulty
2	2	8	Water level sensor in the fuel filter	Signal faulty
			Monitoring fuel filter water level	Max. water level exceeded

Engine corrosion protection

8.1 Corrosion protection

Engine corrosion protection

8.1 Corrosion protection

8

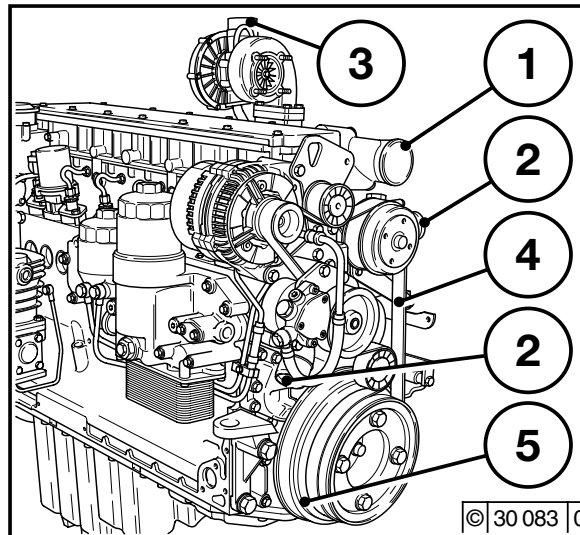
8.1 Corrosion protection

If the engine should be shut down for a long period of time, corrosion protection will be necessary in order to prevent rust formation. The measures described here apply for a shutdown period of up to approx. 6 months. Before the engine is commissioned again the corrosion protection should be removed.

- Corrosion protection oils according to specification:
 - MIL-L 21260B
 - TL 9150-037/2
 - Nato Code C 640/642
- Recommended cleaning agent for removal of corrosion protection:
 - Petroleum benzine (hazard class A3)

Protecting engine from corrosion:

- Clean engine (possibly with cold cleaner).
- Warm up the engine and switch off.
- Drain off engine oil, see chapter 6.1.2 and pour in corrosion protection oil.
- Drain off coolant, see 6.3.3.
- Pour in corrosion protection agent, see above.
- Drain fuel from container (tank).
- Make fuel mixture from 90% diesel fuel and 10% corrosion protection oil and fill up tank.
- Leave the engine running for approx. 10 minutes.
- Switch off engine.
- Turn over the engine manually several times. When turning over with a starter position the shutdown lever in the Stop position.
- Remove V-belt 4, pack up and store.



- Spray the V-belt pulley 5 with corrosion protection agent.
- Seal intake openings 1 and exhaust openings 3.
- Lightly apply corrosion protection agent to the coolant nozzle 2 and seal.
- Drain off corrosion protection agent.

Note:



Fuel tank/supply line to the engine should also be sealed, so that the sensitive Rail System is protected against dirt and dust.

Removing engine corrosion protection:

- Remove corrosion protection agent from grooves of V-belt pulley 5.
- Assemble V-rib belt 4, see 6.5.2.
- Remove plugs from intake opening 1, exhaust opening 3 and coolant inlet/outlet 2.
- Pour in coolant, see 6.3.3.
- Connect fuel tank / supply line to the engine paying attention to cleanliness.
- Start up the engine.

- 9.1 Engine and setting data**
- 9.2 Screw tightening torques**
- 9.3 Tools**

Technical data

9.1 Engine and setting data

9

Engine type

		TDC 2012 L04 V4	TDC 2012 L06 V4
Number of cylinders		4	6
Cyl. arrangement		In-line	
Bore	[mm]	101	
Stroke	[mm]	126	
Total displacement	[cm ³]	4038	6057
Compression ratio	[κ]	18	
Working principle / combustion procedure		Four stroke diesel with charging and direct injection	
Charge air cooler		with	with
Charge air cooler temperature outlet at rated power	[°C]	50	
Direction of rotation		rotation to left	
injection system			
Deutz Common Rail (DCR)	[kPa/bar]	140000/1400	
Engine type EP18		PF 45 K	
Weight TDC 2012 without cooling system according to DIN 70020-A	[approx.kg]	450	570
Engine power	[kW]	1) ¹ .	
Speed max.	[rpm]	3000	
Valve clearance inlet / exhaust, see 6.6.1	[mm]	0.4/0.5 ± 0.05/ angle degree 160/195	
Setting with special tool			
Ignition pressure	[kPa/bar]	1.6000.000/160	
Start of pumping	[°KW before TDC]	1) ¹ .	
Engine ignition sequence		1-3-4-2	1-5-3-6-2-4
V-rib belt tension :		Spring-loaded tension pulley	

¹⁾ Engine power, speed and start of pumping, among other things, are stamped on the engine company plate, see also 2.1.

9.1 Engine and setting data

Technical data

		TDC 2012 L04 V4	TDC 2012 L06 V4
Engine type		Liquid-cooled / cooling system protection	
Cooling			
Coolant quantity			
(only engine content without cooler)[approx.ltr.]		5.6	7.3
Permissible continuous coolant temperature engine outlet[°C]		max.110	
Temperature difference between			
Coolant inlet/outlet	[°C]	4 to 8	
Start of thermostat opening at Bus	[°C]	86 (75)	
Thermostat fully open at	[°C]	102	
Coolant pre-heating		⁽⁴⁾ .	
Lubrication		Forced feed lubrication	
Oil SAE		see chap. 4	
Maximum oil temperature in oil tray	[°C]	125	
Minimum oil pressure in warm state (114 °C)			
and low idling	[kPa/bar]	8,000/0.8	
Initial oil filling quantity without filter max.	[approx.ltr.]	8.5 ⁽³⁾ .	12.5 ⁽³⁾ .
min.	[approx.ltr.]	5 ⁽³⁾ .	9.5 ⁽³⁾ .
Initial oil filling quantity with filter max.	[approx.ltr.]	10 ⁽³⁾ .	14 ⁽³⁾ .
min.	[approx.ltr.]	7 ⁽³⁾ .	11 ⁽³⁾ .

⁽³⁾ Approximate values can vary depending on version The upper oil dipstick marking is always decisive.

⁽⁴⁾ Only necessary for winter operation, see 3.5.1.

Technical data

9.1 Engine and setting data

9

Engine type

		----- TDC 2013 L04 V4 -----	TDC 2013 L06 V4 -----
Number of cylinders		4	6
Cyl. arrangement		In-line	
Bore	[mm]	108	
Stroke	[mm]	130	
Total displacement	[cm³]	4761	7142
Compression ratio	[κ]	18	
Working principle / combustion procedure		Four stroke diesel with charging and direct injection	
Charge air cooler (optional)		without	without
Charge air cooler temperature outlet at rated power/ (at max. power)	[°C]	42/ (max. 50°C)	
Direction of rotation		rotation to left	
injection system			
Deutz Common Rail (DCR)	[kPa/bar]	160000/1600	
Engine type		PF 45	
Weight TDC 2013 without cooling system according to DIN 70020-A	[approx.kg]	530	620
Engine power	[kW]	1).	
Speed max.	[rpm]	3220	
Valve clearance inlet / exhaust, see 6.6.1	[mm]	0.35/0.45 ± 0,05	
Setting with special tool			
Ignition pressure	[kPa/bar]	17500/175	
Start of pumping	[°KW before TDC]	1).	
Engine ignition sequence		1-3-4-2	1-5-3-6-2-4
V-belt tension:			
Generator	[N]	550 / 300 ± 50	
Fuel pump - coolant pump	[N]	550 / 300 ± 50	
Compressor	[N]	650 / 400 ± 50	
V-rib belt tension			
Oil cooler plate cooling share::		Spring-loaded tension pulley	

¹⁾ Engine power, speed and start of pumping, among other things, are stamped on the engine company plate, see also 2.1.

9.1 Engine and setting data

Technical data

		TDC 2013 L04 V4	TDC 2013 L06 V4
Engine type		Liquid-cooled / cooling system protection	
Cooling			
Coolant quantity (only engine content without cooler)[approx.ltr.]		5.0	6.6
Permissible continuous coolant temperature engine outlet [°C]		max.110	
Temperature difference between Coolant inlet/outlet [°C]		4 to 8	
Start of thermostat opening at (Bus) [°C]		83(75)	
Thermostat fully open at [°C]		110	
Coolant pre-heating		(4)	
Cooling water pump amount [dm ³ /min]		295	
Delivery pressure in [kPa/bar]		120000/1.2	
Lubrication		Forced feed lubrication	
Oil SAE		15 W 40 /15 W 30	
Maximum oil temperature in oil tray [°C]		125	
Minimum oil pressure in warm state (114 °C) and low idling [kPa/bar]		150000/1,5	
Initial oil filling quantity without filter max.[approx.ltr.]		10 ³⁾	24 ³⁾
min. [approx.ltr.]		6.5 ³⁾	19 ³⁾
Initial oil filling quantity with filter max.[approx.ltr.]		13.5 ³⁾	27.5 ³⁾
min. [approx.ltr.]		9.5 ³⁾	22.5 ³⁾
Oil cooler plate cooling share:			
Water [Quant.]		10	11
Oil [Quant.]		9	10

³⁾ Approximate values can vary depending on version The upper oil dipstick marking is always decisive.

⁴⁾ Only necessary for winter operation, see 3.5.1.

Technical Data

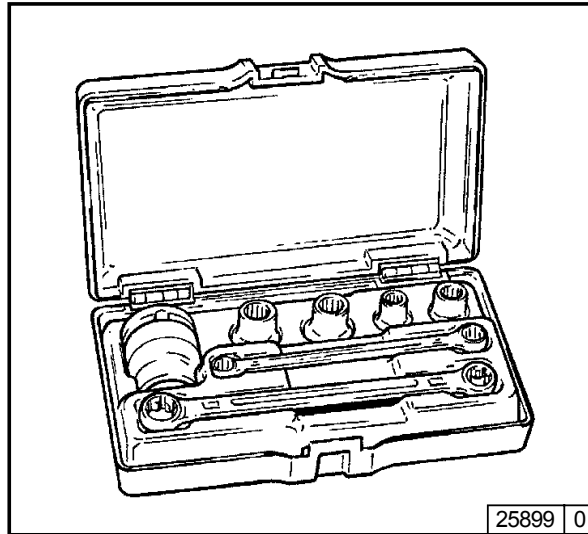
9.2 Screw tightening torques

9

Installation	Pre-tightening [Nm]	Re-tightening				Total	Comments
		1st step	2nd step	3rd step	4th step		
Valve mechanism cover	–	–	–	–	–	11 ± 1 Nm	M6
Rocker arm setting screw	–	–	–	–	–	20 ± 2 Nm	Nut with inner square
Front face mounting foot	–	–	–	–	–	260 Nm	M16 x 85 –10.9
	–	–	–	–	–	260 Nm	M16 x 40 –10.9
Oil drain screw aluminium tray	–	–	–	–	–	55 Nm	M 18x 1.5 with Cu ring
Oil drain screw sheet metal oil tray	–	–	–	–	–	55Nm	M 18x 1.5 with Cu ring

9.3 Tools

TORX



For engines of series 2012/2013, the TORX screw system BN. 8189, amongst others, is used.

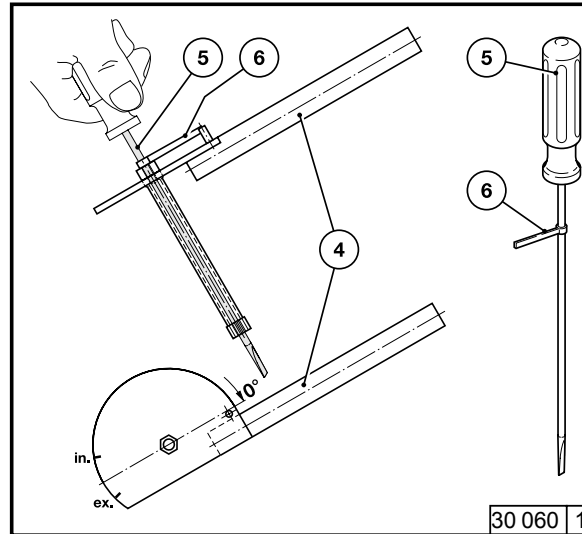
This system was introduced due to its many advantages:

- Excellent screw accessibility.
- High transfer of force when loosening and tightening.
- Slipping or broken wrenches and the risk of injury associated with this is practically impossible.

TORX tools can be obtained from:

WILBÄR
Postfach 14 05 80
D-42826 Remscheid

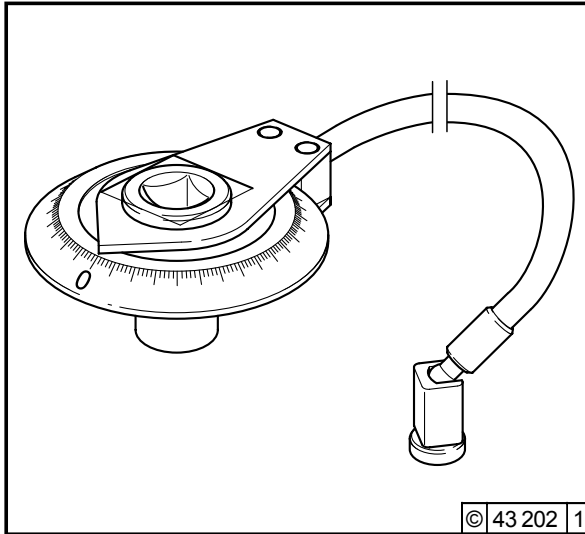
Valve clearance



Special tool part no. 8190 can be obtained from:

WILBÄR
Postfach 14 05 80
D-42826 Remscheid

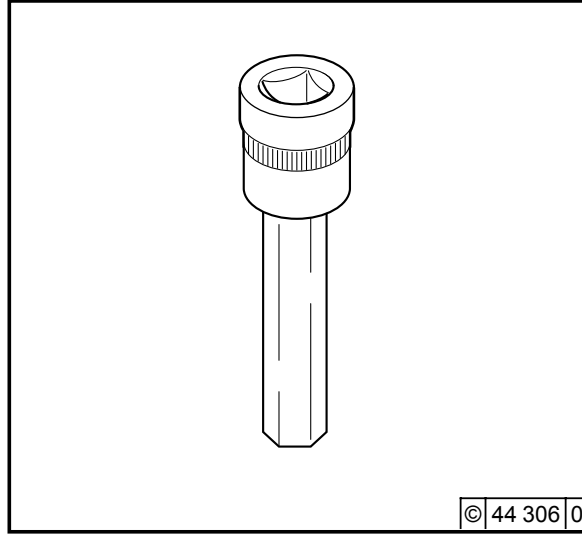
Rotation angle disc



Order No. 8190

Rotation angle disc for setting the valve/
control piston clearance.

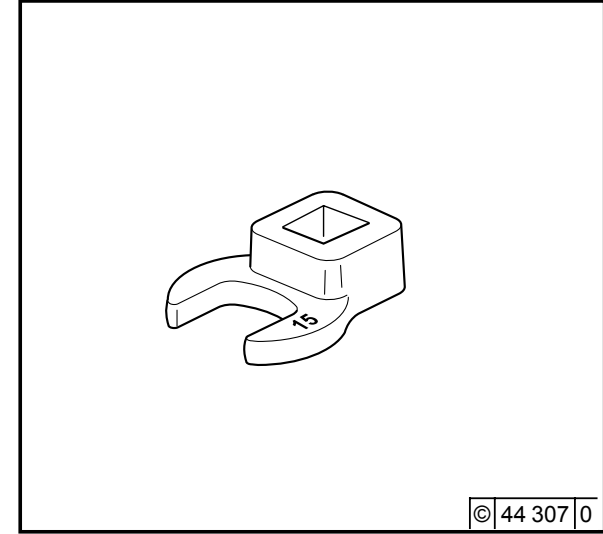
Socket wrench insert



Order No. 8193 (5 mm) valve clearance

Order No. 8194 (4 mm) control piston
clearance. Wrench inserts for rotation angle
disc.

Crow's foot wrench



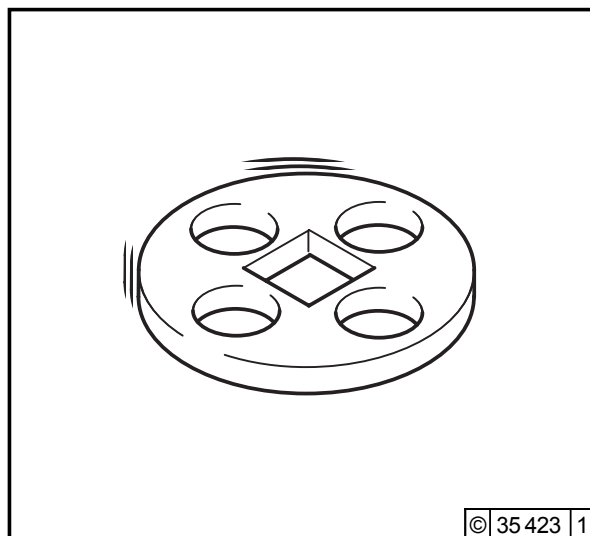
Order No. 8199

Crow's foot wrench for rotation angle disc
8190 in connection with commercially
available square bar extension.

9.3 Tools

Technical data

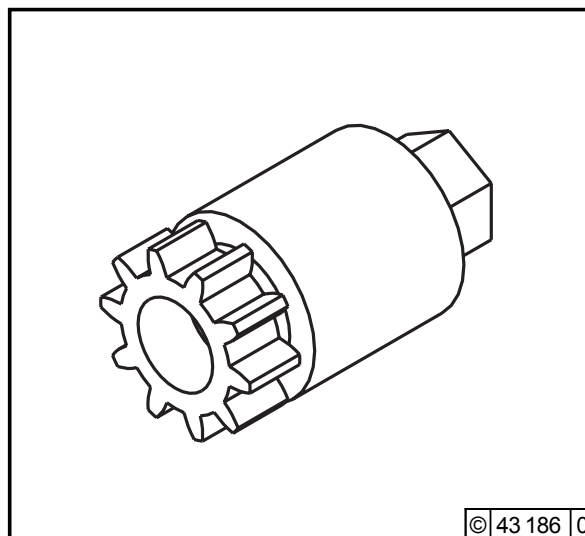
Turning gear



Order No. 100 330

For turning over the engine (as add-on on the torsional vibration damper).

Turning gear for valve clearance setting



Order No. 100 330

To turn over the engine on the SAE housing (Remove cap from SAE housing and mount turning gear).

Service

For many years DEUTZ has stood for pioneering development in engine construction. As an independent manufacturer we offer a complete palette of diesel and gas engines worldwide. Our products are perfectly tailored to meet the requirements of our customers.

More than 1.4 million DEUTZ engines reliably perform their service all over the world. We want to preserve the operational readiness of our engines and with it the satisfaction of our customers. Therefore we are represented worldwide by a network of competent partners, the concentration of whom corresponds to the regional distribution of our engines.

Thus, DEUTZ is not just a name for innovative engines. But also for a complete service package for every aspect of engines, and a service that you can rely on.

You can find an overview of DEUTZ partners in your area, their product competencies and their services on the DEUTZ website (see following addresses).

Also if there is no direct product competency specified, your DEUTZ partner will be able to help you further with professional advice.

Your DEUTZAG

Deutz-Mülheimer Str. 147-149

D-51063 Cologne

Telephone: 0049-221-822-0

Fax: 0049-221-822-3523

Telex: 8812-0 khd d

<http://www.deutz.com>

Email: info@deutz.de



the engine company

DEUTZ AG
Service-Information Systems

Deutz-Mülheimer Str. 147-149

D-51057 Köln

Tel.: ++49 (0)2 21-8 22-0

Fax: ++49 (0)2 21-8 22-53 58

Internet: www.deutz.de

Printed in Germany

All rights reserved

1st Edition, © 01/06

Order No.: 0312 2443