

Operation Manual
TCD 2012 L04/06 V2
TCD 2013 L04/06 V2





- 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.**

Operation Manual

TCD 2012 L04/06 V2

TCD 2013 L04/06 V2

312 1890 en

Engine number:

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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

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General

DEUTZ Diesel Engines

are the product of many years of research and development. The resulting know-how, coupled with stringent quality standards, guarantee their long service life, high reliability and low fuel consumption.

It goes without saying that DEUTZ Diesel Engines meet the highest standards for environmental protection.

Beware of Running Engine

Shut the engine down before carrying out maintenance or repair work. Ensure that the engine cannot be accidentally started. Risk of accidents!

When working on the running engine, work clothing must be close fitting.

Observe industrial safety regulations when running the engine in an enclosed space or underground.

When the work is complete, be sure to refit any panels and guards that may have been removed. Never fill the fuel tank while the engine is running.

Care and Maintenance

Sound care and maintenance practices will ensure that the engine continues to meet the requirements placed on it. Recommended service intervals must be observed and service and maintenance work carried out conscientiously. Special care should be taken under abnormally demanding operating conditions.

Safety



This symbol is used for all safety warnings which, if not observed, present a direct danger to life and limb for the person involved. Please follow them carefully. The attention of operating personnel should be drawn to these safety instructions. General safety and accident prevention regulations laid down by law must also be observed.

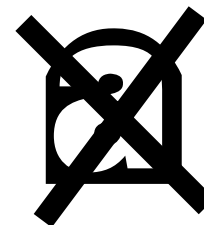
Service

Please contact one of our authorized service representatives in the event of breakdowns or for spare parts inquiries. Our trained specialists will carry out repairs quickly and professionally, using only genuine spare parts. Original parts from DEUTZ AG are always produced in accordance with state-of-the-art technology.

The Technical Circulars listed in the instruction manual are obtainable from your DEUTZ partner.

Please turn to the end of this manual for further service information.

Asbestos



DEUTZ original parts are asbestos-free.

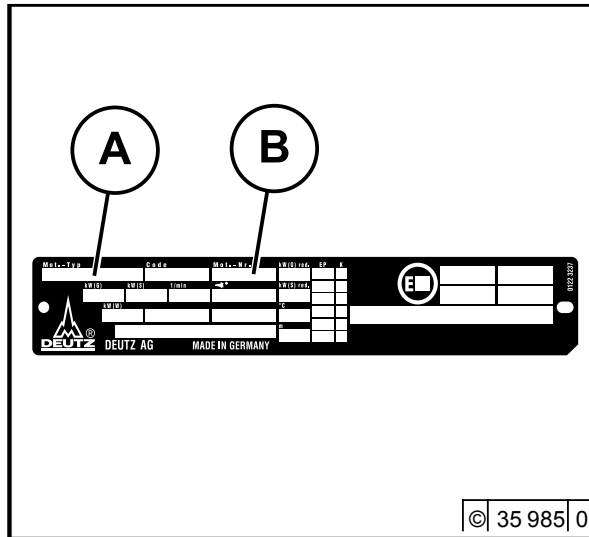
- 2.1 Engine type**
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Engine description

2.1 Engine type

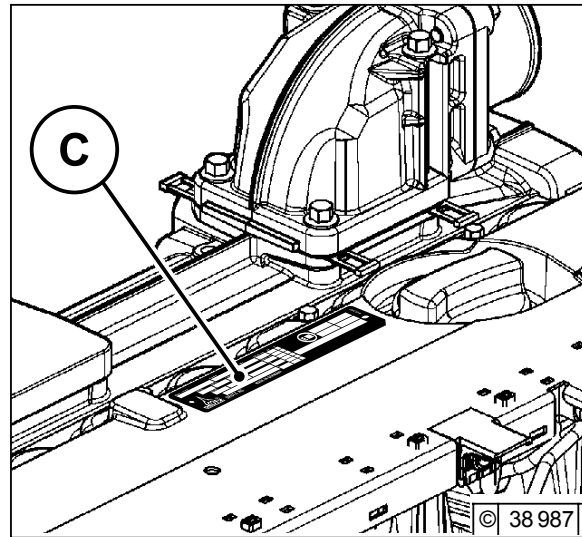
2

2.1.1 Company plate

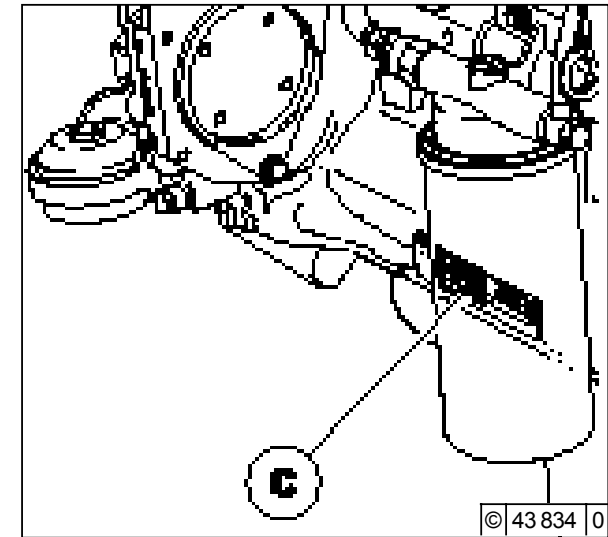


The engine type **A**, engine number **B** and the power data are stamped on the company plate. The engine type and number must be stated when purchasing spare parts.

2.1.2 Location of company plate



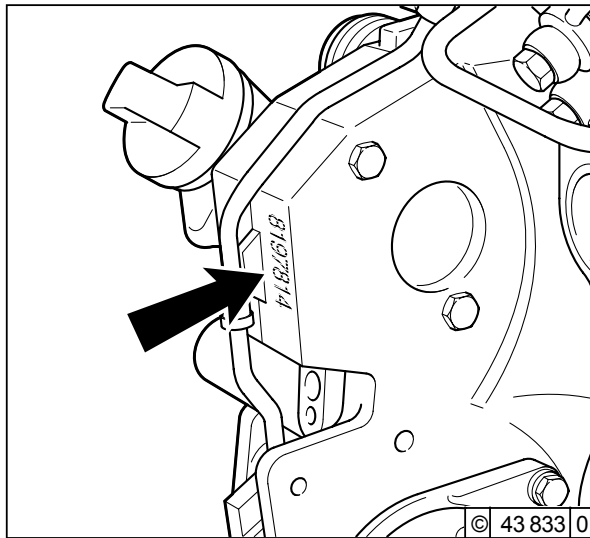
The company plate **C** is fixed to the cylinder head cover or the crankcase.



2.1 Engine type

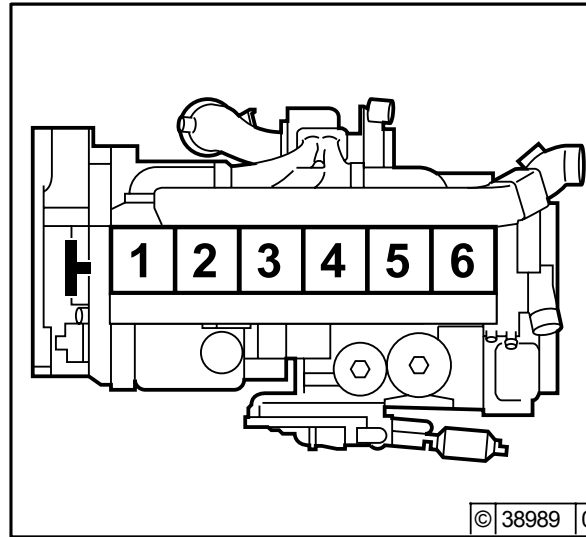
Engine description

2.1.3 Engine number



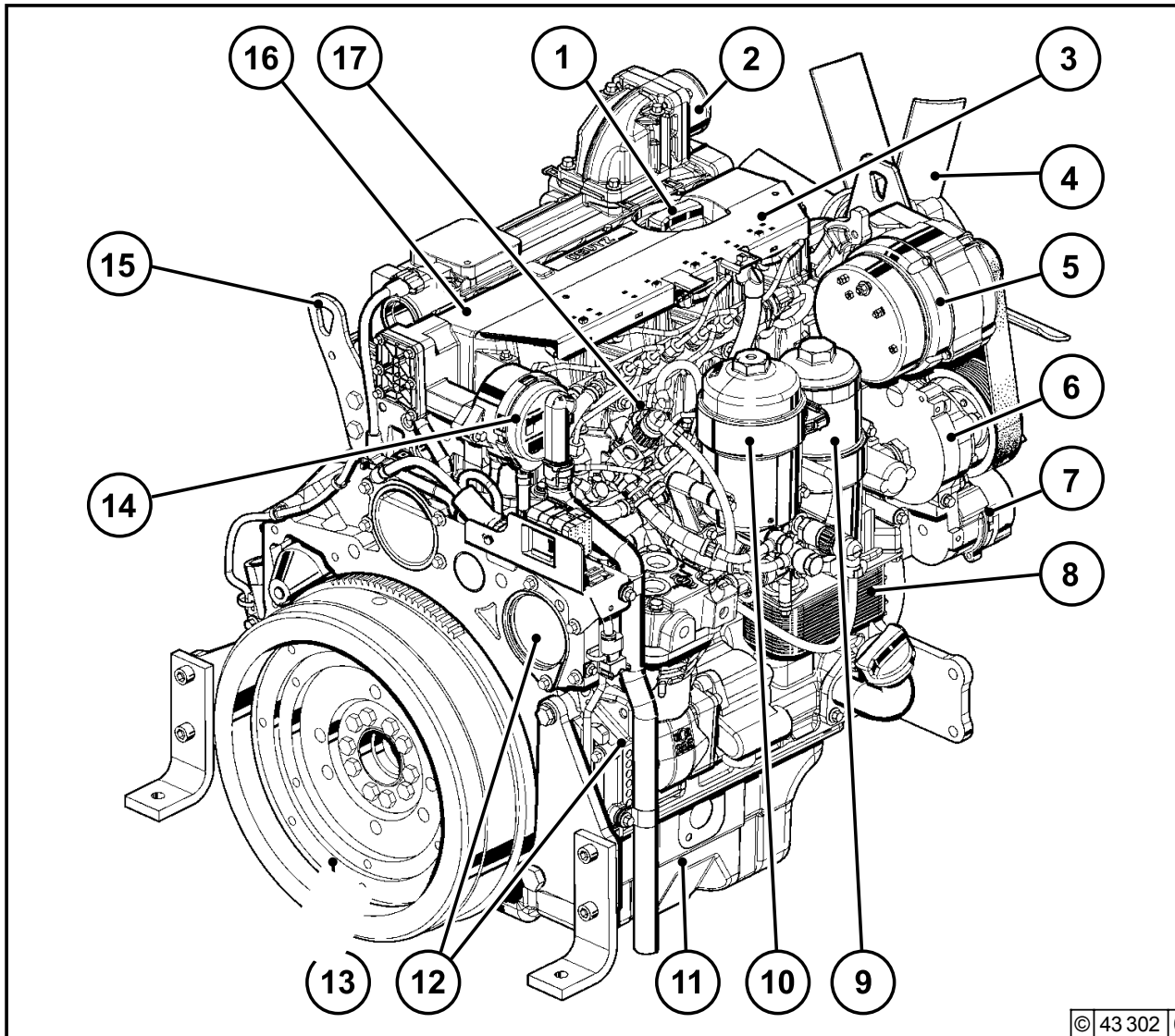
The engine number is stamped on the crankcase (arrow) and on the company plate.

2.1.4 Cylinder numbering



The cylinders are counted consecutively, starting from the flywheel.

2.2.1 Operation side TCD 2012 L04 2V

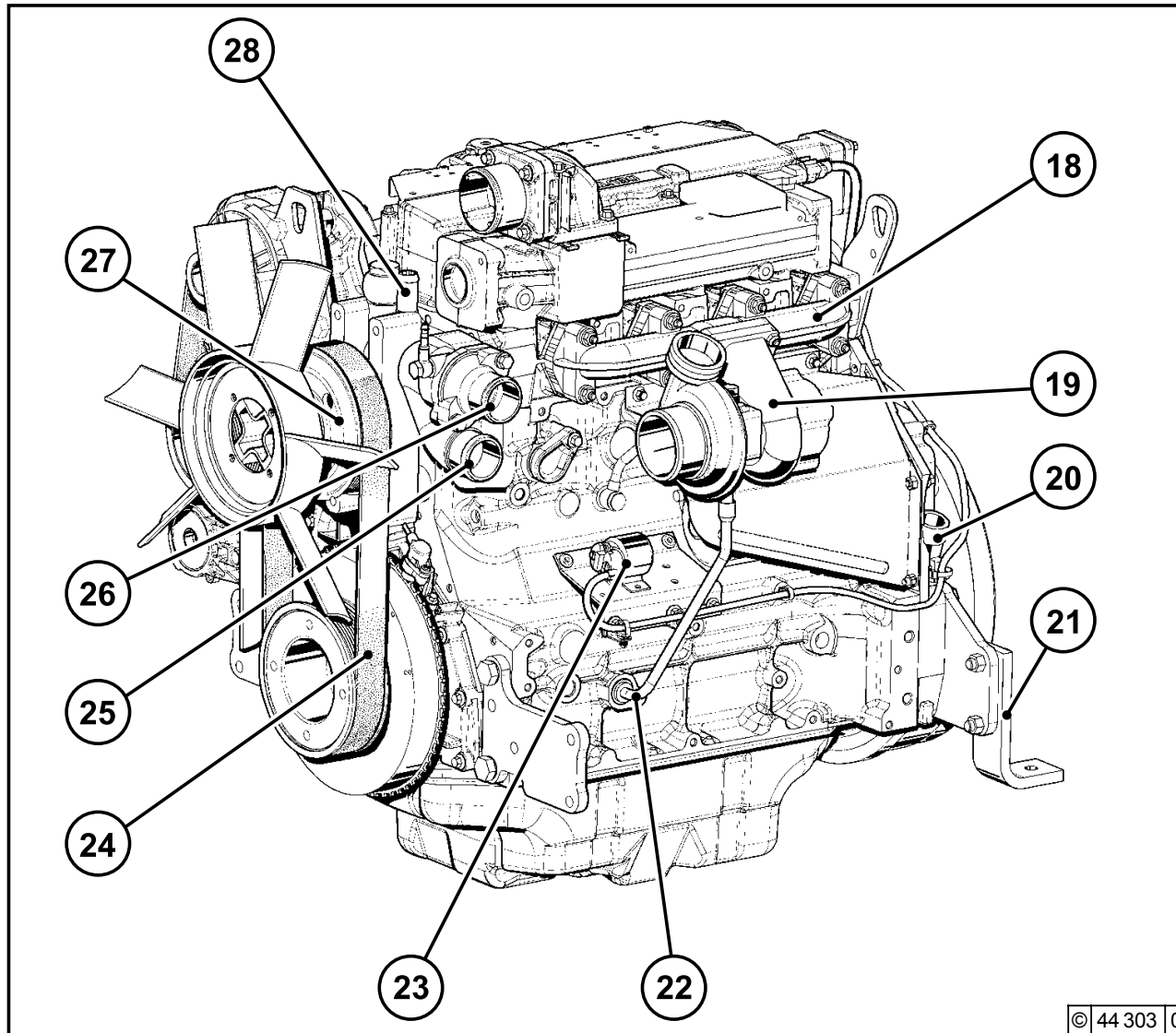


- 1 Oil filler
- 2 Combustion air inlet
- 3 Cover
- 4 Fan
- 5 Generator
- 6 Fuel pump
- 7 Tension pulley with torsion spring
- 8 Oil cooler
- 9 Exchangeable fuel filter
- 10 Exchangeable lube oil filter
- 11 Oil tray
- 12 Hydraulic pump or compressor mounting possibility
- 13 Flywheel
- 14 Crankcase bleeding valve
- 15 Transport eyes
- 16 Charge air pipe
- 17 Fuel control unit

2.2 Engine diagrams

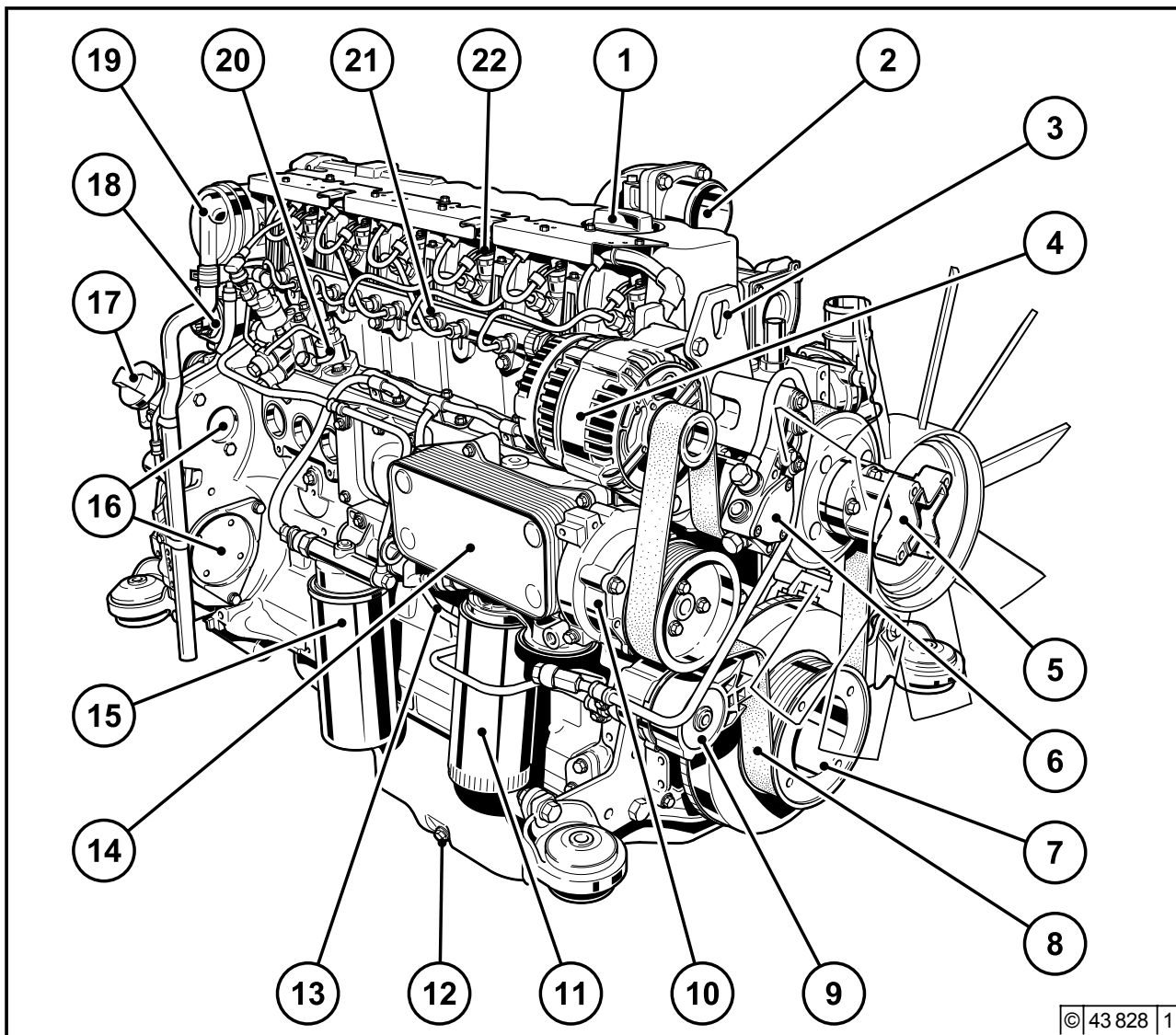
Engine description

2.2.2 Starter side TCD 2012 L04 2V



- 18 Exhaust manifold
- 19 Turbocharger
- 20 Oil filler (optional)
- 21 Engine mounting
- 22 Oil return line from turbocharger
- 23 Relay (starter)
- 24 V-rib belt
- 25 Coolant inlet
- 26 Coolant outlet
- 27 Coolant pump
- 28 Connection cabin heater or compensation line

2.2.3 Operation side TCD 2012 L06 2V

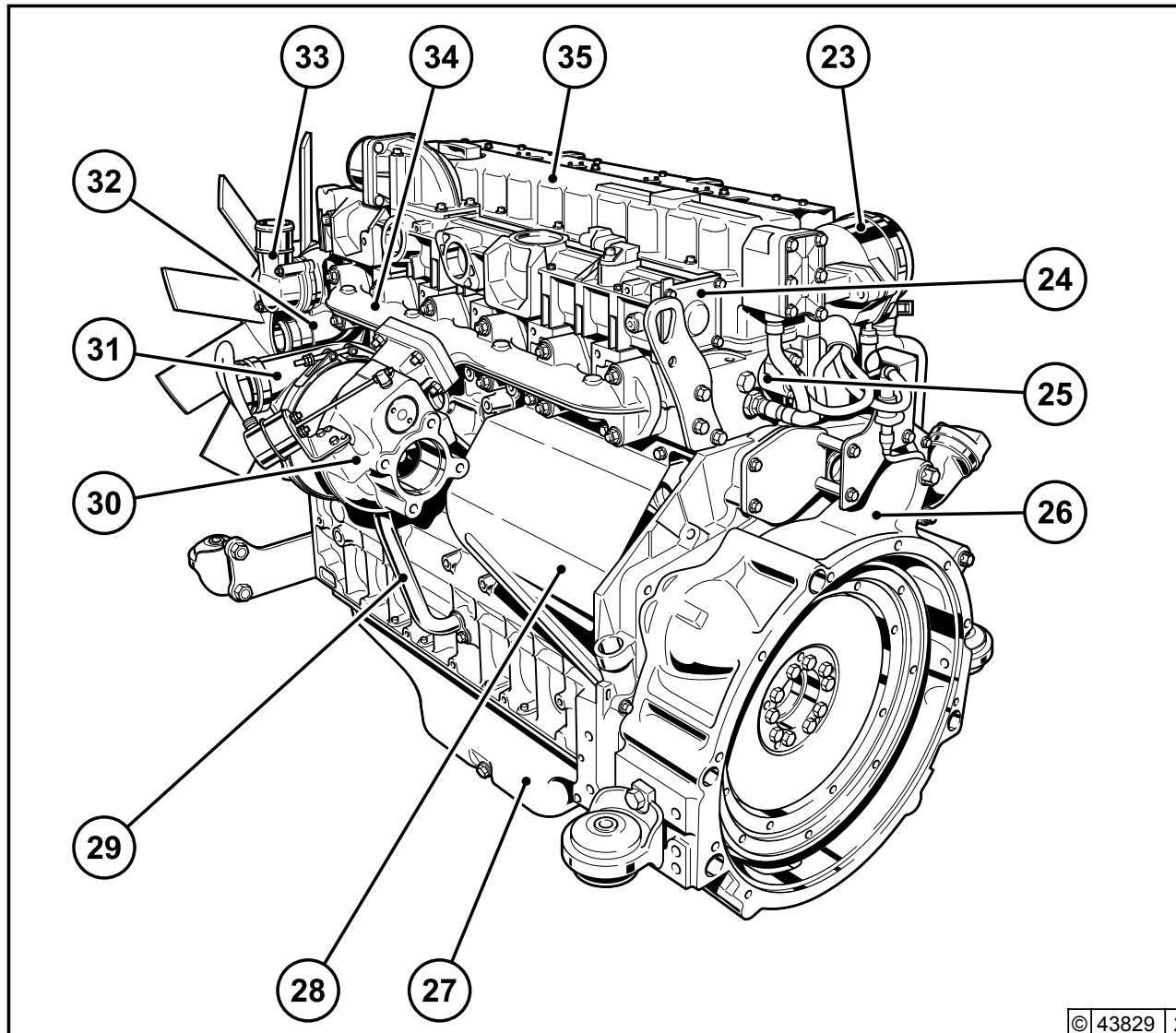


- 1 Oil filler
- 2 Combustion air inlet
- 3 Transport eyes
- 4 Generator
- 5 Fan hub
- 6 Fuel pump
- 7 V-rib belt drive on crankshaft
- 8 V-rib belt
- 9 Tension pulley with torsion spring
- 10 Coolant pump
- 11 Exchangeable lube oil filter (1x optional)
- 12 Oil drain screw
- 13 Oil dipstick
- 14 Lube oil cooler
- 15 Exchangeable fuel filter
- 16 Hydraulic pump or compressor installation (optional)
- 17 Oil filler (optional)
- 18 Plug to control unit
- 19 Crankcase bleeding valve
- 20 High-pressure pump (2)
- 21 Rail
- 22 Injector

2.2 Engine diagrams

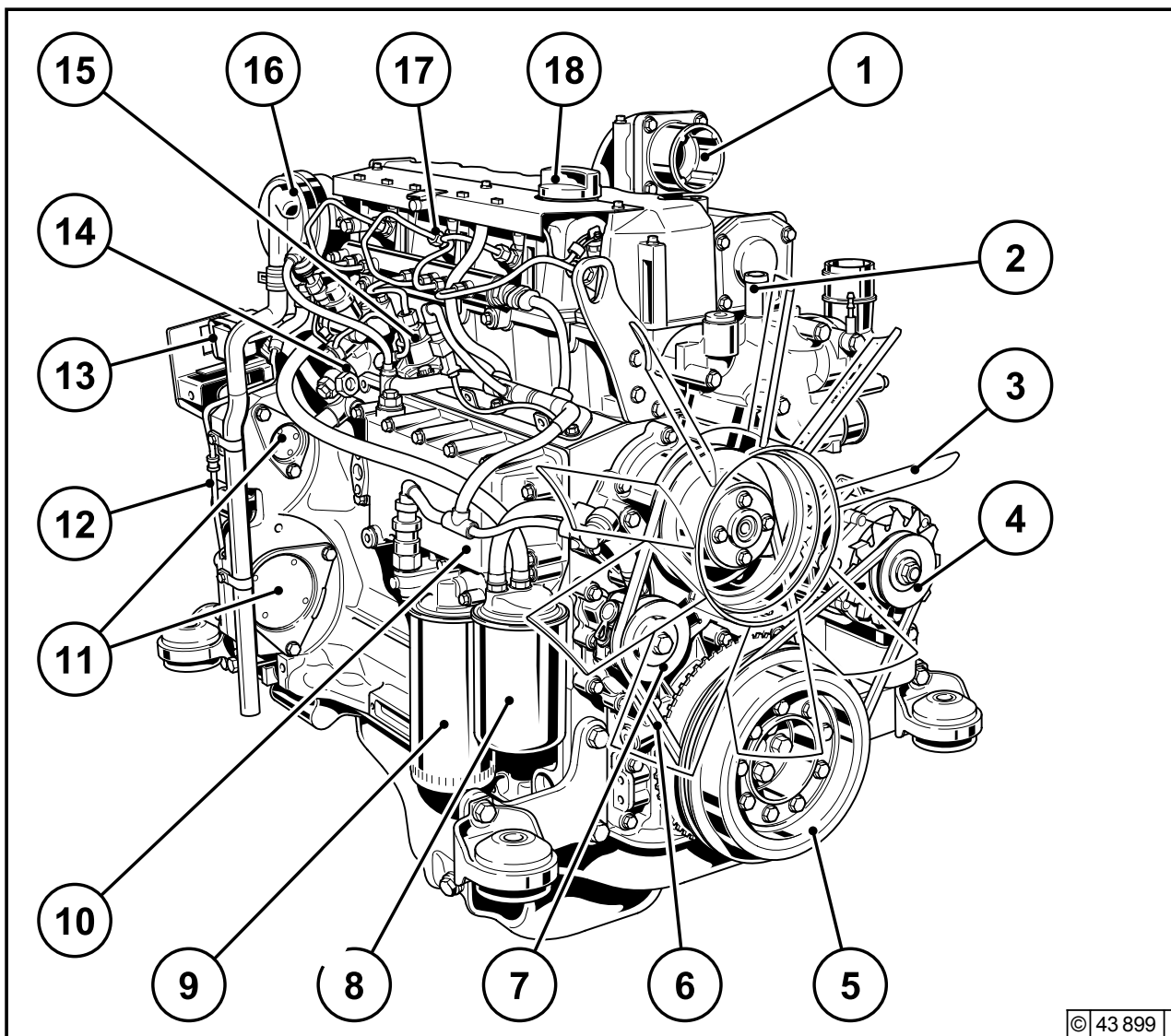
Engine description

2.2.4 Starter side TCD 2012 L06 2V



- 23 Crankcase bleeding valve
- 24 Charge air pipe
- 25 Solenoid valve for exhaust gas recirculation
- 26 SAE housing
- 27 Oil tray
- 28 Starter cover
- 29 Oil return line from turbocharger
- 30 Exhaust turbocharger
- 31 Charge air connection to charge air cooler
- 32 Coolant inlet
- 33 Coolant outlet
- 34 Exhaust manifold
- 35 Cylinder head cover

2.2.5 Operation side TCD 2013 L04 2V

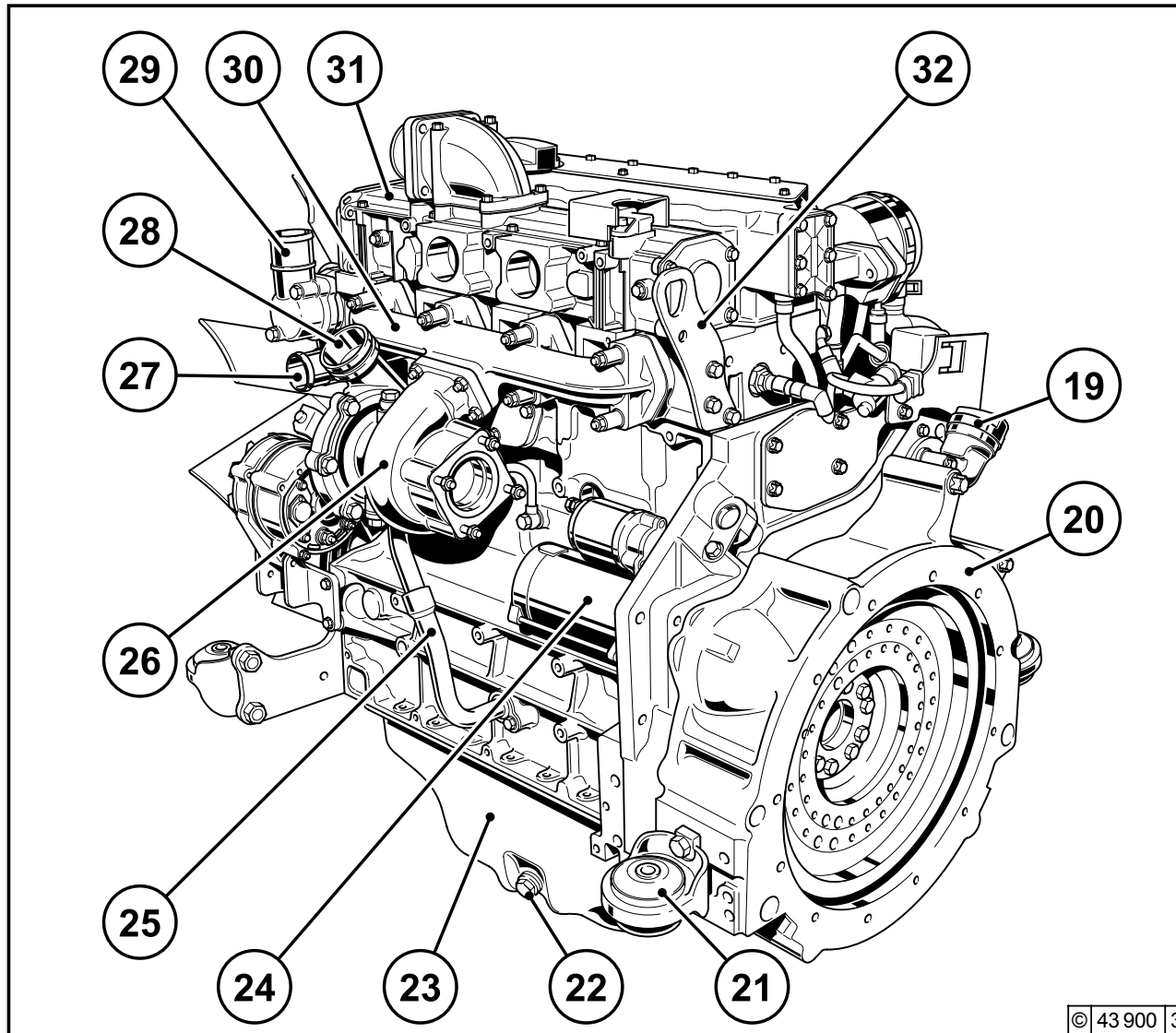


- 1 Combustion air inlet
(heating flange installation facility, optional)
- 2 Connection cabin heater or compensation
line
- 3 Fan (drive coolant pump)
- 4 Generator
- 5 Belt pulley on crankshaft
- 6 V-belt
- 7 Fuel pump drive
- 8 Exchangeable fuel filter
- 9 Exchangeable lube oil filter
- 10 Oil cooler
- 11 Drive facility (e.g. hydraulic pump,
optional)
- 12 Oil return line crankcase bleeding
- 13 Plug to control unit
- 14 Fuel control unit
(**Electronic Control Unit**)
- 15 High-pressure pump
- 16 Crankcase bleeding valve
- 17 Injector
- 18 Oil filler

2.2 Engine diagrams

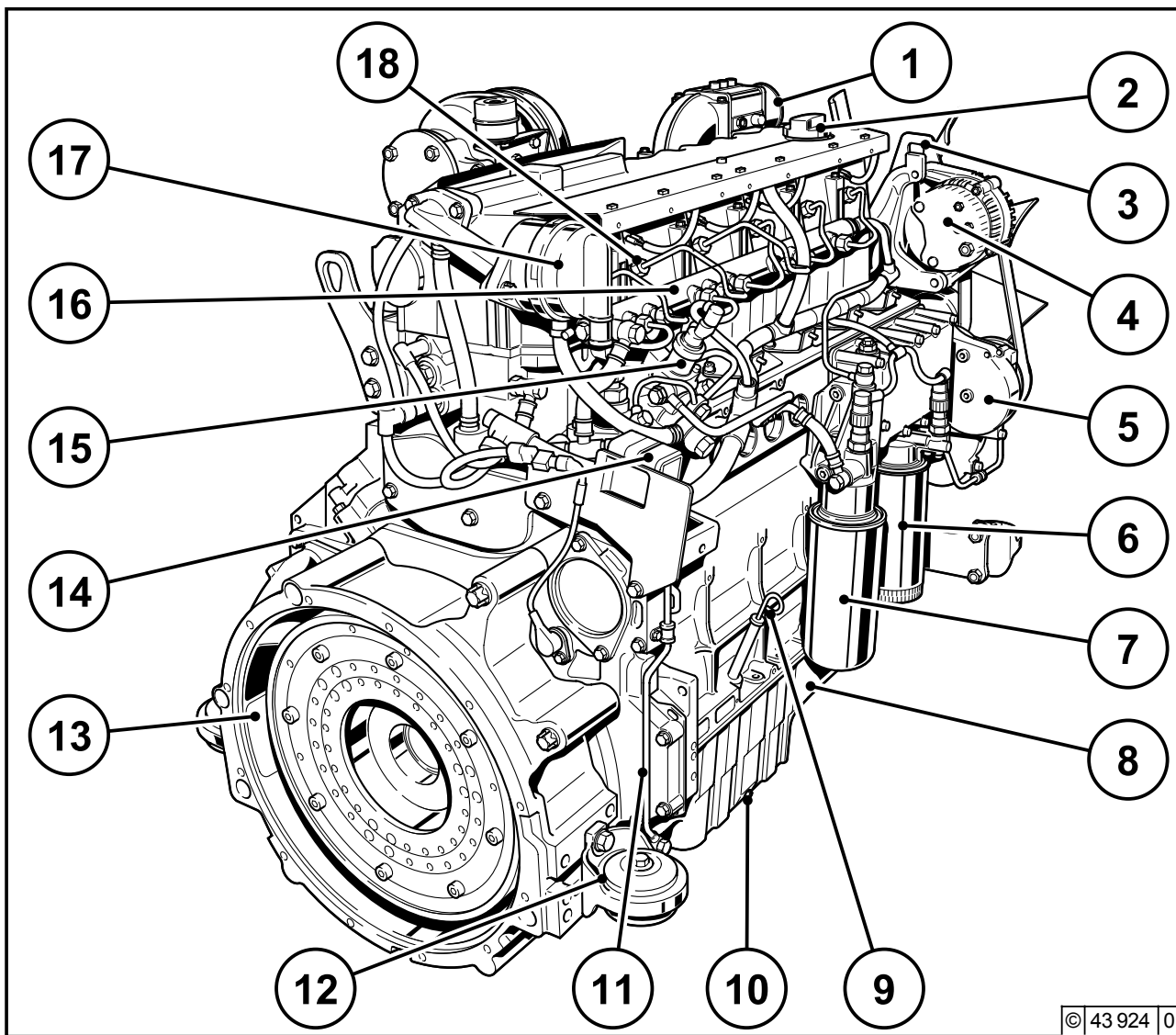
Engine description

2.2.6 Starter side TCD 2013 L04 2V



- 19 Oil filler (optional)
- 20 SAE housing
- 21 Engine mounting
- 22 Oil drain screw
- 23 Oil tray
- 24 Starter
- 25 Lube oil return from turbocharger
- 26 Turbocharger
- 27 Coolant inlet
- 28 Charge air connection to cooler
- 29 Coolant outlet
- 30 Exhaust manifold
- 31 Charge air pipe
- 32 Transport eyes

2.2.7 Operation side TCD 2013 L06 2V

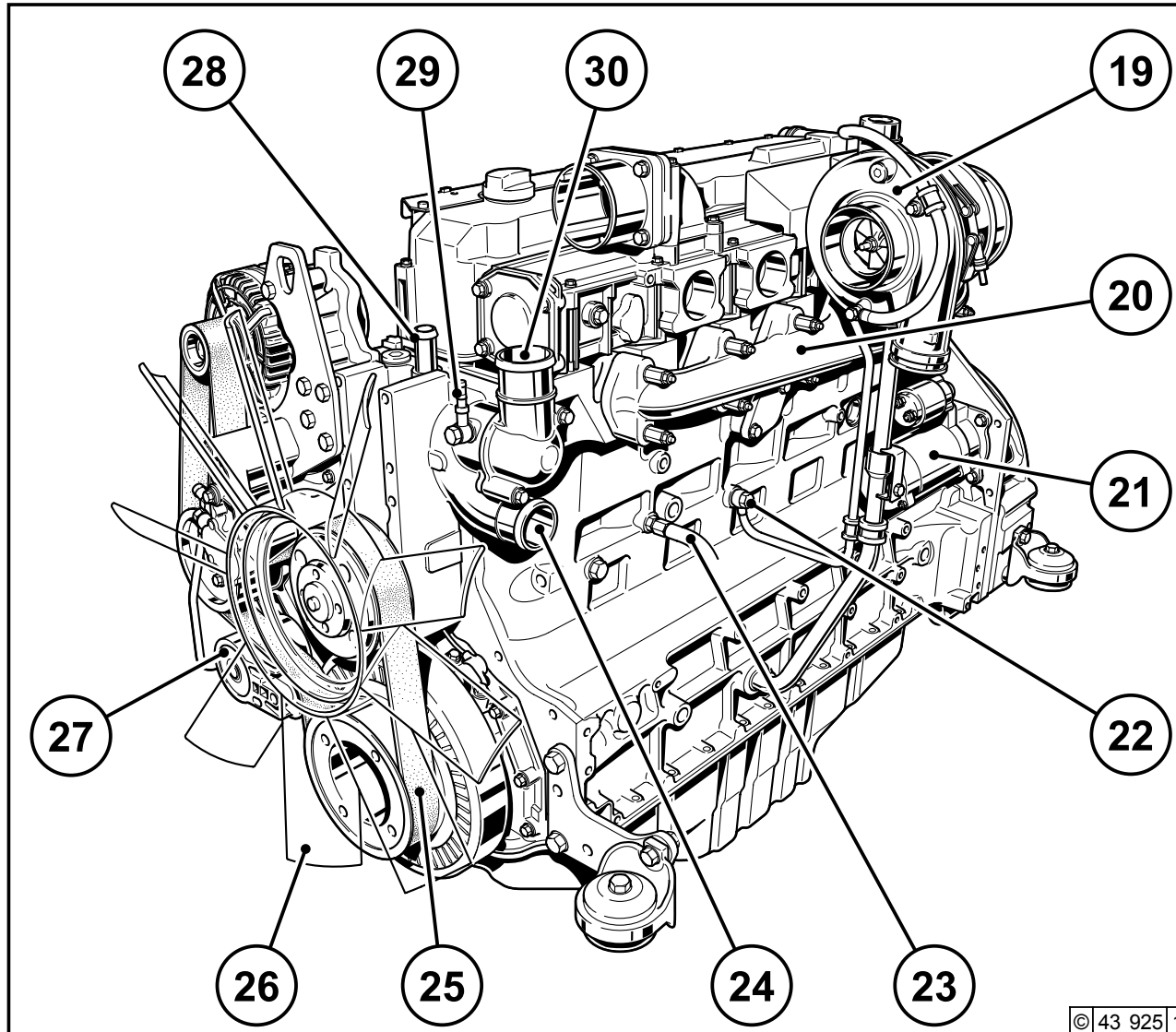


- 1 Combustion air inlet
- 2 Oil filler
- 3 Transport eyes
- 4 Generator
- 5 Coolant pump
- 6 Exchangeable lube oil filter
- 7 Exchangeable fuel filter
- 8 Oil tray
- 9 Oil dipstick
- 10 Oil drain screw
- 11 Oil return line crankcase bleeding
- 12 Engine mounting
- 13 SAE housing
- 14 Plug to control unit
- 15 High-pressure pump
- 16 Rail
- 17 Crankcase bleeding valve
- 18 Injector

2.2 Engine diagrams

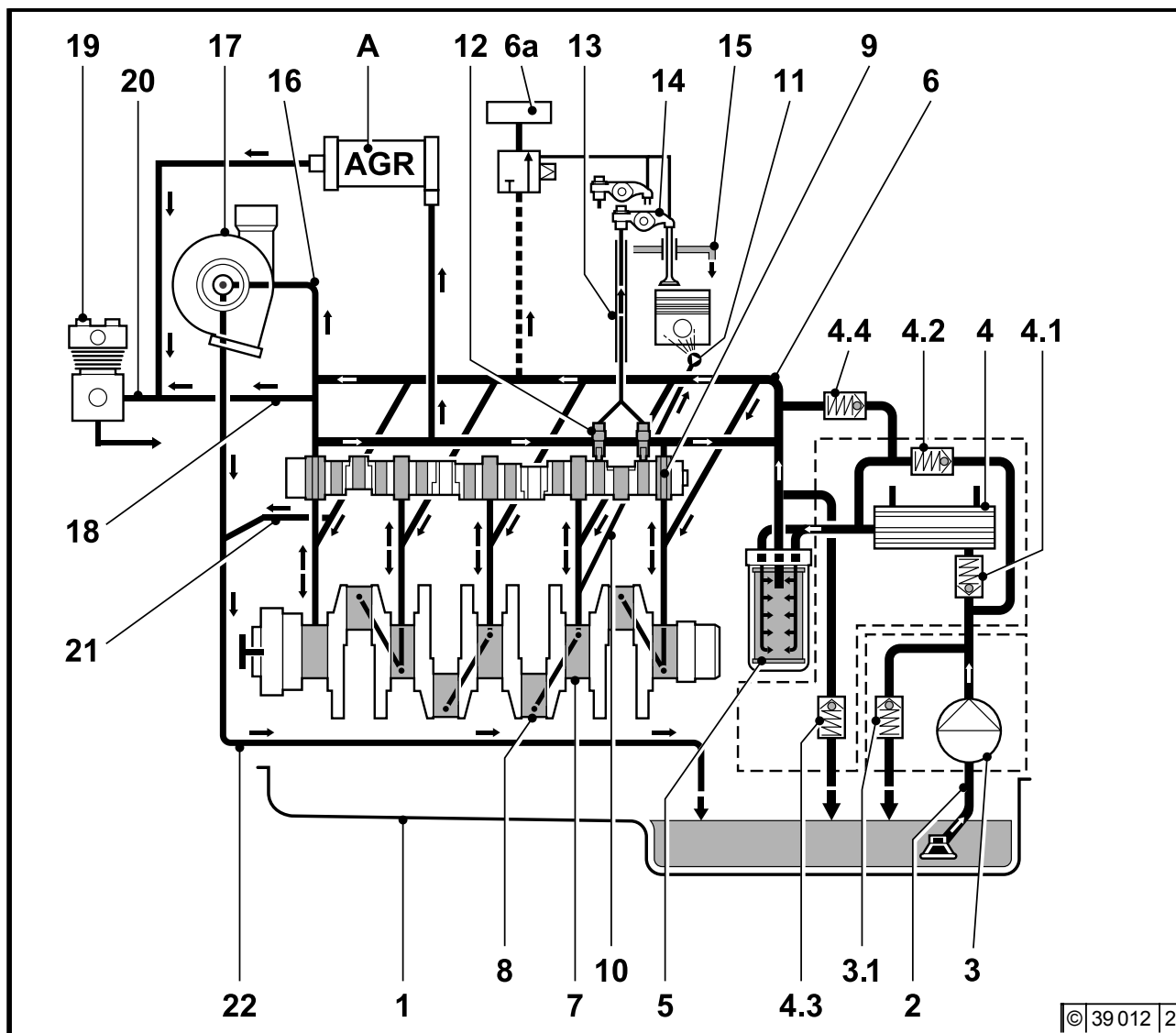
Engine description

2.2.8 Starter side TCD 2013 L06 2V



- 19 Turbocharger
- 20 Exhaust manifold
- 21 Starter
- 22 Lube oil line to turbocharger
- 23 Coolant drain screw
- 24 Coolant inlet
- 25 V-rib belt
- 26 Fan
- 27 Tension pulley with torsion spring
- 28 Connection compensation line
- 29 Ventilation line to compensation tank
- 30 Coolant outlet from engine to cooler

2.3.1 Lube oil diagram (example)

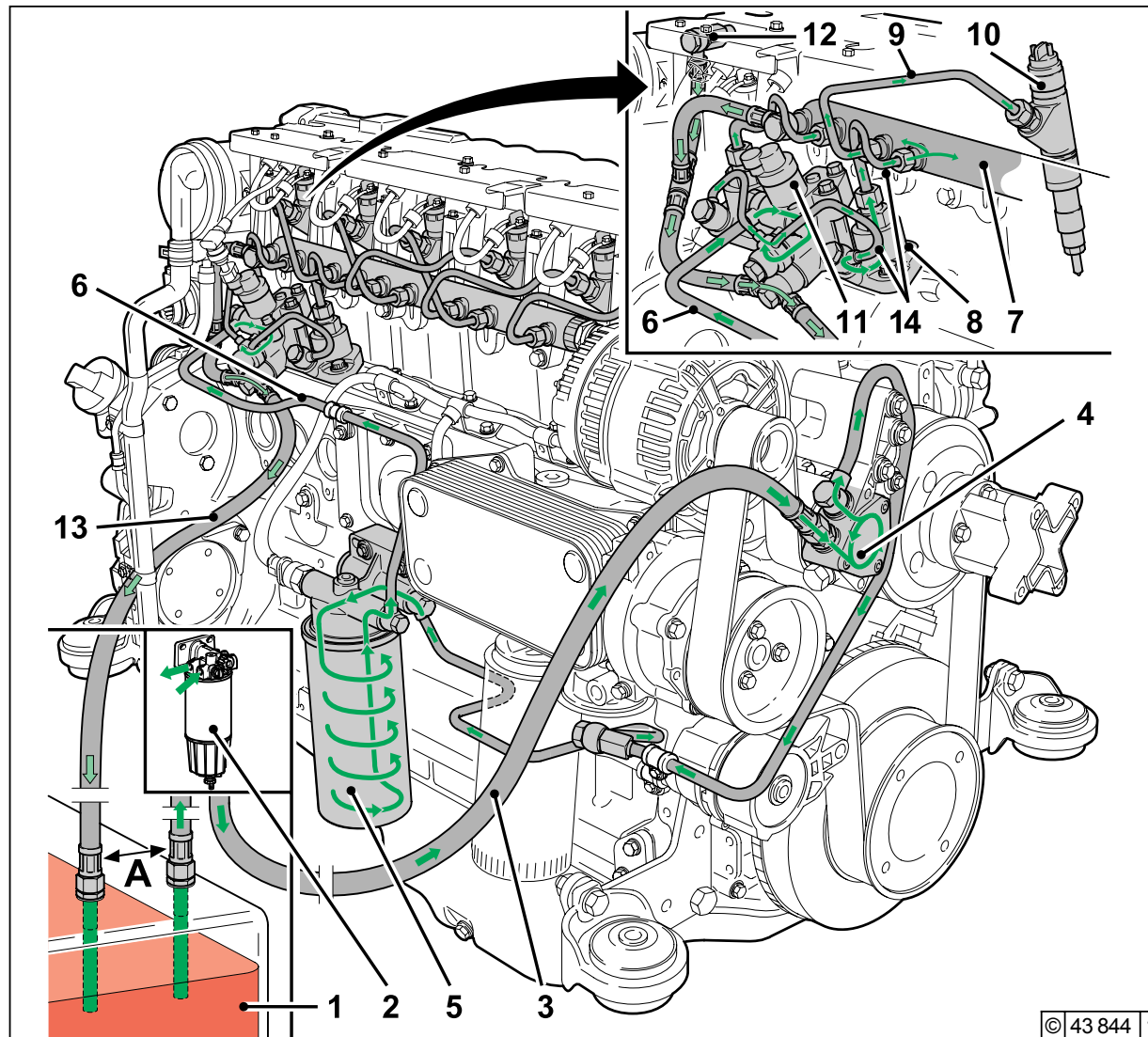


- 1 Oil tray
- 2 Intake pipe
- 3 Lube oil pump
- 3.1 Safety valve
- 4 Lube oil cooler
- 4.1 Return shutoff valve (only in 2012)
- 4.2 By-pass valve
- 4.3 By-pass valve oil filter
- 4.4 Pressure control valve
- 5 Exchangeable lube oil filter
- 6 Main oil pipe
- 6a Internal exhaust gas recirculation
- 7 Crankshaft bearing
- 8 Con rod bearing
- 9 Camshaft bearing
- 10 Line to injection nozzle
- 11 Injection nozzle for piston cooling
- 12 Tappet with rocker arm pulse lubrication
- 13 Stop rod, oil supply for rocker arm lubrication
- 14 Rocker arm
- 15 Return line to oil tray
- 16 Lube oil line to exhaust turbocharger
- 17 Exhaust turbocharger
- 18 Return line from compressor 2x
- 19 Compressor or hydraulic pump
- 20 Oil line to compressor or hydraulic pump
- 21 Return line from exhaust turbocharger

2.4 Fuel circuit

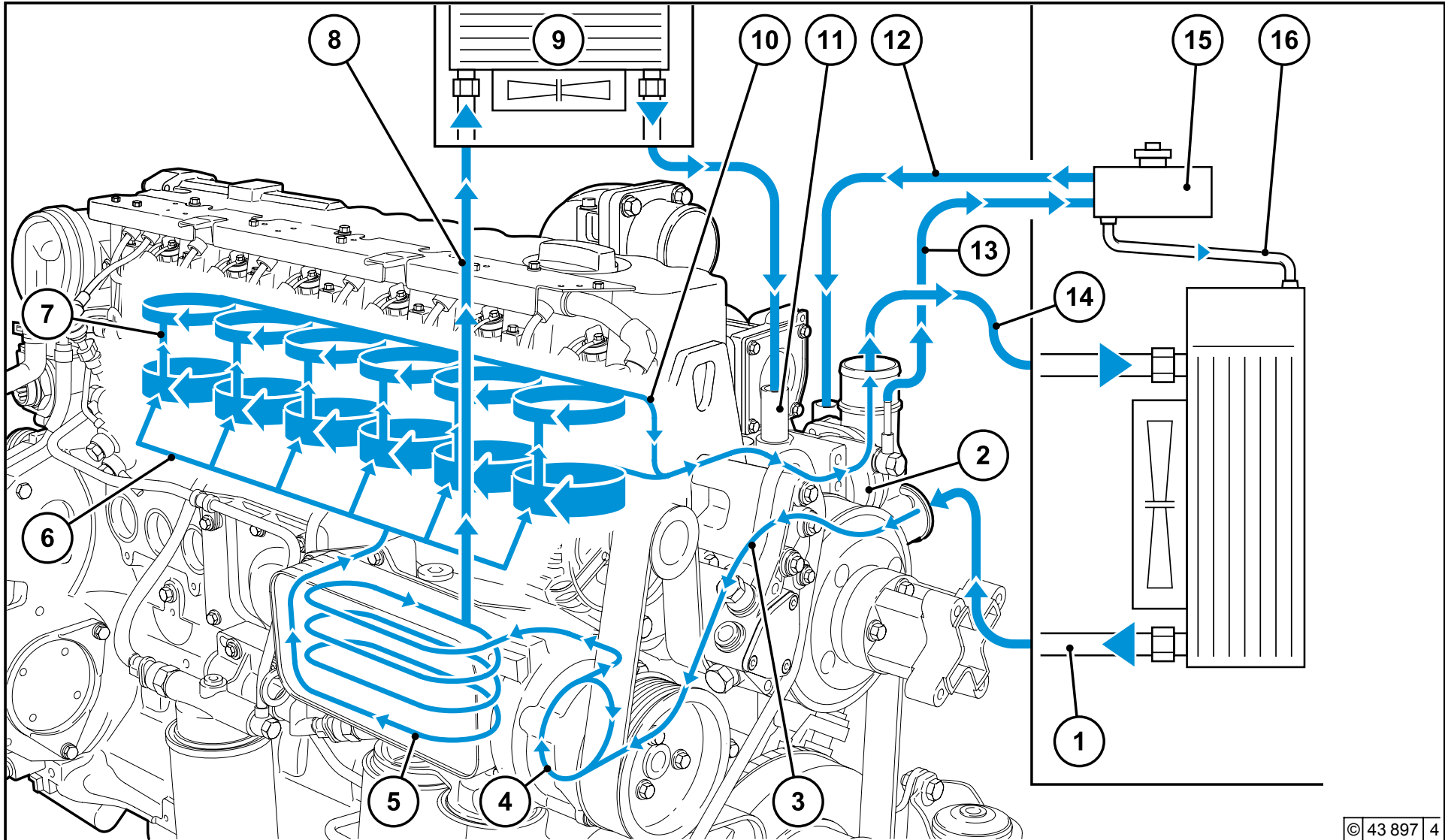
Engine description

2.4.1 Fuel diagram



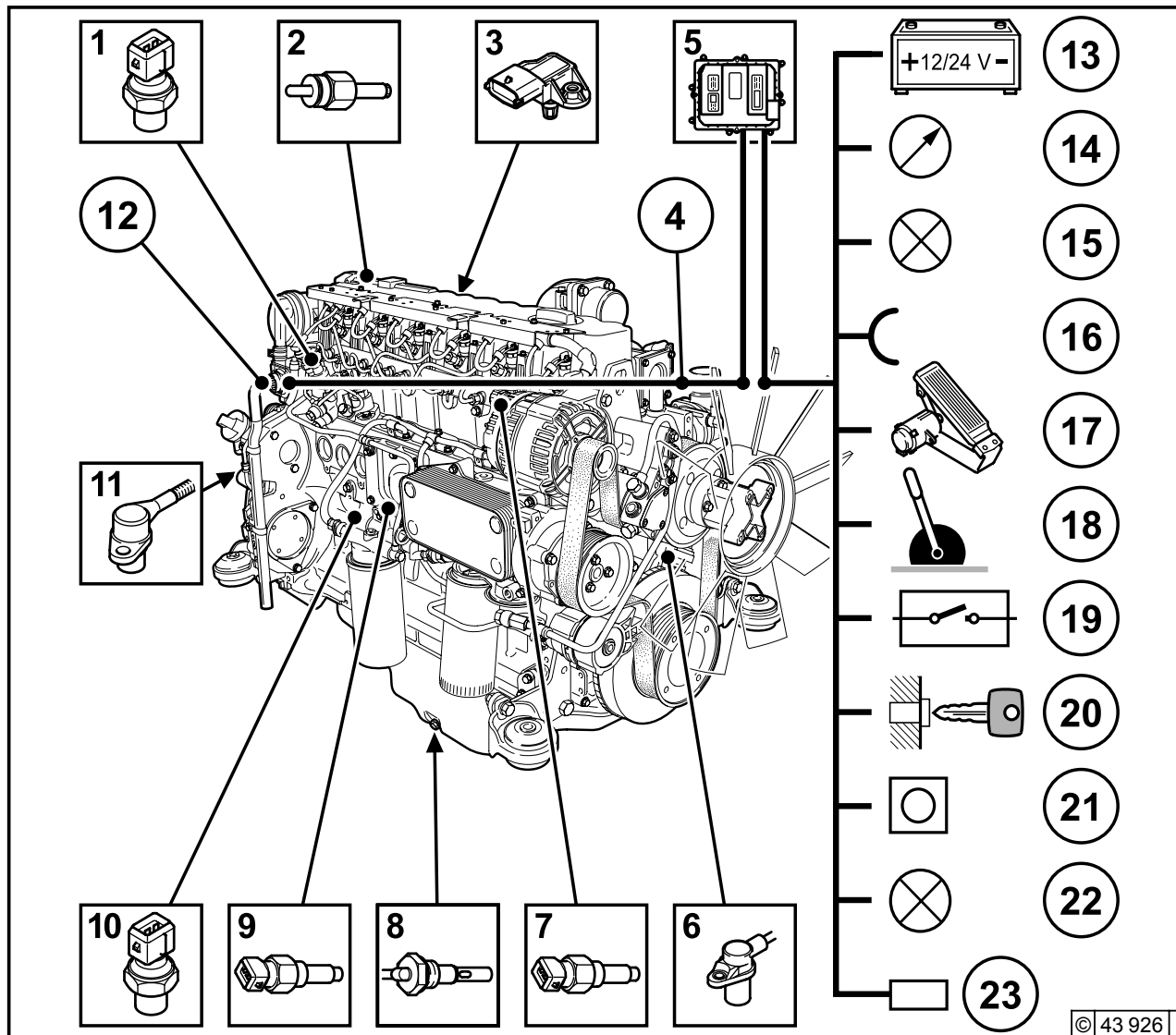
- 1 Fuel container
 - 2 Fuel pre-filter with pre-pressure pump possibility for filling the low pressure area (to be provided by the customer)
 - 3 Line to fuel pump
 - 4 Fuel pump
 - 5 Fuel filter
 - 6 Fuel supply line to fuel control unit
 - 7 Rail
 - 8 High-pressure pump
 - 9 Fuel line to injector
 - 10 Injectors
 - 11 Control block FCU (Fuel Control Unit)
 - 12 Fuel return at the cylinder head
 - 13 Fuel return line to the tank
 - 14 Fuel lines from the control block to the high-pressure pumps and to the rail
- A min. distance 500 mm

2.5.1 Coolant diagram (example)



- 1 Coolant outlet at the cooler
- 2 Thermostat
- 3 Coolant feed line to pump
- 4 Coolant pump
- 5 Lube oil cooler
- 6 Cylinder cooling
- 7 Cylinder head cooling
- 8 Coolant inlet to heating
- 9 Heating
- 10 Coolant to thermostat
- 11 Heating connection
- 12 Compensation line
- 13 Ventilation line to compensation tank
- 14 Coolant outlet to cooler
- 15 Compensation tank
- 16 Compensation line to heat exchanger

2.6.1 Electrical cable connections for monitoring



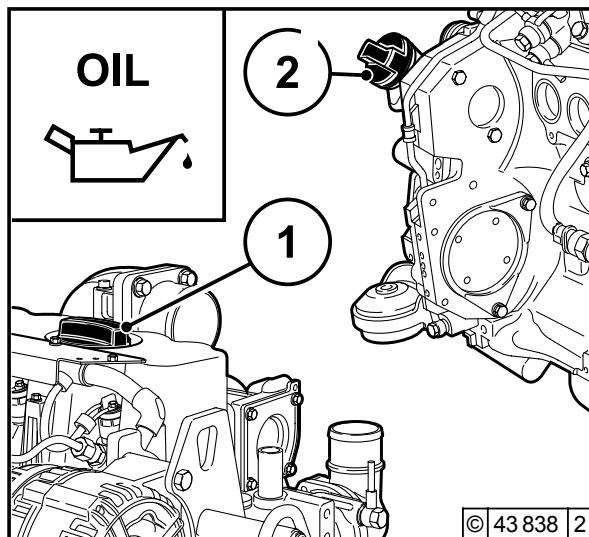
- 1 Solenoid valve EGR (optional)
- 2 Coolant temperature
- 3 Charge air pressure/temperature transmitter
- 4 Connection facility example:
Control unit not mounted on the engine
- 5 Engine control unit
- 6 Speed governor via crankshaft
- 7 Rail pressure, on side of rail
- 8 Oil level transmitter (optional)
- 9 Oil pressure transmitter
- 10 Fuel pressure
- 11 Speed governor via camshaft
- 12 Central plug (for engine control)
- 13 Power supply (battery)
- 14 Multifunction displays
- 15 Outputs (configurable, e.g. for lamps, torque (PWM), speed, engine running signal, etc.)
- 16 Inputs (configurable) (PWM/digital/analogue)
- 17 Accelerator pedal
- 18 Hand throttle (optional)
- 19 Switch functions (optional, e.g. for P factor, controller type, roof curves, fixed speeds, (etc. also multistage switches))
- 20 Key switch
Start/stop
- 21 Diagnosis button
- 22 Fault light with blink code
- 23 Diagnosis interface / CAN-Bus

Other application-side components (depending on the application)

- Water trap fuel filter, see chap. 6.2.3
 - Override key, see chap. 3.3.1 (for temporary bypassing of the engine protection functions)
 - Coolant level transmitter
 - Separate engine stop switch
 - Fan control
 - Switch for brake contact, engine brake, clutch
 - Drive speed sensor, drive speed control unit (+ - keys, for speed increase reduction)
 - Cold start aid control lamp, see chap. 3.2.1
- If there is a serious fault, e.g. the heating flange draws current although the control unit does not control it, this lamp flashes. The power supply to the heating flange **must** then be disconnected separately (overheating protection heating flange).

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

3.1.1 Filling engine oil



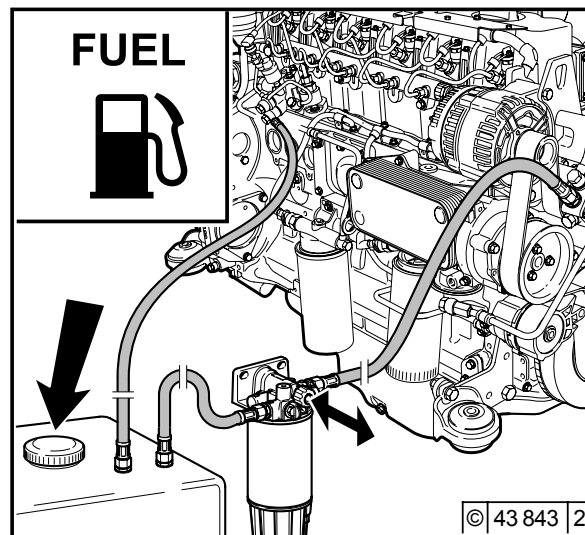
The engines are generally supplied without oil filling.

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.

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.

Bled the fuel low pressure system after filling, see 6.2.3.

Additional venting of the fuel system by a 5 minute trial run in idle or low load is absolutely essential.



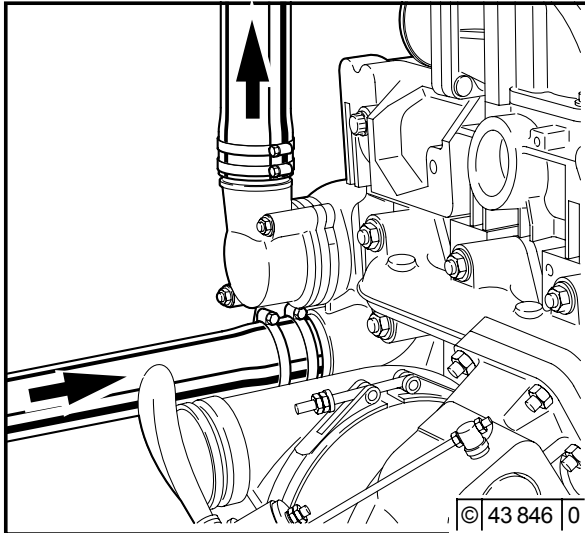
Oil may not be filled into the dust collecting tank of the pre-separator, if this is present.



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 connection coolant outlet 1 and coolant inlet 2 to the cooling system. Connect the lead line from the compensation tank to the water pump or to the coolant inlet pipe 2.
- Connect the bleed lines from the engine and poss. 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 run warm until the thermostat opens (line 1 heats up).
- Engine run with open thermostat 2 - 3 minutes.

- Check the coolant level in the compensation tank and top up the coolant if necessary.
- Repeat the process with engine start if necessary.



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

3.1.4 Other preparations

- 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
- Check V-belt, re-tighten if necessary, see 6.5.

- **Running-in**

Check the oil level twice a day during the running-in phase. After the running-in phase, checking once a day is sufficient.

3.2.1 Electrical starting



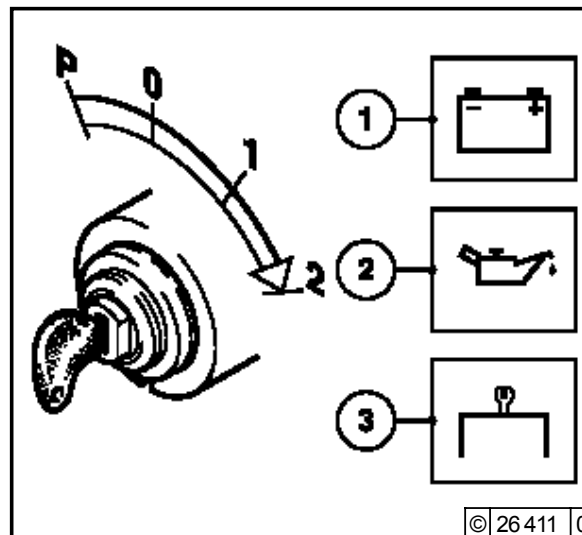
Before starting make sure that there is nobody in the engine/work machine danger area. After repairs: Check that all protective equipment is

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



- 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.

- 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.

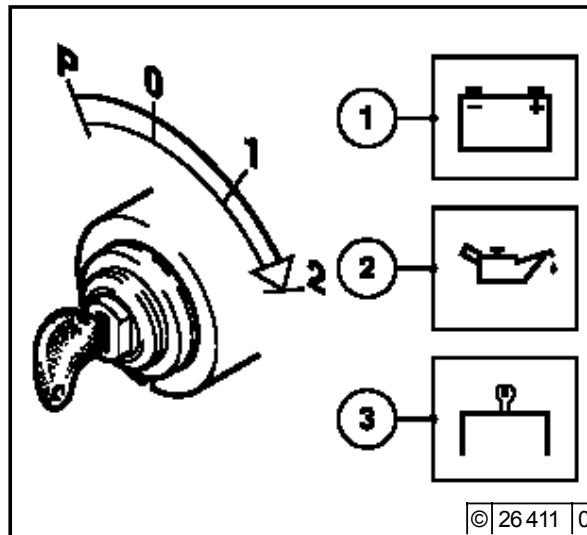
Start the engine for a maximum of 20 seconds uninterrupted. If the engine does not start up, wait for one minute and then repeat the starting process. If the engine does not start up after two starting processes, determine the cause as per fault table (see 7.1).

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.

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.

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:

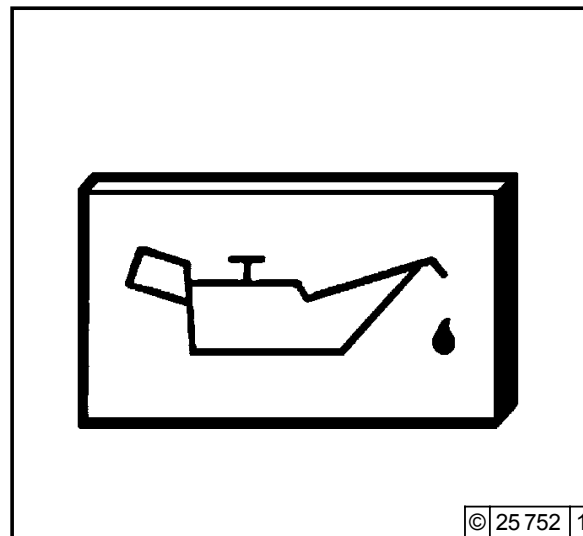
- There is an error in the system or a variable of the engine (temperature, pressure, etc.) is in the warning area. Depending on the error, the performance of the engine may be reduced by the EMR3 to protect the engine so that it is not in danger.

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.

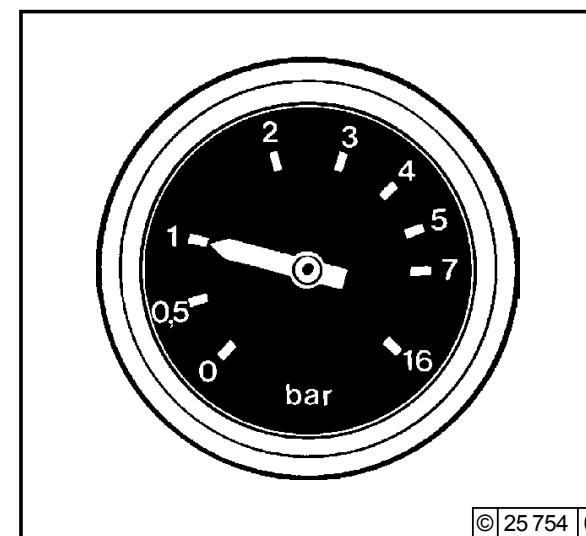
3.3.1 Engine oil pressure

Oil pressure light



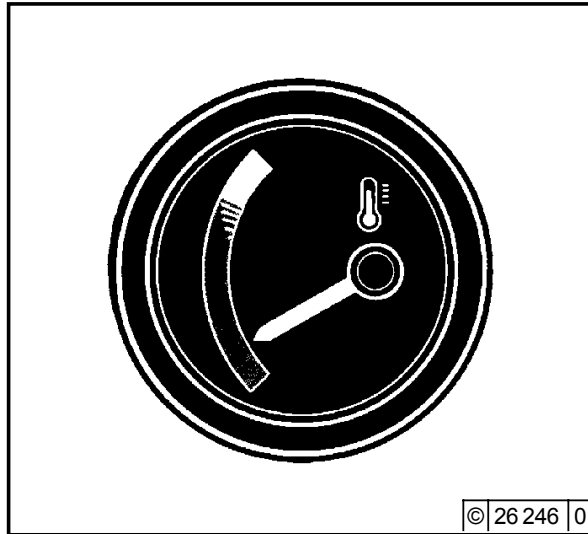
- The oil pressure light comes on for about 2s after switching on the system.
- The oil pressure light must be off when the engine is running.

Oil pressure gauge



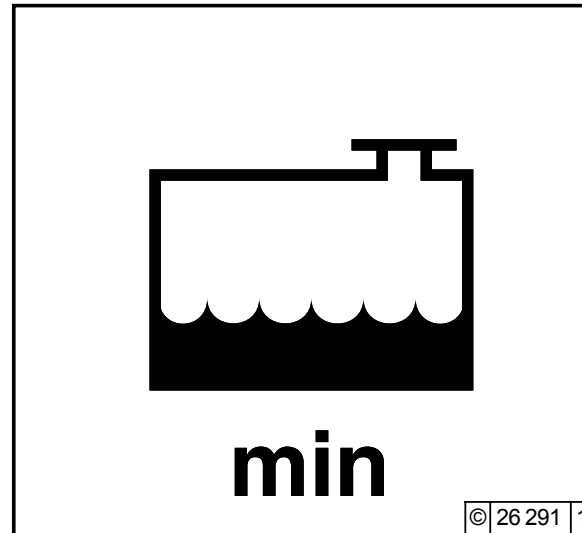
- Oil pressure gauge shows the lube oil pressure (minimum lube oil pressure, see chap. 9.1).

3.3.2 Coolant temperature



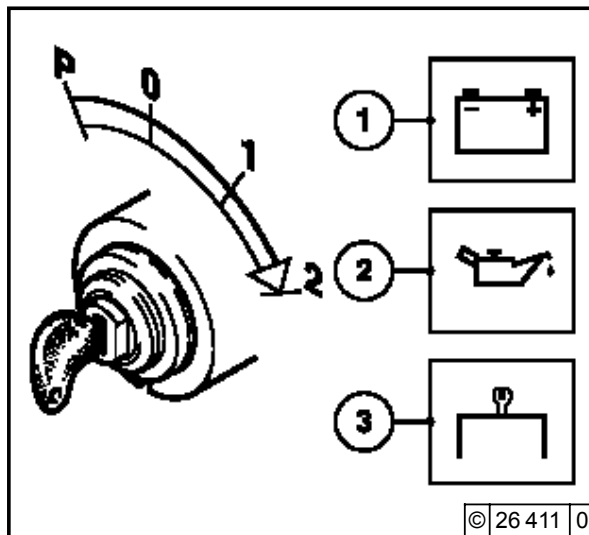
- The needle of the temperature display should always be in the green area, and only as an exception in the yellow/green area. If the needle rises into the orange area the engine is getting too hot. Switch off the engine and determine the cause as per fault table (see 7.1).

3.3.3 Coolant level



- Light on coolant level display comes on (contact is via float switch/ level probe if coolant level is below minimum):
Switch off the engine and determine the cause as per fault table (see 7.1).
- Function check of coolant level:
 - Coolant level OK: Light goes out

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.

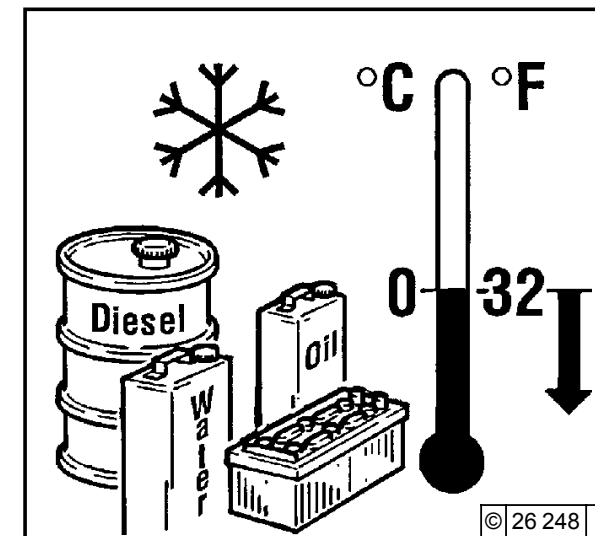


Avoid shutting down from full load operation if possible (coking/blockage of the remaining oil in the turbocharger bearing housing).

Lube oil is no longer supplied to the turbocharger! Run the engine after relieving the load for about one minute at low idling speed.

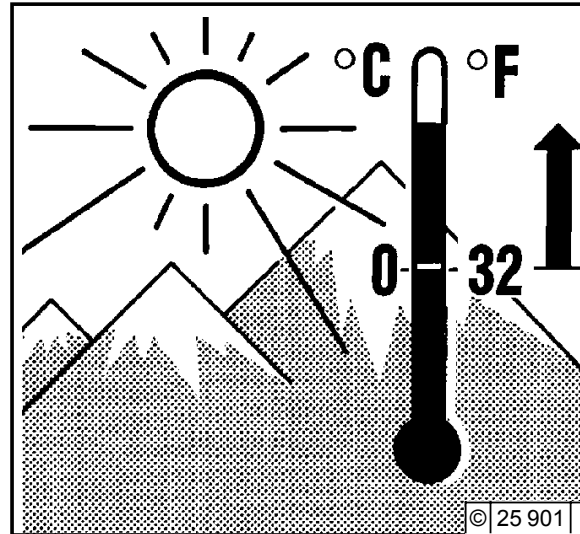
3.5.1 Winter operation

- 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 $-10\text{ }^{\circ}\text{C}$, see 6.1.1.
- Diesel fuel
 - Below $0\text{ }^{\circ}\text{C}$ use winter fuel, see 4.2.2.
- Coolant
 - Mixing ratio anti-freeze / water for lowest temperature (max. $-35\text{ }^{\circ}\text{C}$), see 4.3.1.
- Additional maintenance work
 - Check the fuel container weekly for contaminations, 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 plugs if necessary (see 3.2.1).
This does not only lower the starting limit temperature, but also simplifies starting at temperatures which do not 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. $20\text{ }^{\circ}\text{C}$ (dismantle and store in a warm room) lowers the starting limit temperature by $4\text{--}5\text{ }^{\circ}\text{C}$.



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 1500 m altitude and a temperature of 30 °C is permissible, for stationary operation 1000 m altitude and a temperature of 40 °C is permissible.
When using the engine under adverse conditions (high altitude or high temperature) the amount of fuel power injected is reduced and the amount of fuel injected and with it the engine power.
- In case of doubt regarding engine usage, please 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

General

Modern diesel engines place very high demands on the lube oil to be used. The specific engine performances which have increased constantly over the last few years lead to an increased thermal load on the oil and also the oil is more exposed to contamination due to reduced oil consumption and longer oil change intervals. For this reason it is necessary to observe the requirements and recommendations described in this instruction manual in order not to shorten the life of the engine.

Lube oils always consist of a basic oil and an additive package. The most important tasks of a lube oil (e.g. wear protection, corrosion protection, neutralization of acids from combustion products, prevention of coke and soot deposits on engine parts) are assumed by the additives. The properties of the basic oil are also decisive for the quality of the product, e.g. with regard to thermal load.

Mixing of engine oils should be avoided because the worst properties of the mixture are always dominant. Basically all engine oils are mixable so that a complete lube oil change from one oil type to another is unproblematical under the aspect of mixability.

The **lube oil quality** has a considerable influence on the life, performance and thus also on the cost-effectiveness of the engine.

It basically applies that: the better the lube oil quality, the better these properties.

The **lube oil viscosity** describes the flow behavior of the lube oil dependent on the temperature. The lube oil viscosity has no influence and effect on the lube oil quality.

Synthetic lube oils are used increasingly and have advantages. These oils have a better temperature and oxidation stability as well as a relatively low cold viscosity. Since some processes relevant to the definition of the lube oil change intervals are not essentially dependent on the lube oil quality (such as the entry of soot and other contaminations), the lube oil change interval when using synthetic lube oils may not be increased in relation to the specifications of the lube oil change intervals section 6.1.1.

Biodegradable lube oils may be used in DEUTZ engines if they meet the requirements of this operating manual.

4.1.1 Quality

Lube oils are classified by DEUTZ according to their performance and quality class (**DQC : Deutz Quality Class**). It basically applies that the lube oils are more efficient or higher quality with ascending quality class (DQC I, II, III, IV).

The annex (- 02, - 05) specifies in what year the classification was created.

Lube oils according to other, comparable specifications can be used as long as they meet the DEUTZ requirements. In regions in which none of these qualities is available, please contact the DEUTZ Service responsible.

The following lube oils are prescribed for the engines of this operating manual:

TCD 2012 / 2013 2V

with open crankcase bleeding:

DQC II - 05

DQC III - 05

DQC IV - 05

DEUTZ lube oil quality classes	DQC I - 02	DQC II - 05	DQC III - 05	DQC IV - 05
ACEA classification (Association des Constructeurs Européen d'Automobiles)	E2 - 96	E3 -96 / E5 - 02 E7 - 04	E4 - 99 / E6 - 04 or according to table T 4-1-3	Table T 4-1-4
or API classification (American Petroleum Institute)	CF / CF - 4	CG - 4 / CH-4 / CI-4	-	-
or worldwide classification	-	DHD - 1	-	-

The best results are achieved with DEUTZ lube oils. These can be ordered from DEUTZ Service with the order number.

DEUTZ lube oil quality classes	DQC II - 05		DQC III - 05	
	Container	Order no.	Container	Order no.
Lube oil type	DEUTZ ÖITLS - 15W-40 D		DEUTZ ÖITLX - 10W-40 FE	
	5 liter	0101 6331	5 liter	0101 6335
	20 liter	0101 6332	20 liter	0101 6336
	209 liter	0101 6333	209 liter	0101 6337
	Tank store	0101 6334	Tank store	0101 6338

Operating substances

4.1 Lube oil

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Manufacturer	DEUTZ lube oil quality level		DQC III-05
	Lube oil type	SAE class	Availability
DEUTZ	DEUTZ oil TLX-10W40FE	10W-40	Europe
ADDINOL	ADDINOL Super Truck MD 1048 ADDINOL Ultra Truck MD 0538	10W-40 5W-30	Europe, Asia Europe, Asia
AGIP	Agip Sigma Ultra TFE Autol Valve Ultra FE	10W-40 10W-40	worldwide Germany
ARAL	Aral MegaTurboral Aral SuperTurboral	10W-40 5W-30	worldwide worldwide
AVIA	TURBOSYNTH HT-E	10W-40	Germany
BAYWA	BayWa Super Truck 1040 MC BayWa Turbo 4000	10W-40 10W-40	Southern Germany Southern Germany
BP OIL International	BP Vanellus E7 Plus BP Vanellus E7 Supreme BP Vanellus C8 Ultima	10W-40 10W-40 5W-30	Europe Europe Europe
Bucher AG	MOTOREXFARMER	10W-40	Europe
Castrol	Castrol Enduron Plus Castrol Enduron Castrol Elexion	5W-40 10W-40 5W-30	Europe, America, Australia, South Africa Europe, America, Australia, South Africa USA
CEPSA	EUROTRANS SHPD	10W-40	Spain, Portugal
CHEVRON	Chevron Delo 400 Synthetic	5W-40	North Amerika
ESSO	Essolube XTS 501	10W-40	Europe
FUCHS EUROPE	Fuchs Titan Cargo MC Fuchs Titan Unic Plus MC	10W-40 10W-40	worldwide worldwide
MOBIL OIL	Mobil Delvac 1 SHC Mobil Delvac 1 Mobil Delvac XHP Extra	5W-40 5W-40 10W-40	Europe, SE Asia, Africa worldwide Europe, SE Asia
OMV AG	OMV super Truck OMC truck FE plus	5W-30 10W-40	Europe Europe
Ravensberger Lube oil refinery	Ravenol Performance Truck	10W-40	Germany
Salzbergen	Wintershall TFG	10W-40	Europe varies
Texaco	Ursa Super TDX Ursa Premium FE	10W-40 5W-30	Europe Europe
TOTAL	TOTAL RUBIA TIR 8600 EXPERTY	10W-40 10W-40	worldwide worldwide

DEUTZ lube oil quality level DQC IV-05			
Manufacturer	Lube oil type	SAE class	Availability
FUCHS EUROPE	Fuchs Titan Cargo SL	5W-30	worldwide
SHELL International	Shell Rimula Ultra Shell Rimula Ultra	5W-30 10W-40	Europe, code country-specific, varies Europe, code country-specific, varies

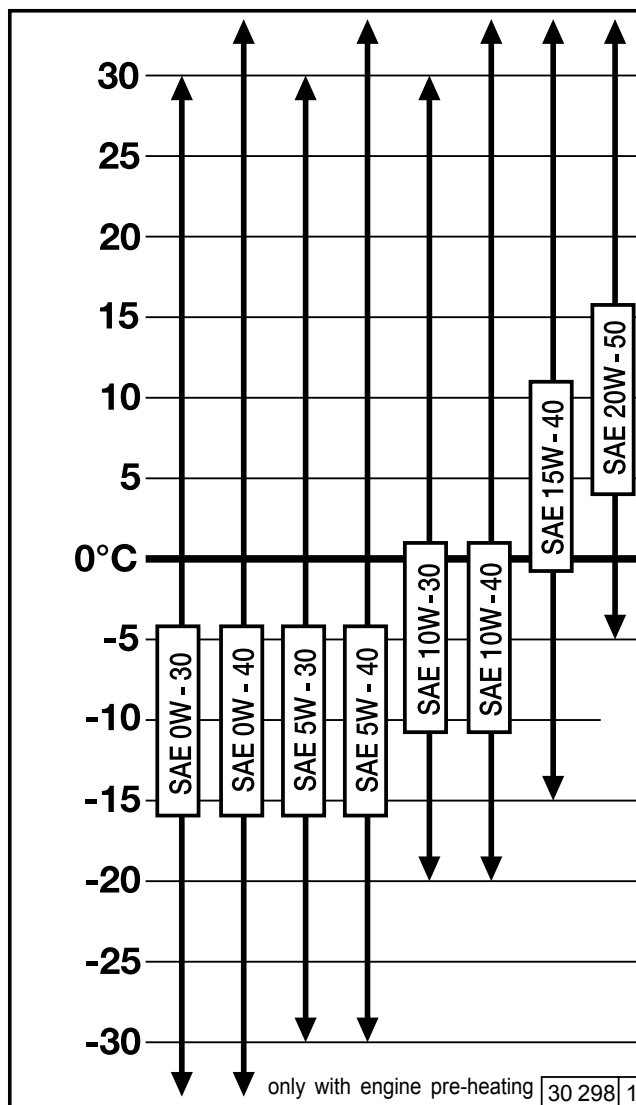
T 4-1-4 Release list for DEUTZ lube oil quality class DQC IV - 05

4

4.1.2 Quality

The ambient temperature at the installation site or area of application of the engine is decisive for the choice of the right viscosity class. Too high a viscosity can lead to starting difficulties, too low a viscosity can endanger the lubrication effect and cause high lube oil consumption. At ambient temperatures below 40°C the lube oil must be pre-heated (e.g. by storing the vehicle or machine in a shed). The viscosity is classified according to SAE. Multipurpose oils should be used basically. Single purpose oils can also be used in closed, heated rooms at temperatures >5 °C. The specified lube oil qualities must also be single purpose oils of course.

Depending on the ambient temperature we recommend the following common viscosity classes:



4.2.1 Quality

The following fuel specifications are permitted:

- Diesel fuels according to DIN EN 590
- US diesel fuel according to ASTM D 975 Grade-No 1-D and 2-D
- Japanese diesel fuel JIS K 2204 Grade 1 Fuel and Grade 2 Fuel with lubricating properties according to diesel fuel EN 590 (HFFR max. 460 micrometer according to EN ISO 12156)

Use commercially available diesel fuels with a sulfur content below 0.5%. If the sulfur content is higher, the lube oil change intervals must be reduced (see 6.1.1).

If other fuels are used which do not meet the requirements of this instruction manual, the warranty will be voided.

The certification measurements to satisfy the legal emission limits are performed with the test fuels defined by law. These correspond to the diesel fuels according to EN 590 and ASTM D 975 described in this operating manual. No emission values are guaranteed with the other fuels described in this instruction manual.

4.2.2 Winter fuel

For the engines TCD 2012/2013 2V and TCD 2012/2013 4V which are operated with fuel according to ASTM D 975 1-D/2-D, adding paraffin is not permissible.

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 up to 30 % as per the diagram on the right.

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

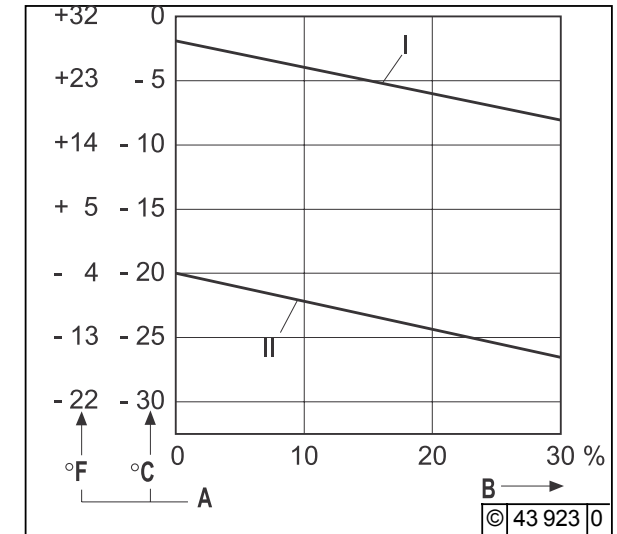


Diagram key:	
I	Summer diesel fuel
II	Winter diesel fuel
A	Outside temperature
B	Paraffin mixing proportion



Only carry out mixing in the tank! First pour in the necessary amount of paraffin, then the diesel fuel. Addition of normal and super petrol is not permitted.

4.3.1 General

In liquid-cooled engines, the coolant must be conditioned and monitored otherwise the engine may incur damage due to:

- corrosion,
- cavitation,
- freezing.

The correct water quality is important for conditioning the coolant. Basically, clear, clean water within the following analysis values must be used:

Analysis values	min.	max.
ph value at 20 °C	6.5	8.5
Chloride ion content[mg/dm ³]	-	100
Sulfate ion content[mg/dm ³]	-	100
Total hardness *1 [°dGH]	3	12

*1 carbonate hardness proportion of total hardness min 3 dGH.

Water quality data are obtainable from the local waterworks.

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

The water must be treated if it deviates from the analysis values.

- pH value too low:

Addition of diluted caustic soda or caustic potash solution. Small sample mixtures are advisable.

- Total hardness too high:

Mix with softened water *2

- Total hardness or carbon hardness too low:

Mix with harder water *3

- Chloride and / or sulfate too high:

Mix with softened water *2

*2 Softened water is a distilled water, pH neutral condensate or water treated with ion exchangers.

*3 Harder water is available in most cases in the form of drinking water (city water).

4.3.2 Coolant preparation

The coolant for liquid-cooled DEUTZ compact engines is conditioned by mixing an antifreeze with ethylene-glycol-based corrosion protection inhibitors into the water.

The best results are achieved with DEUTZ cooling system preservatives:

Container	Order no.
5 liter container	0101 1490
20 liter container	0101 6416
210 liter container	1221 1500

This cooling system is free from nitrite, amine, phosphate and adapted to the materials in our engines. Order from your DEUTZ Service

If the DEUTZ cooling system preservative is not available, a coolant according to T 4-1-5 can be used.

Coolants of product group A or B respectively can be mixed.

Coolants of product group A may not be mixed with coolants of product group B.

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 (e.g. refractometer).

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

At temperatures below -35°C, please consult your responsible DEUTZ Service.

It is possible to use other cooling system preservatives (e.g. chemical corrosion preservatives) in exceptional cases. Consult DEUTZ Service.



The mixing of nitrite based cooling system preservatives with amine-based agents forms nitrosamines which are hazardous to the health!

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**

check= ● set=○ clean=▲ renew= ■										Industrial 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				
↓ check 2x daily before or during the 1st trial run, during the running-in phase or when commissioning new and overhauled engines												Activity		Section
↓ every 10 oh or daily														
E10	E20	in operating hours (oh)						every year(s)		Activity		Section		
		E30 500	E40 1,000	E45 1,500	E50 3,000	E60 6,000	E70 12,000	1	2					
●	●									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			
			■ ¹⁾							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)				
			●							Check function of heating plug / heating flange				
			●							Battery and cable connections	6.7.1			
●			●							Engine monitoring, warning system ²⁾	3.3 #			
					○					Valve clearance / control piston clearance (exhaust gas return)	6.6.1			
●		●				■			■	V-belt (re-tighten if necessary)	6.5.1			
●			●		●	■				V-rib belt/tension pulley (renew when wear limit reached)	6.5.1			
			●		■					Crankcase pressure bleed valve	#			
●	●									Engine tightness (visual inspection for leaks)	–			
●			●							Engine mounting (renew in case of damage)	9.2			
●			●							Fastenings, hose connections / clamps	–			
							■			General overhaul	#, 5.1.1			

¹⁾ The maintenance interval must be halved for contaminated fuel or poor quality fuel.

²⁾ If the warning system (light/siren) is activated, the fuel pre-filter must be emptied immediately.

5.1 Maintenance schedule

Maintenance

5

check= ● set= ○ clean= ▲ renew= ■							Enhancements or modifications for engines with EPA acceptance 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	Section
max. permissible job times in operating hours (oh) every									
↓ check 2x daily before or during the 1st trial run, during the running-in phase or when commissioning new and overhauled engines									
↓ every 10 oh or daily									
E10	in operating hours (oh)			every year(s)		Activity			
	E30 500	E40 5,000	E70 12,000	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
		■				Injector			#
	●	▲				Charge air cooler (drain lube oil/condensation)			#
	●	▲				Charge air cooler inlet surface (clean if necessary)			#
					■	Crankcase bleeding valve			#
		■				Exhaust turbocharger compressor outlet			-

5.1 Maintenance schedule

Maintenance

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
10 oh or 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
3000 oh	E 50	partial overhaul	authorised specialists
5000 oh (EPA)	E 60	extended partial overhaul	authorised specialists
6000 oh	E 60	extended partial overhaul	authorised specialists
12000 oh ^{*)}	E 70	general overhaul	authorised specialists

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

Maintenance

5.2 Maintenance diagram

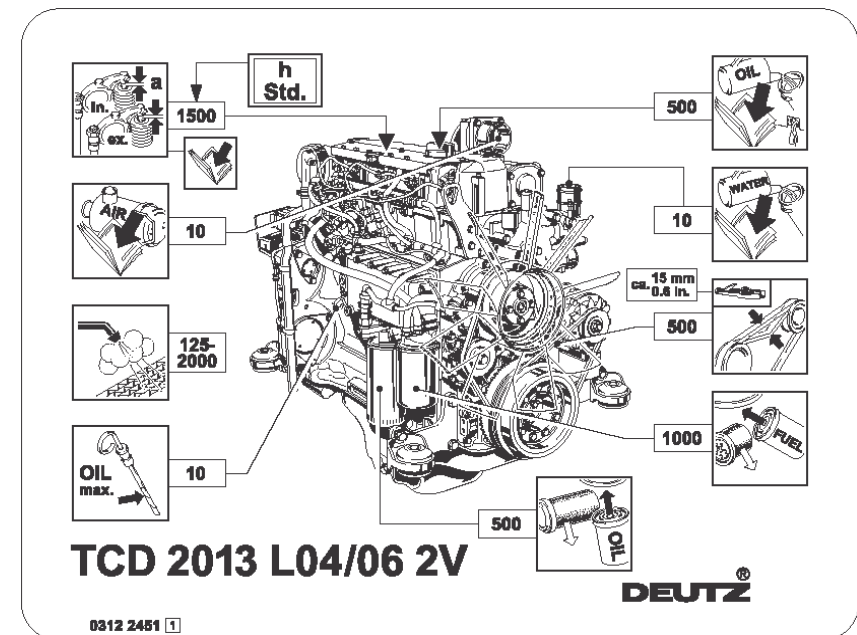
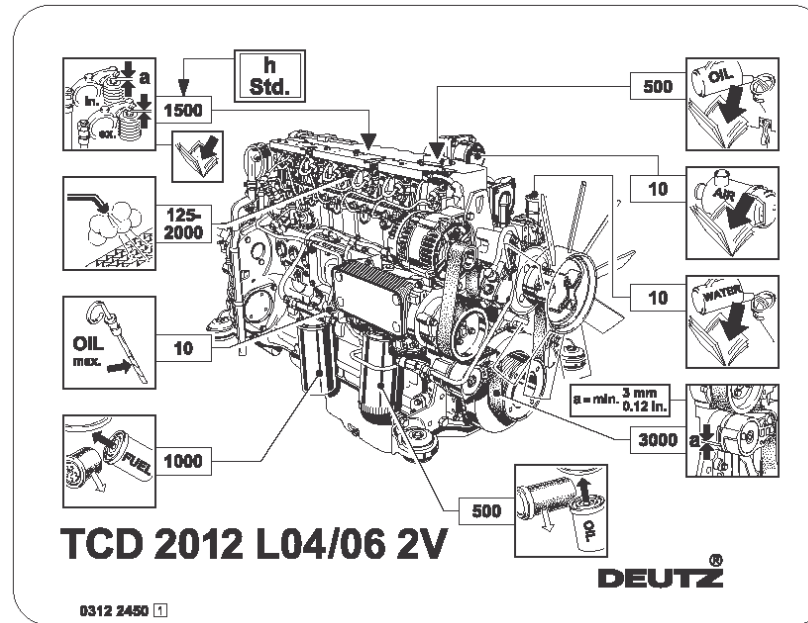
5

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.



© 2005



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.

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.

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			11000		
11125			11250		
11375			11500		
11625			11750		

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**

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 -10 °C (+14 °F)
 - For fuels
 - with sulphur content > 0.5 to 1%
- or
- Constant ambient temperatures < -10 °C (+14 °F)
- 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.

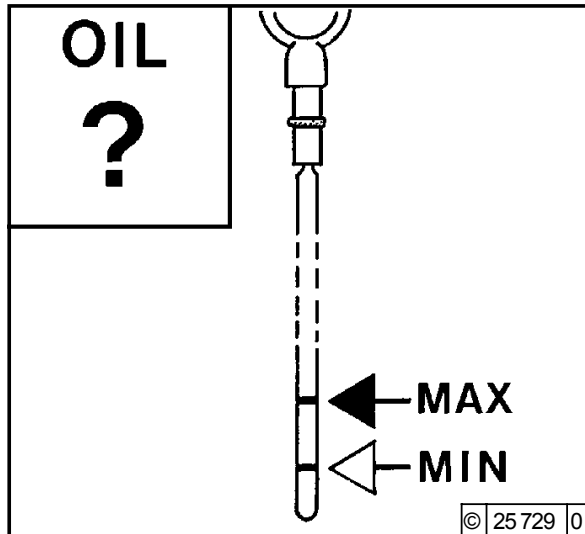
Carry out oil changes on warm engine when the engine is not running (lube oil temperature < 80 °C).

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 chap 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 2012 L04/06 2V	Crankcase ventilation: open	-	500	500	500
TCD 2013 L04/06 2V	Crankcase ventilation: open	-	500	500	500

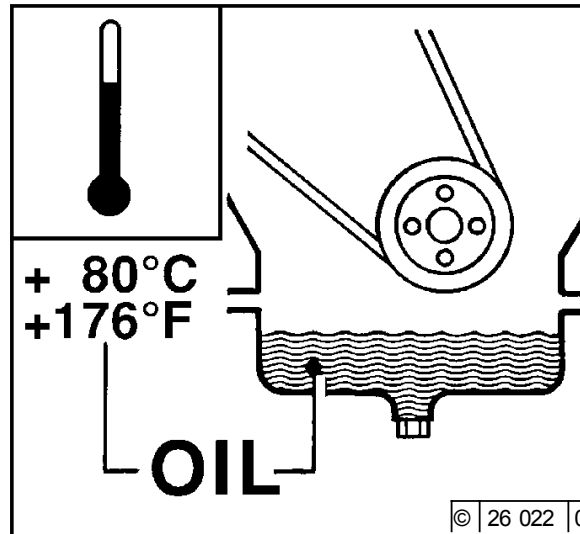
6.1.2 Checking oil level, changing engine oil

6.1.2.1 Checking oil level

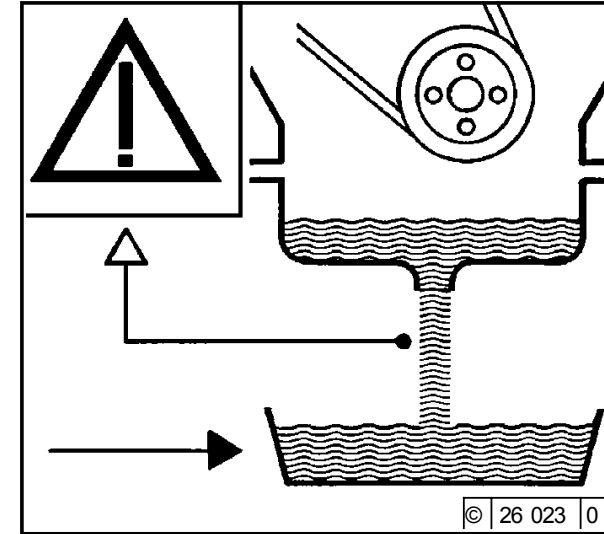


- Position the engine or vehicle so as to be level.
 - **Engine warm:**
Switch off the engine, wait for 5 minutes and check the oil level.
 - **Engine cold:**
Check oil level.
- Extract oil dipstick.
- Wipe with a fibre-free, clean cloth.
- Insert until it stops and extract again.
- Check oil level and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

6.1.2.2 Changing engine oil



- Warm up the 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.

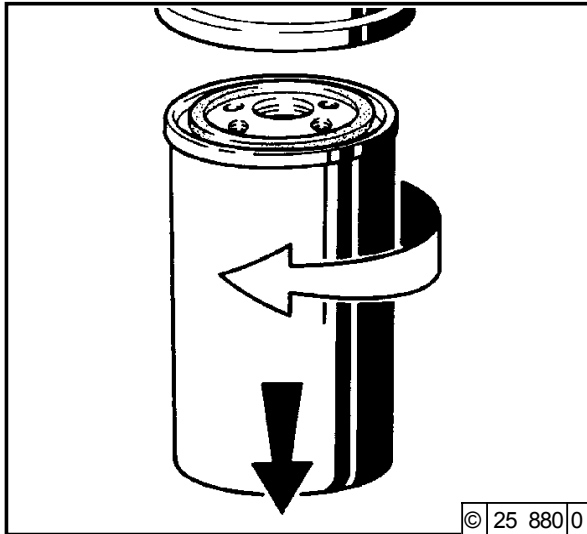


- Drain off oil.
- Screw in oil drain screw with new sealing ring and tighten. (For tightening torque see 9.2).
- Fill lube oil
 - For quality / viscosity data see 4.1.
 - For filling quantities, see 9.1
- Check oil level, see 6.1.2.1

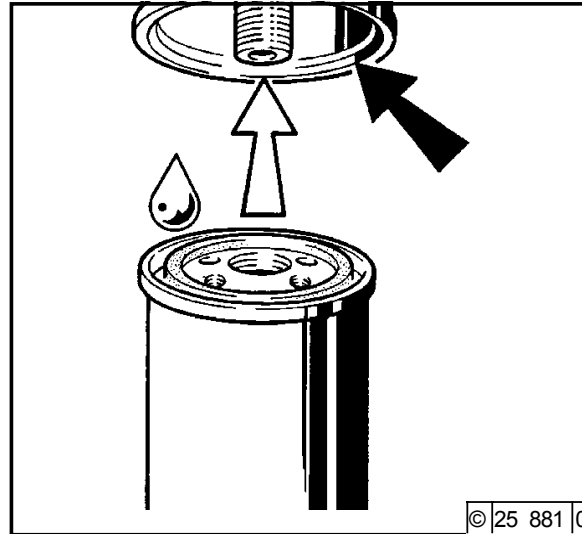


Caution when draining hot oil: danger of scalding!
Collect the used oil, do not allow to seep into floor! Dispose of according to instructions!

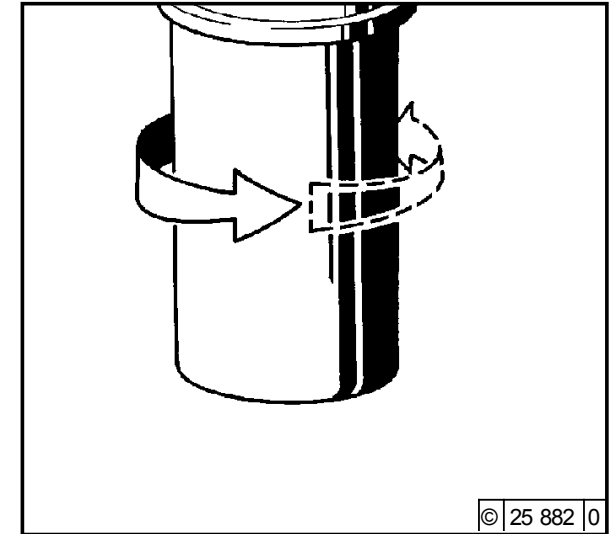
6.1.3 Changing oil filter



- 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 dirt there may be.
- Lightly oil the rubber seal of the new lube oil cartridge.
- Screw on the cartridge by hand until the seal makes contact.

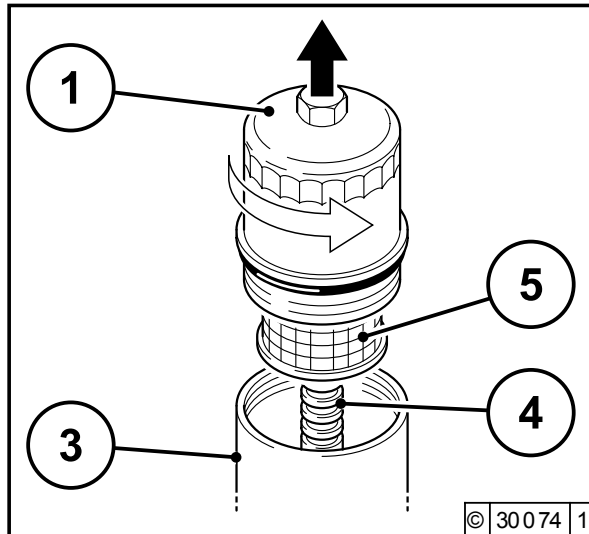


- Tighten the lube oil filter cartridge with a three-quarter turn (about 10 Nm).
- Check the seal of the lube oil cartridge for tightness.
- Check oil level, see 6.1.2.

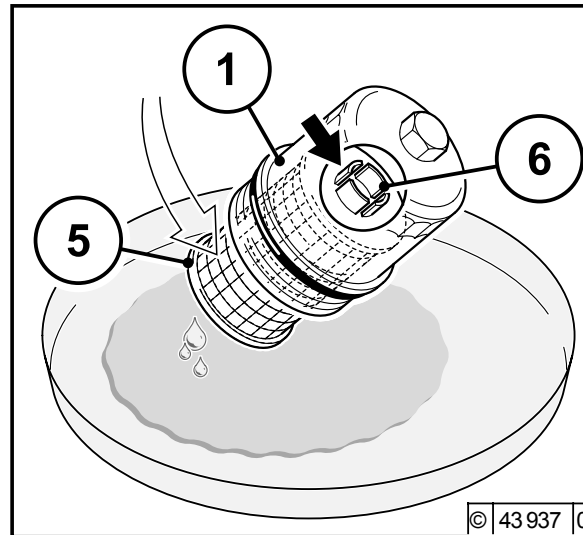


Careful with hot oil:
danger of scalding!

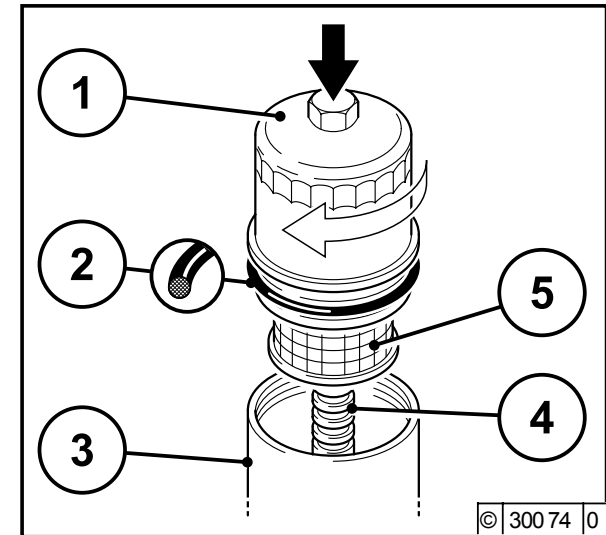
6.1.4 Cleaning / changing oil filter (cup)



- 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.

Regulations for working on the fuel system



Engine must be switched off!
Smoking and naked lights prohibited!

No injection/high pressure pipes may ever be disconnected

when the engine is running.

Caution when handling hot fuel!

Pay attention to absolute cleanliness when refueling and working on the fuel system! Clean the vicinity of the components concerned carefully. Blow damp areas dry with compressed air.

Observe the safety regulations and national regulations for handling fuels.

Dispose of leaked fuel and filter elements according to regulations. Do not allow fuel to seep into the ground.

After working on the fuel system, bleed it, conduct a test run and check for leaks.

Additional venting of the fuel system by a 5 minute trial run in idle or low load is absolutely essential.

Additional regulations for DEUTZ Common Rail Systems



Danger to life! Never work on the fuel system with the engine running. The system is under high pressure!

Do not stand near to a leak in the

high pressure system because fuel jet can cause severe injury! After switching off the engine, wait 30 seconds before working on the fuel system. In the event of leaks in the fuel system contact your DEUTZ Service immediately!

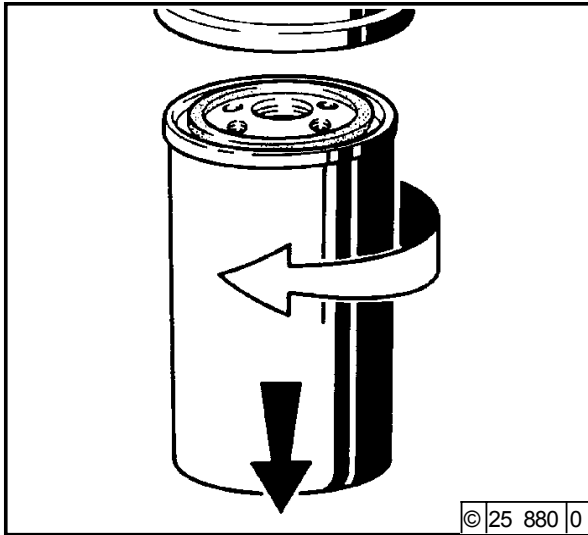
Cleanliness hints and measures for handling DEUTZ Common Rail Systems

Pay attention to extreme cleanliness due to the high-precision technology!

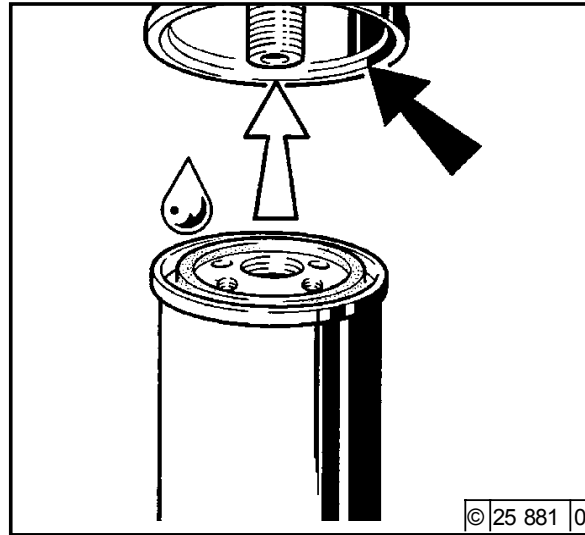
The fuel system must be tight and closed. Inspect visually for leaks/damage in the system.

Clean the engine and engine compartment thoroughly and dry before starting work. Cover engine compartment areas from which dirt could be loosened with fresh, clean foil. Work on the fuel system may only be carried out in an absolutely clean environment. Air contamination such as dirt, dust, moisture etc. must be avoided.

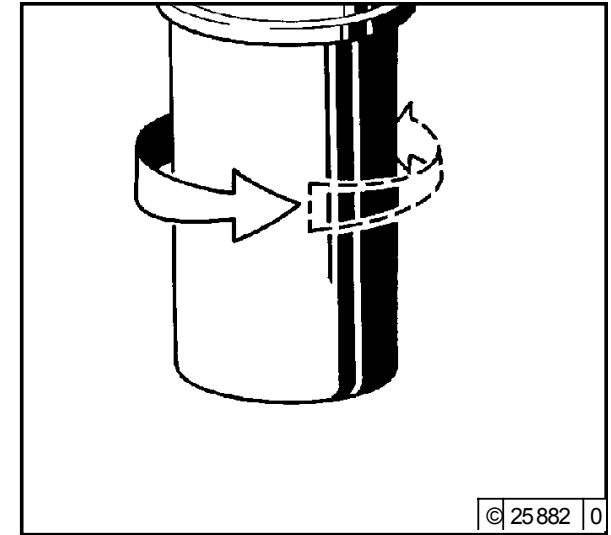
6.2.1 Changing fuel filter



- 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 filter support.



- Lightly oil the 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 a three-quarter turn (10 Nm).
- Open fuel stopcock.
- Check for tightness.

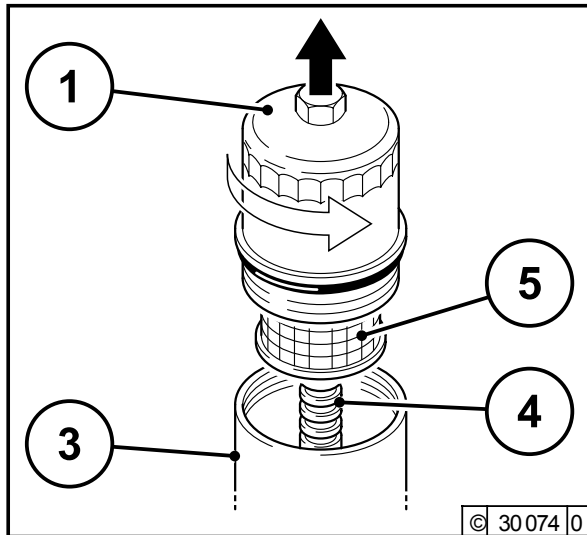


No open fire when working on the fuel system! Do not smoke! Pay attention to cleanliness as the fuel system (rail) is very sensitive!!!

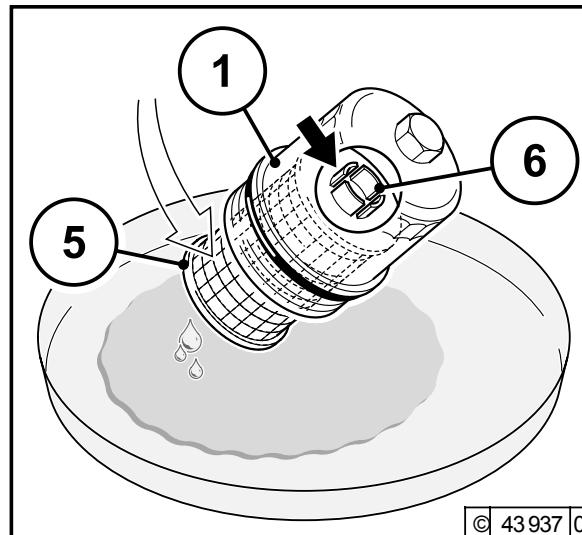


Venting of the fuel system is necessary, see chapter 6.2.3.

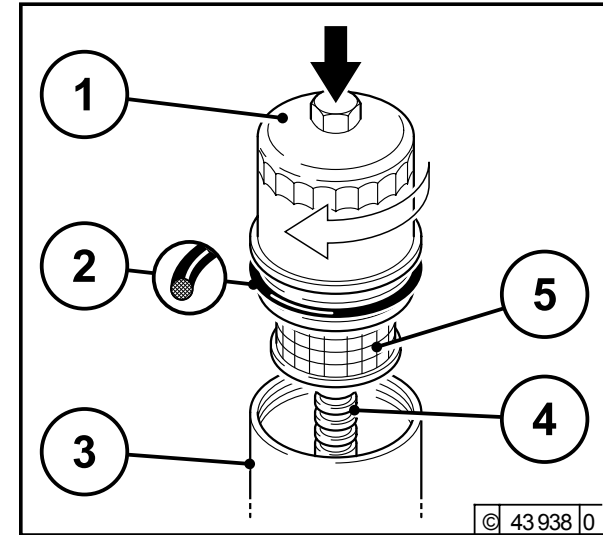
6.2.2 Cleaning / changing fuel filter (cup)



- Switch off engine.
- Loosen fuel filter cover 1 with two or three turns and wait for 30 seconds.
- Unscrew fuel 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 fuel which may run out.
- Slightly bend paper filter cartridge 5 sideways in the collecting vessel until the cartridge is loosened from clamp 6.
- 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.

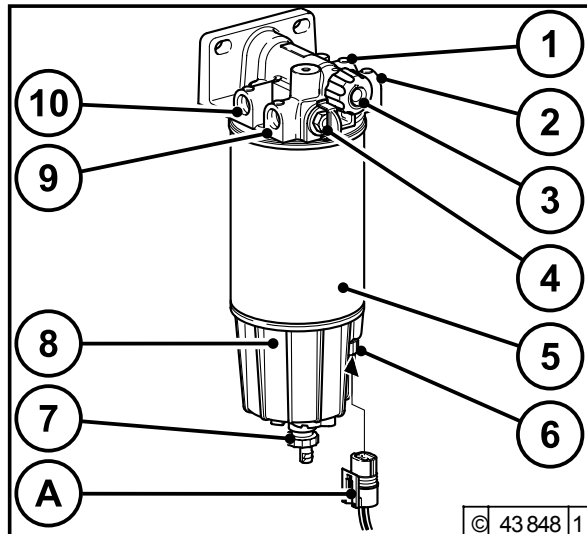


- Change the round sealing ring 2 and lightly oil.
- Press new paper filter cartridge 5 into the clip 6 and insert carefully in the guide 4 together.
- Tighten the fuel filter cover 1 in clockwise direction (25 Nm).
- Start the engine.
- Check fuel filter attachment for tightness.



Only work on the fuel system when the engine is switched off. Wait at least 30 seconds. No open fire! Do not smoke! Dispose of used fuel in an environmentally friendly manner. Venting of the fuel system is necessary, see chapter 6.2.3.

6.2.3 Fuel pre-filter, changing / bleeding 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 carry on pumping a few more times (the return pipe must be filled).
- Start the engine and run for about 5 minutes in idle or low load. Check the pre-filter for leaks.
- Perform some more pumping movements. (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
- A Connection for electr. warning lamp / siren



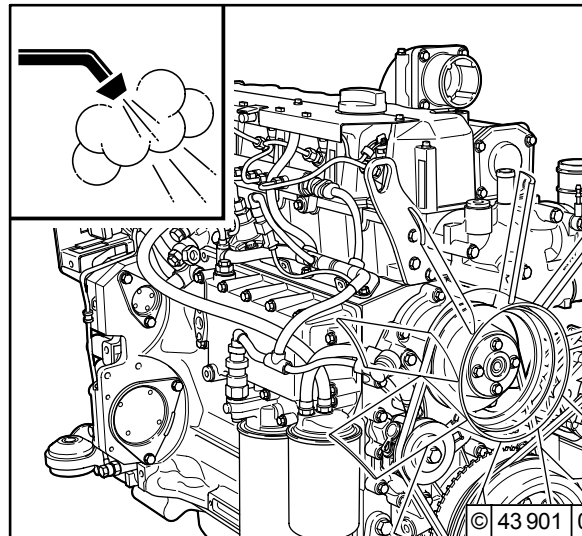
Only work on the fuel system when the engine is switched off. No open fire! Do not smoke! Dispose of used fuel in an environmentally friendly manner.

6.3.1 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.

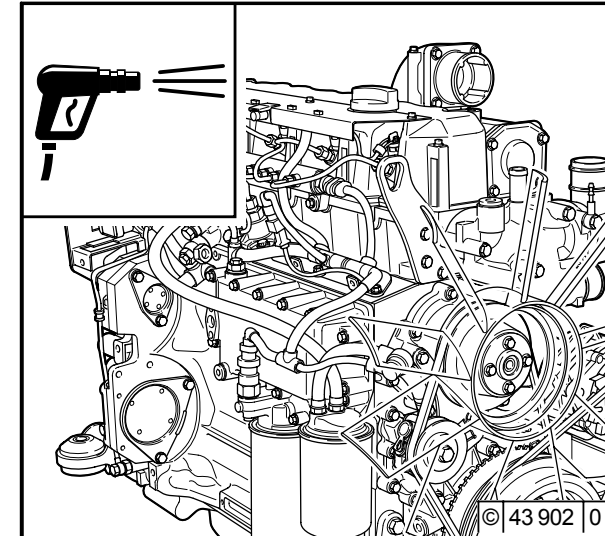
Checking or cleaning intervals Guideline oh	Engine application
2000	Ships, electronic units in enclosed spaces, pumps
1000	Vehicles on paved roads
500	Tractors, fork lift trucks, drivable electronic units
250	Vehicles on building sites and unpaved roads, building machines, compressors, mining equipment.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

6.3.2 Cleaning cooling system



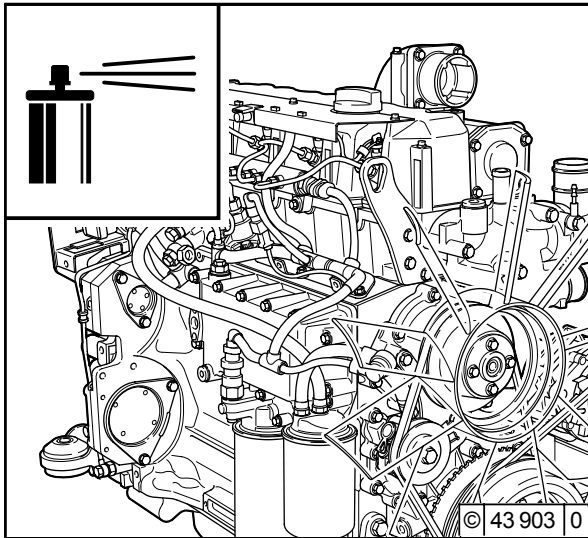
Cleaning with compressed air

- 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).



Cleaning with steam or hot water

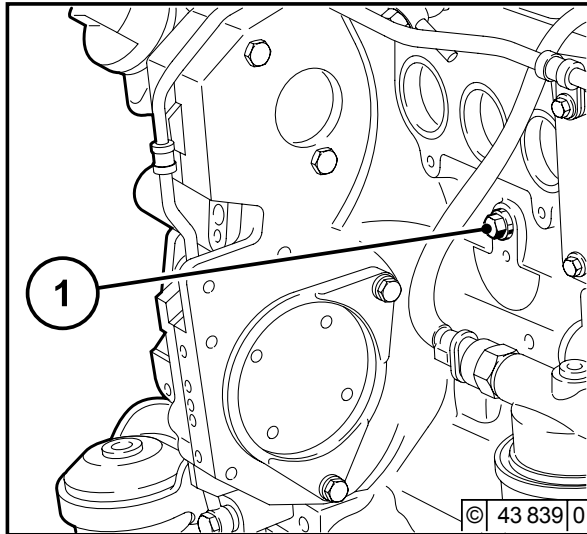
- Remove oil and greasy residues with a gentle jet setting (do not spray directly on sensitive engine parts, e.g. generator, wiring, electrical-components, fan drive).
- Warm up the engine so that the water residues evaporate.

External cooling

- For external coolers: Cleaning as per specifications of the cooling system manufacturer.

Injection pressure: maximum 100 bar and at a distance of 1 meter!

6.3.3 Emptying cooling system

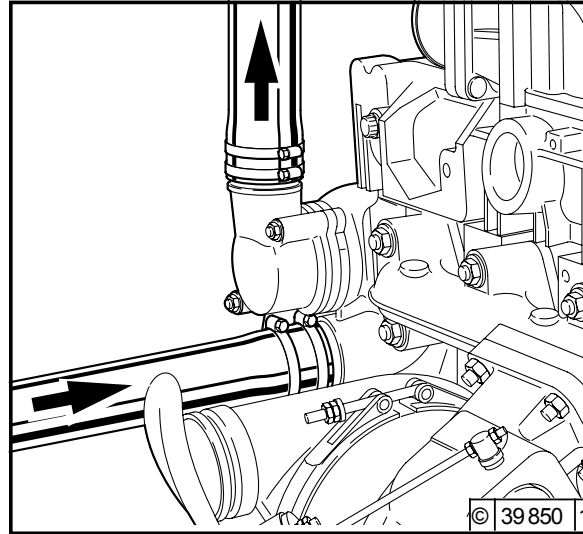


- Open cooler cover.
- Position collecting dish underneath locking screw 1.
- Remove locking screw 1 on the crankcase.
- Drain off coolant.
- Re-tighten locking screw 1.
- If locking screw 1 is not accessible, the cooling system can be emptied on the engine oil cooler (coolant channel).



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

6.3.4 Filling / bleeding cooling system



- Open cooler cover.
- Loosen locking screw item 1 (chap.6.3.3).
- Pour in coolant until the maximum mark or the filling limit (system heating valve must be open, if present).
- Tighten locking screw item 1(chap.6.3.3).
- 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.

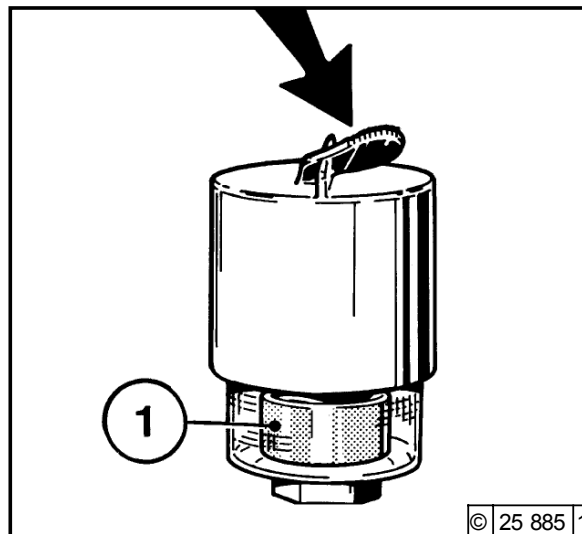
- The cooling system (if constructed under consideration of our installation guidelines) is bled automatically after filling.



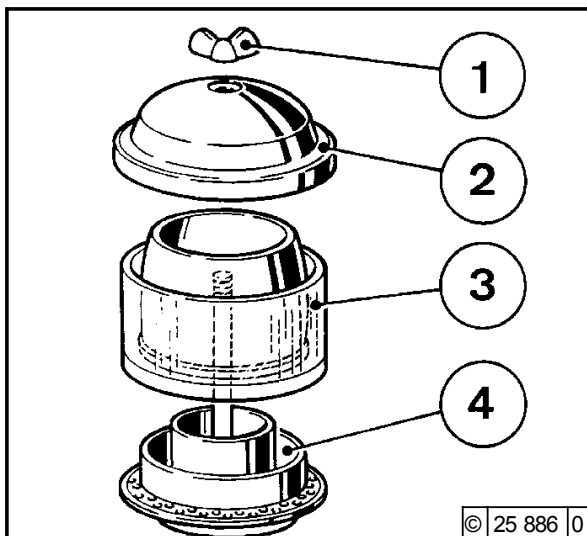
Never operate the engine without coolant (not even briefly).

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 lights up 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.

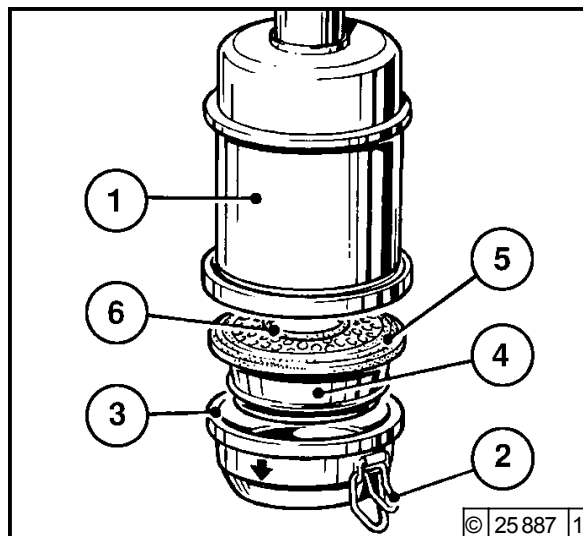


6.4.2 Emptying cyclone pre-separator



- 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.

6.4.3 Cleaning oil bath air filter



- Turn off the engine and wait approx. 10 min until the oil has run out of the filter housing 1.
- Loosen quick fasteners 2 and remove oil pan 3 with filter insert 4, if possible loosen filter insert on the dividing point with the aid of a screwdriver. Do not damage rubber seal 5!
- Remove soiled oil and sludge, clean oil pan.
- Clean filter insert 4 in diesel fuel and allow to drip dry thoroughly.

- In the event of heavy soiling, clean filter housing 1.
- Visually inspect rubber seals 5 and 6 and renew if necessary.
- Fill up the oil pan with engine oil up to the oil level mark (arrow) (for viscosity see 4.1.2).
- Place the oil pan with the filter insert on the filter housing and close the plugs.

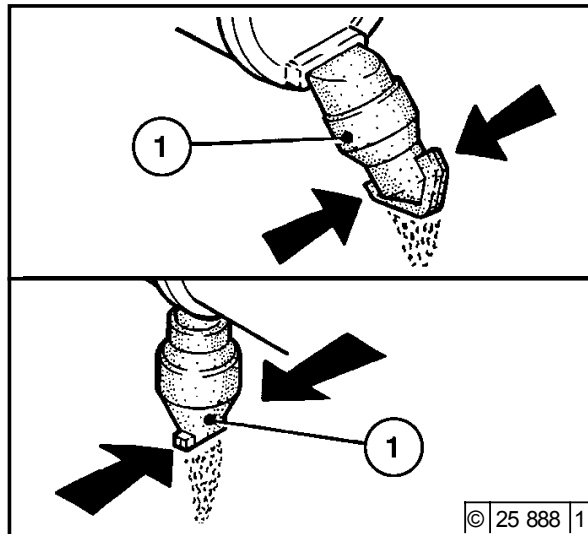
Never fill the dust container with oil, replace damaged containers!



Never clean the filter in petrol!
Dispose of used oil according to instructions!

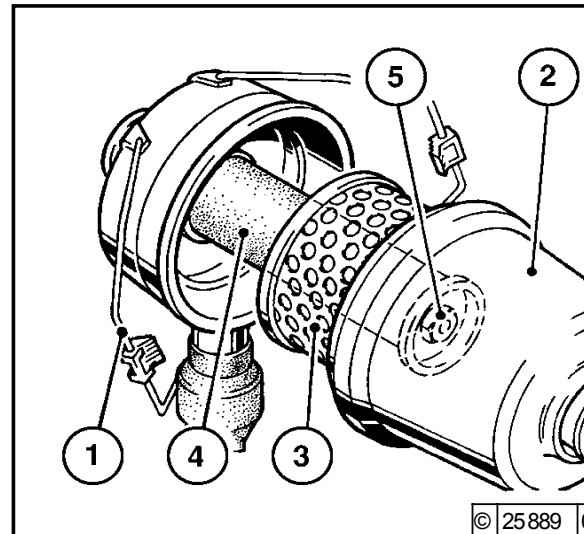
6.4.4 Dry air filter

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



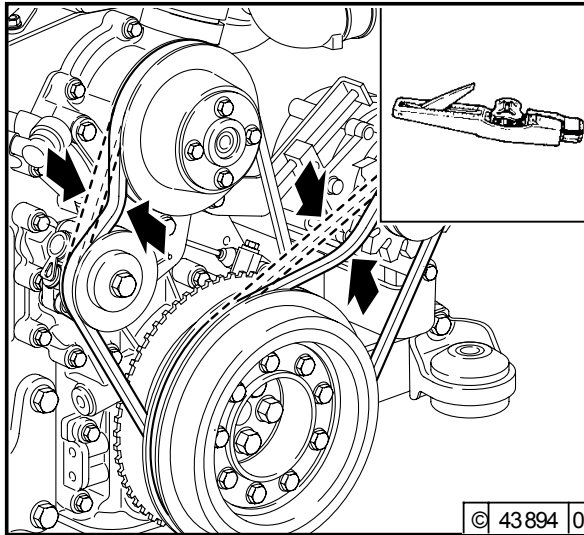
- Open clamping bracket 1.
- Remove filter hood 2 and pull out filter cartridge 3.
- Clean filter cartridge, renew after a year at the latest.
- Clean filter cartridge 3.
 - Blast out from the inside out with dry compressed air (max. 5 bar), or
 - beat out (only in extreme cases). Do not damage the cartridge, or
 - wash according to manufacturer's specifications.

- Check filter cartridge for damage to the filter paper (shine light through) and damage to the seal. 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.

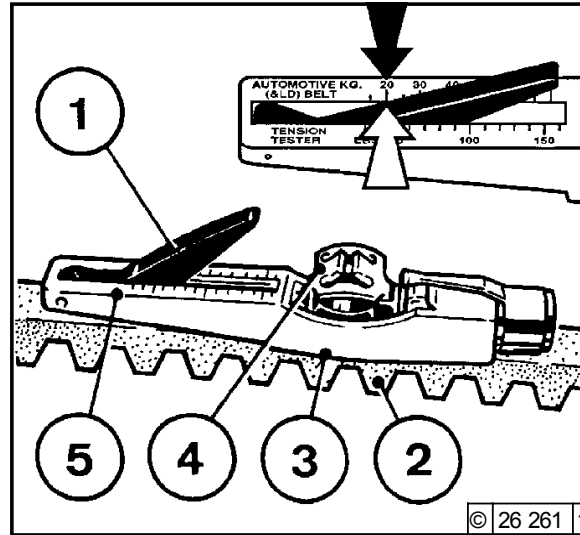


Never clean filter cartridge with petrol or hot liquids!

6.5.1 Checking V-belt 2013 example



- Visual inspection of entire length of V-belt for damages.
- Renew damaged V-belts.
- Check the belt tension of new V-belts after 15 minutes running time.



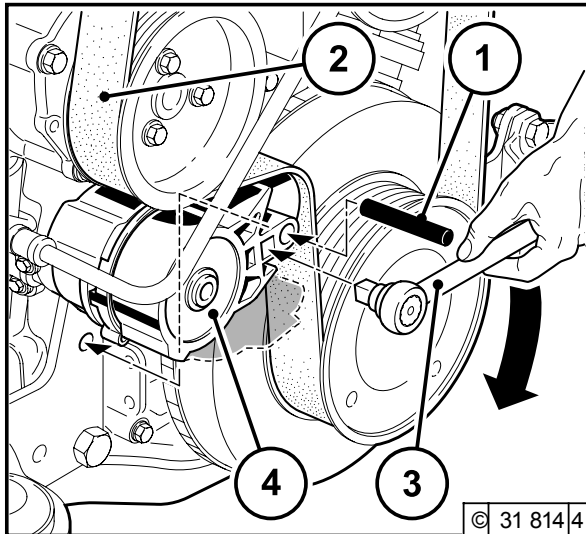
- To check the V-belt tension
 - Use a tension measuring device (see 9.3).
 - Lower indicator arm 1 into the measuring device.
 - Lay the guide 3 between two belt pulleys on the V-belt 2. The stop should lie sideways.
 - Press the button 4 at right angles to the V-belt 2 steadily, until the spring is heard or felt to unlock.

- Carefully lift the measuring device, without altering the position of the indicator arm 1.
- Read off the measured values on the intersection (arrow), scale 5 and the indicator arm 1. For setting values see 9.1.
- If necessary, re-tighten and repeat measurement.



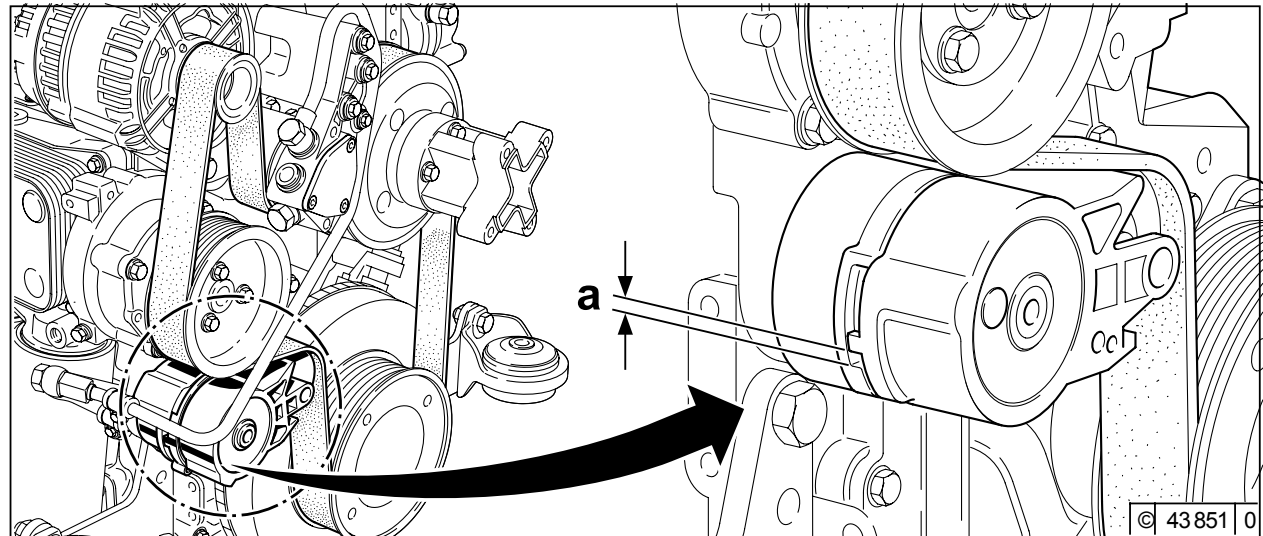
Only test / tighten / change V-belts when the engine is not running. If necessary, re-mount V-rib belt guard.

6.5.2 Changing V-rib belt



- Push tension roller 1 with ratchet 3 in direction of arrow until locking pin 4 can be fixed in the mounting hole. V-rib belt 2 is now tension-free.
- First pull the V-rib belt 2 from the smallest roller or from the tension roller.
- Fit new V-rib belt 2.
- Hold ratchet 3 in the opposite direction to the arrow and remove pin 4.
- Loosen the tension pulley in the opposite direction to the arrow until the V-rib belt is tight, at the same time checking that the V-rib belt is positioned correctly in its guides.

6.5.3 Checking wear limit of V-rib belt

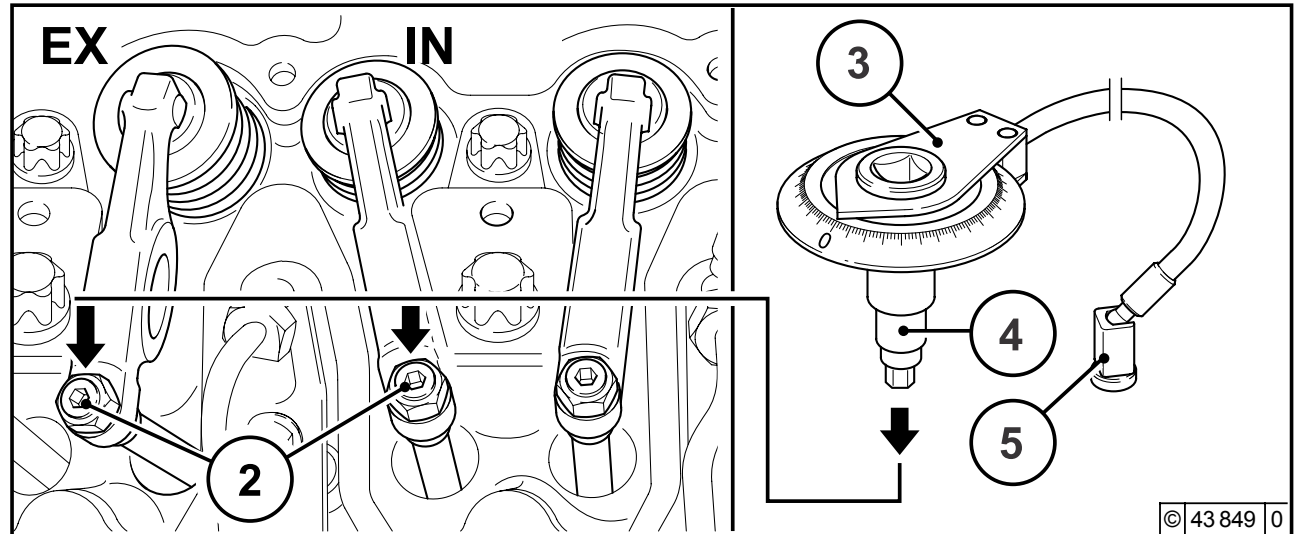
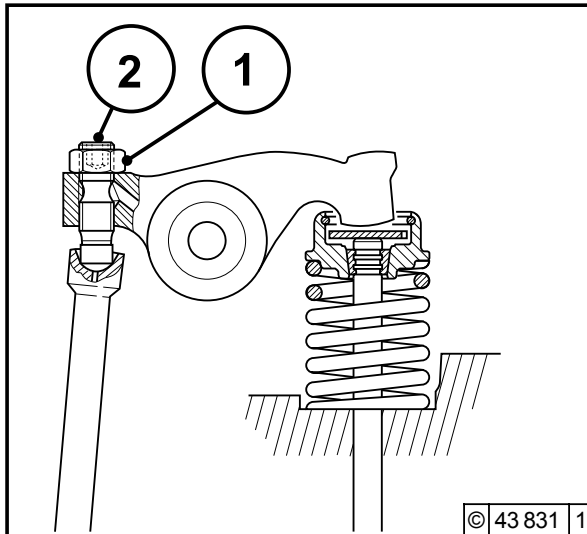


- The wear limit of the V-rib belt is checked as follows:
- Check the distance between the projection of the moving tension arm and the contact with the fixed tensioner housing.
- If the distance "a" is less than **3 mm**, the V-rib belt should be changed.



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

6.6.1 Checking valve clearance, setting if necessary



- Before setting the valve clearance allow the engine to cool down for at least 30 minutes: Oil temperature below 80 °C.
- Place the turning gear (see chap. 9.3) over the fastening screws of the belt pulleys.
- Turn over engine until the valve overlap is achieved, cylinder no. 1.
The cylinders to be set are specified in the setting schematic, see chap. 6.6.3.

- Loosen lock nut 1
- Place rotation angle disc and socket wrench insert 4 on the valve clearance setting screw 2.
- Fix magnet 5 to the rotation angle disc 3.
- Turn the rotation angle disc 3 clockwise to the stop (rocker arm without clearance) and set scale to zero.
- Turn the rotation angle disc anti-clockwise until you reach the specified rotation angle size:

Engine 2012

IN = inlet valve	75°
EX = outlet valve	120°

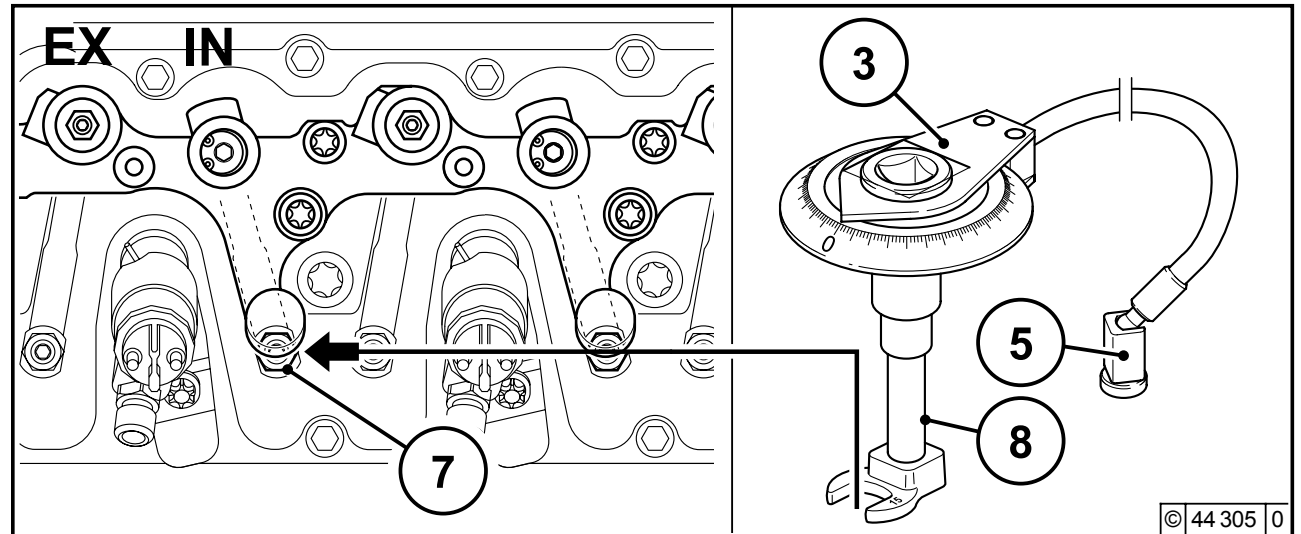
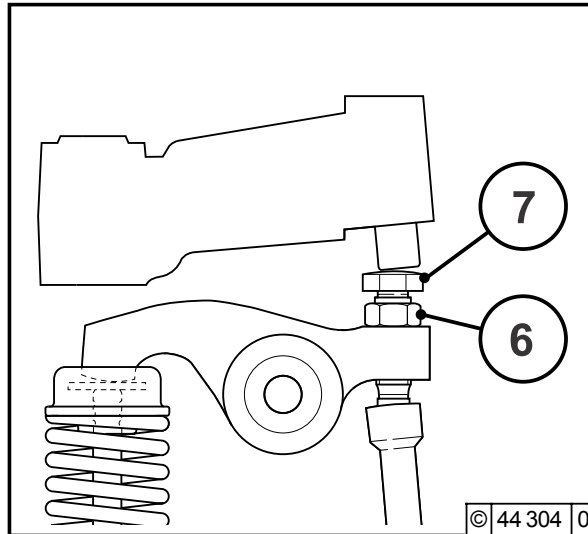
Engine 2013

IN = inlet valve	90°
EX = outlet valve	150°

- Hold rotation angle disc 3 tight against twisting.
- Tighten the lock nut 1.
- Perform the setting on every cylinder (see chap. 6.6.3).



Special tools for valve setting
see chap. 9.3



Valve clearance setting inlet valve in exhaust gas return line (EGR):

- Loosen lock nut 6.
- Place rotation angle disc 3 with crow's foot wrench 8 on valve clearance setting screw 7 on the inlet valve.
- Fix magnet 5 to the rotation angle disc 3.
- Turn the rotation angle disc 3 clockwise to the stop (rocker arm without clearance) and set scale to zero.
- Turn the rotation angle disc anti-clockwise until you reach the specified rotation angle size.

Engine 2012

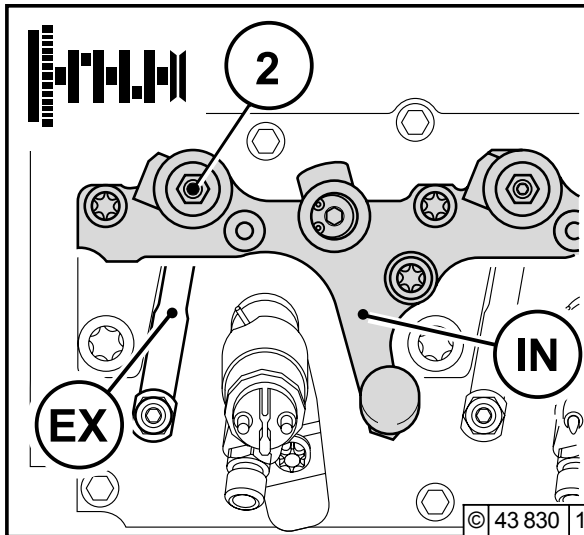
IN = inlet valve 75°

Engine 2013

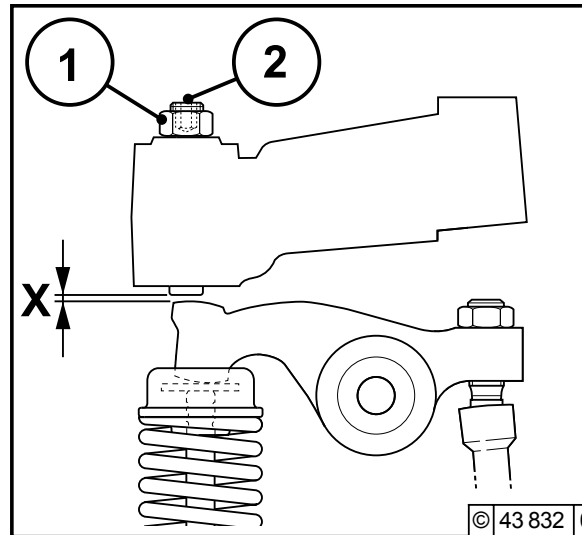
IN = inlet valve 90°

- Hold rotation angle disc 3 tight against twisting.
- Tighten the lock nut 6.
- Perform the setting on every inlet valve (see chap. 6.6.3)

6.6.2 Setting control piston clearance in exhaust gas recirculation (EGR)



- After setting the valve clearance, the control piston clearance should be set as follows:
- Place the turning device over the fastening screws of the belt pulley.
- Turn engine until reaching the valve overlap, cylinder no. 1 The cylinders to be set are specified in the setting diagram, see chap. 6.6.3



- Loosen lock nut 1.
- Place the rotation angle disc and socket wrench insert on the setting screw 2
- Fix the magnet of the rotation angle disc.
- Turn the rotation angle disc clockwise to the stop (control piston without clearance) and set scale to zero.
- Turn the rotation angle disc counter-clockwise until you reach the specified rotation angle.
Control piston x : 144°
- Tighten the lock nut 1.
- Perform the setting on every control piston (see chap. 6.6.3)

Special tools for valve setting see chap. 9.3

6.6.3 Diagram for setting valve / control piston clearance

Engine TCD 2012/2013 L04 2V

Ignition sequence: 1-3-4-2

Valves	Cylinder			
overlap	1	3	4	2
set to	4	2	1	3

Valve overlap: Outlet valve not yet closed, inlet valve starts opening.



At fully open outlet valve, the inlet valve opens briefly by about 2 mm. This is not the valve overlap.

Engine TCD 2012/2013 L06 2V

Ignition sequence: 1-5-3-6-2-4

Valves	Cylinder					
overlap	1	5	3	6	2	4
set to	6	2	4	1	5	3

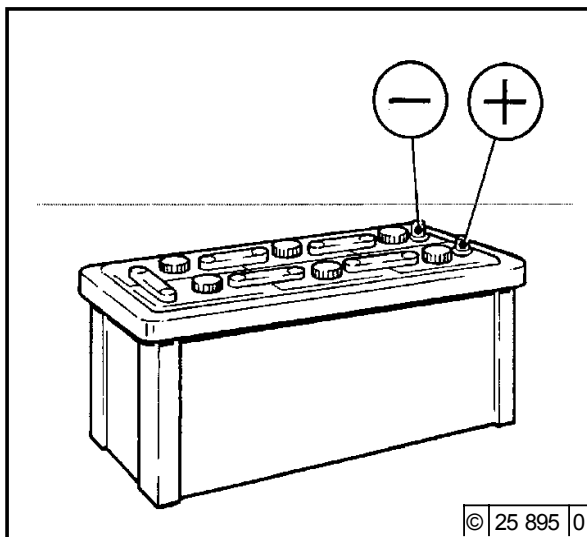
Valve overlap: Outlet valve not yet closed, inlet valve starts opening.



At fully open outlet valve, the inlet valve opens briefly by about 2 mm. This is not the valve overlap.

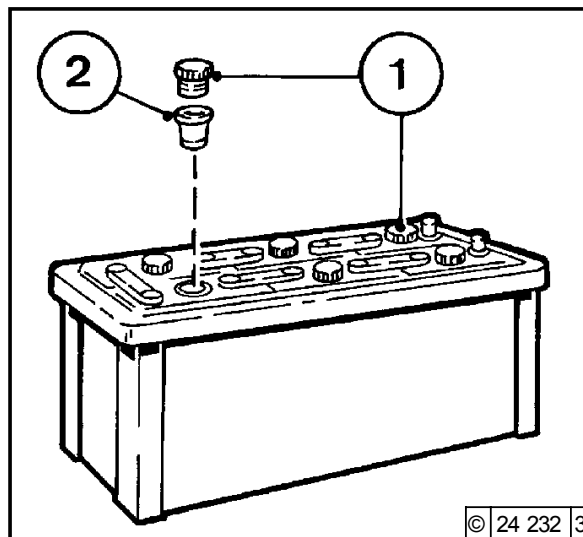
6.7.1 Battery

6.7.1.1 Checking battery and cable connections



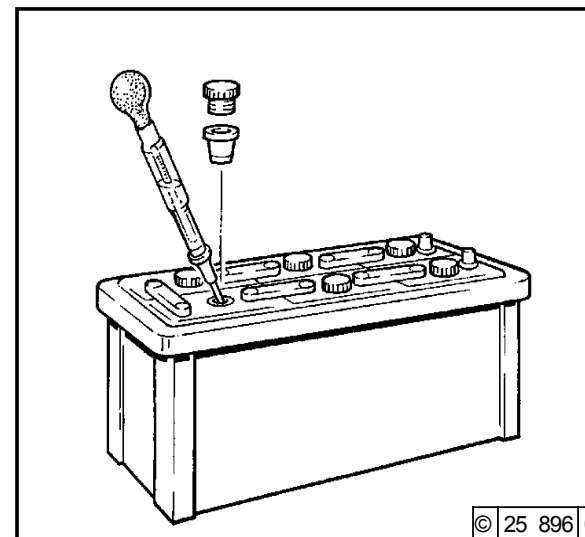
- Keep the battery clean and dry.
- Loosen soiled connection terminals.
- Clean the battery poles (+ and -) and terminals, and grease with an acid-free and acid-resistant grease.
- Ensure that the terminal connections contact well when assembling. Tighten the clamping screws by hand.

6.7.1.2 Checking the acid level



- Remove sealing caps 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 caps 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.

Acid density in [kg/ l]		Charge level
Normal	Tropics	
1.28	1.23	well charged
1.20	1.12	half charged, re-charge
1.12	1.08	discharged, charge immediately



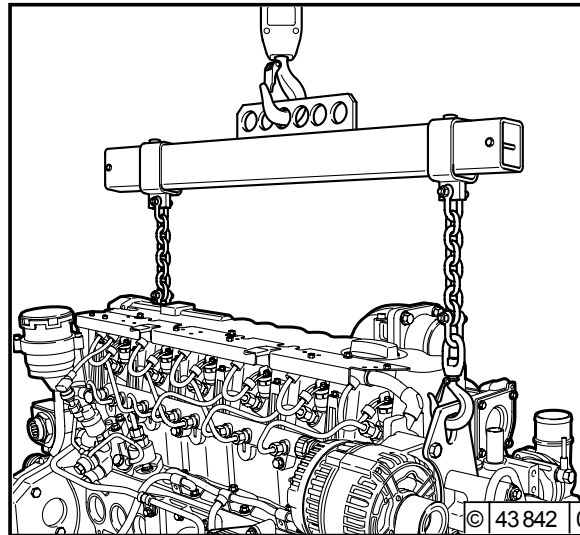
The gases released by the battery are explosive! Avoid sparks and open fire in the vicinity of the battery! Do not allow acid to get on skin or clothes!
Wear protective glasses!
Do not place any tools on the battery!

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.
- Disconnect battery and three-phase current generator.
- Remove the control unit.

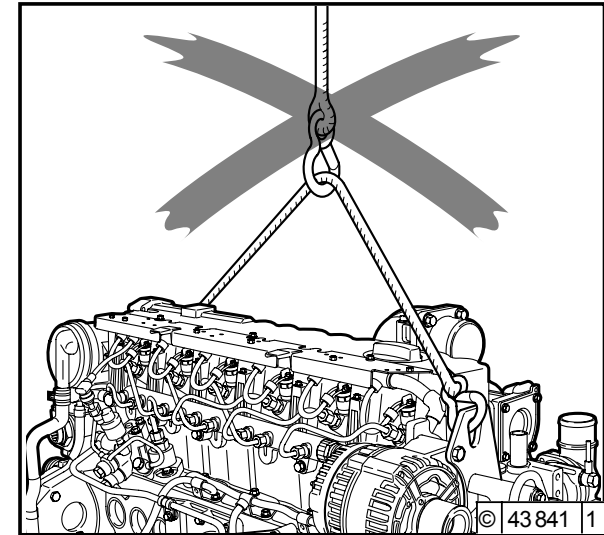
6.7.3 Transportation suspension



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



Only use correct suspension equipment!



- 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.



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

Faults										Action		
Engine doesn't start up, or starts up with difficulty										Check C Set S Change Ch Clean Cl Fill up F Lower L Engine electronics E* * Identify fault by monitoring the blink code or fault memory	Section Operation C C C F L C / S C / S Combustion air C / Ch C C / Ch C Cooling system C / Cl C / Cl C / W C Electrics C	
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												
●										Not disconnected (if possible)		
●									●	Starting limit temperature not reached		
●			●							Engine shutdown lever is still in stop position (shutdown magnet defective)		
			●			●				Oil level too low		
			●	●			●	●		Oil level too high		
						●	●	●		Engine is tilted too far		
●										Set throttle to halfway (only with mech. regulators)		
			●	●					●	Air filter soiled / exhaust turbocharger defective	Combustion air	C / Ch
			●	●					●	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 / Cl
				●						Coolant heat exchanger soiled		C / Cl
●		●	●	●		●				V-belt/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

Faults										Action		
Engine doesn't start up, or starts up with difficulty										Check	C	
Engine doesn't start up and diagnosis light is blinking										Set	S	
Engines starts up, but runs irregularly or misfires										Change	Ch	
Engine gets too hot. Temperature warning system is activated										Clean	Cl	
Engine lacks power										Fill up	F	
Engine lacks power and diagnosis light is lit up										Lower	L	
Speed changes are possible + diagnostic light is lit up										Engine electronics	E*	
Engine has no, or too little, oil pressure										* Identify fault by monitoring the blink code or fault memory		
Engine has too high oil consumption												
Engine has too high oil consumption												
Engine smoulders - blue												
- white												
- black												
										Cause	Section	
●										Starter, circuit cable connections loose or oxidised	Electrics	C
●										Starter defective or pinion doesn't mesh		C
●	●	●					●	●		Valve clearance incorrect	Engine	S
●	●	●		●						Injection line leaking		C
		●								Ventilation line blocked (coolant heat exchanger)		C / Cl
●							●			Heating plug defective		C
●	●	●	●		●			●	●	Injector defective		C / Ch
●	●	●	●		●					Air in fuel system		C / Ch
●	●	●	●		●					Fuel filter / fuel pre-cleaner soiled		C / Cl / Ch
		●								Oil filter defective		Ch
●						●	●			Incorrect SAE class or quality of engine lube oil	Operating substance	Ch
●	●	●	●					●		Fuel quality does not comply with instruction manual		Ch
		●								Lack of cooling water		C / Ch
	●									Engine electronics prevent start	Electronics	C / Cl
				●						Engine electronics reduce power		C / E
				●						Engine electronics has detected a system error and activates an equivalent speed		C / E

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 against damage in certain fault situations by monitoring compliance with the 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. shutdown of the engine after a brief warning time, poss. connected with a start prevention.
- To cool the engine, forced operation at low idling speed, poss. with automatic shutdown.
- Start prevention. (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.

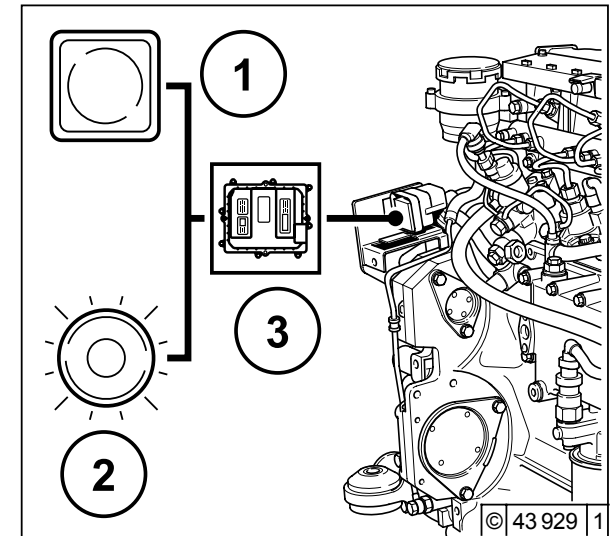
7.2.2 Using the diagnosis button

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.

Blinkcode			Function / Component	Error
Short	Long	Short		
0.4s	0.8s	0.4s		
1	2	3	Output to coolant temperature light	Signal faulty, Overtemperature control unit
1	2	6	Hand accelerator	Signal faulty / implausible
1	2	8	Suction air temperature sensor	Signal faulty
1	3	3	Gear oil temperature sensor	Signal faulty
1	3	4	Monitoring rail pressure	Signal implausible, pressure / pressure deviation outside the permissible range
1	3	5	Output to oil pressure warning lamp	Signal faulty, overtemperature control unit
			Output to valve of the fuel measuring unit	Signal faulty, overtemperature control unit
1	3	6	Monitoring air filter	Air pressure behind filter too low
1	3	7	Output to actuators	Short circuit to battery
1	3	8	Output to actuators	Short circuit to ground
1	4	2	Output to engine operating lamp	Signal faulty, overtemperature control unit
1	4	3	Multi-step switch 1 / 2 / 3	Signal faulty / implausible
1	4	4	Oil temperature sensor	Signal faulty / implausible
			Monitoring the oil temperature	Temperature outside the nominal range
1	4	5	Monitoring override switch	Signal implausible
1	4	6	Rail pressure limiting valve	Valve open / pressure surge necessary / do not open after pressure surge
1	4	7	Rail pressure sensor	Signal faulty, pressure deviation outside the permissible range

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

Blinkcode			Function / Component	Error
Short	Long	Short		
0.4s	0.8s	0.4s		
2	3	1	Monitoring oil pressure	Pressure outside the nominal range
2	3	2	Monitoring coolant temperature	Temperature above the nominal range
2	3	3	Monitoring suction intake air temperature	Temperature above the nominal range
2	3	5	Monitoring coolant state	Level below the nominal range
2	3	7	Monitoring fuel temperature	Temperature outside the nominal range
2	3	8	Output to the fan adjuster 1 / 2	Signal faulty, overtemperature control unit
			Monitoring fan speed	Speed outside the nominal range
2	4	1	Monitoring combustion	Misfiring detected in one or more cylinders
2	6	1	Monitoring output to actuators	Relay does not open or opens too late, short-circuit to ground
2	6	3	Output to cold start aid	Signal faulty, relay defective, jammed or connected incorrectly, short-circuit
2	7	1	CAN-Bus	Timeout of one or more send messages, bus inactive
2	8	2	Sensor supply voltage 1 / 2 / 3	Voltage outside the nominal range
2	9	2	Atmospheric pressure sensor	Signal faulty / implausible

Blinkcode			Function / Component	Error
Short	Long	Short		
0.4s	0.8s	0.4s		
3	1	4	Hydraulic oil temperature sensor	Signal faulty
			Monitoring hydraulic oil temperature	Temperature outside the nominal range
3	1	8	Monitoring battery	Voltage outside the nominal range
3	2	8	Output to cold start aid indicator lamp	Signal faulty, overtemperature control unit
4	1	4	Output to external EGR actuator	Signal faulty
4	1	5	Output to external EGR actuator	Signal faulty, overtemperature control unit
4	1	6	Output to external EGR actuator	Signal faulty
4	1	7	Oil wear meter	Critical time reached

Blink code			Function / Component	Error
Short	Long	Short		
0,4s	0,8s	0,4s		
5	1	2	Output to start relay	Signal faulty, overtemperature control unit
5	1	3	Output to error lamp	Signal faulty, overtemperature control unit
5	1	4	Monitoring terminal 15	No signal detected
5	1	5	Monitoring terminal 50	Permanent signal detected
5	2	1	Speed measurement	Implausible drive speed
5	2	8	Output to internal engine brake	Signal faulty

All other blink codes: Please contact your service partner

Behavior in case of error signal faulty / implausible: Perform function test on the parts concerned; check wiring and plugs for short-circuits, breaks, corrosion.

Engine corrosion protection

8.1 Corrosion protection

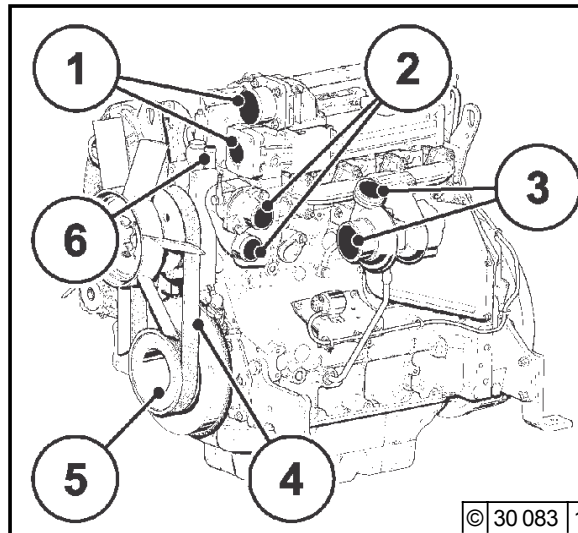
8.1 Corrosion protection

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.

Removing engine corrosion protection:

- Remove corrosion protection agent from grooves of V-belt pulley 5.
- Assemble V-rib belt 4 or V-belt, 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. Pay attention to cleanliness here.
- Start up the engine.

Note:



Fuel tank/supply line to the engine should also be sealed, so that the sensitive rail system is protected against dirt and dust. Protect the electronics from moisture/corrosion.

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

Engine type

	TDC 2012 L04 2V	TDC 2012 L06 2V
Number of cylinders	4	6
Cyl. arrangement	In-line	
Bore [mm]	101	
Stroke [mm]	126	
Total displacement [cm ³]	4038	6067
Compression ratio [ε]	18	
Working principle / combustion procedure	Four stroke diesel with charging and direct injection	
Charge air cooler	without/with	with
Charge air cooler temperature outlet at rated power [°C]	50	
Direction of rotation	rotation to left	
Injection system	DCR + PLD	DCR
Deutz Common Rail (DCR)		
Pump Line Nozzle (PLD)		
Weight TDC 2012 without cooling system according to DIN 70020-A [approx.kg]	410	530
Engine performance according to ISO 3046 [kW]	1).	
Max. nominal speed [1/min]	2400	
Valve clearance inlet/ exhaust, see 6.6.1 [mm]	0.3/0.5 ^{+0.1/} angle degree 75/120	
Setting with special tool		
Ignition pressure [bar]	160	
Start of pumping [°KW before TDC]	1).	
Engine ignition sequence	1-3-4-2	1-5-3-6-2-4
V-belt tension	pre-tighten/re-tighten	
Generator [N]	650 / 400 ± 50.	
Fuel pump - coolant pump [N]	650 / 400 ± 50.	
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.

2) The V-rib belt has a spring-loaded tension pulley which tightens automatically and is not re-tightened: see ch. 6.5.2

	TDC 2012 L04 2V	TDC 2012 L06 2V
Engine type	Liquid-cooled / cooling system protection	
Cooling	Liquid-cooled / cooling system protection	
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 [°C]	86	
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 [bar]	0,8	
Initial oil filling quantity without filter max. [approx.ltr.]	15 ³⁾	26 ³⁾
min. [approx.ltr.]	12.5 ³⁾	23.5 ³⁾
Initial oil filling quantity with filter max. [approx.ltr.]	15.5 ³⁾	26.5 ³⁾
min. [approx.ltr.]	13 ³⁾	24 ³⁾

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

⁴⁾ Only necessary for winter operation, see 3.5.1.

Engine type

	TDC 2013 L04 2V	TDC 2013 L06 2V
Number of cylinders	4	6
Cyl. arrangement	In-line	
Bore [mm]	108	
Stroke [mm]	130	
Total displacement [cm ³]	4761	7142
Compression ratio [ε]	18	
Working principle / combustion procedure	Four stroke diesel with charging and direct injection	
Charge air cooler	without/with	
Charge air cooler temperature outlet at rated power [°C]	50	
Direction of rotation	rotation to left	
Injection system		
Deutz Common Rail (DCR) Pump Line Nozzle (PLD)	DCR+PLD	DCR
Weight TDC 2013 without cooling system according to DIN 70020-A [approx.kg]	450	590
Engine performance according to ISO 3046 [kW]	1).	
Max. nominal speed [1/min]	2300	
Valve clearance inlet / exhaust, see 6.6.1 [mm]	0.4/0.6 ^{+0.1} / angle degree 90/150	
Setting with special tool		
Ignition pressure [bar]	160	
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:	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.

2) The V-rib belt has a spring-loaded tension pulley which tightens automatically and is not re-tightened: see ch. 6.5.2

Engine type	TDC 2013 L04 2V	TDC 2013 L06 2V
Cooling	Liquid-cooled / cooling system protection	
Coolant quantity (only engine content without cooler)[approx.ltr.]	7.2	9.8
Permissible continuous coolant temperature engine outlet [°C]	max.105	
Temperature difference between Coolant inlet/outlet [°C]	4 to 8	
Start of thermostat opening at [°C]	86	
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 [bar]	0.8	
Initial oil filling quantity without filter max. [approx.ltr.]	15 ³⁾	26 ³⁾
min. [approx.ltr.]	12.5 ³⁾	23.5 ³⁾
Initial oil filling quantity with filter max. [approx.ltr.]	15.5 ³⁾	26.5 ³⁾
min. [approx.ltr.]	13 ³⁾	24 ³⁾

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

⁴⁾ Only necessary for winter operation, see 3.5.1.

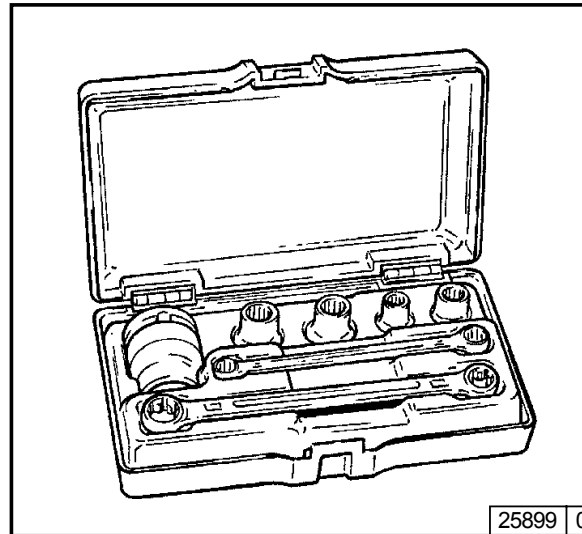
Installation	Pre-tightening [Nm]	Re-tightening				Total	Comments
		1st step	2nd step	3rd step	4th step		
Cylinder head cover	–	–	–	–	–	9 ± 1 Nm	M6
Lock nut Valves	–	–	–	–	–	20 ± 2 Nm	Nut with inner square
Front face mounting foot	–	–	–	–	–	280 Nm	M16 x 85 –10.9
	–	–	–	–	–	280 Nm	M16 x 40 –10.9
Oil drain 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

Ordering tools

The special tools listed in this chapter must be ordered from:

FA.WILBÄR
Postfach 14 05 80
D-42826 Remscheid
<http://www.deutz-tools.com>

TORX



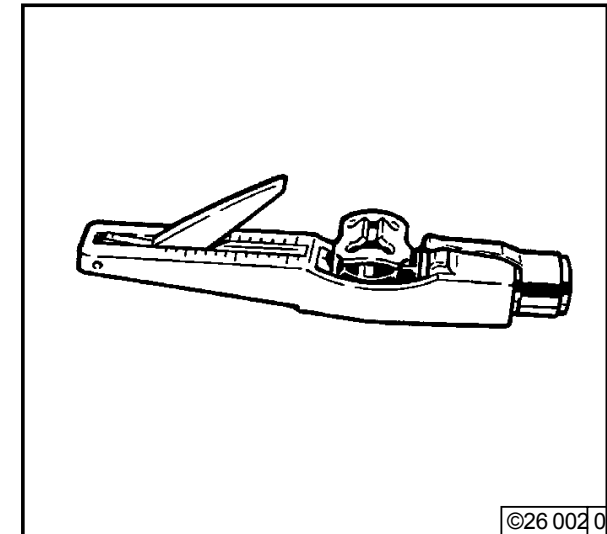
Order No. 8189

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.

V-belt tension measuring device

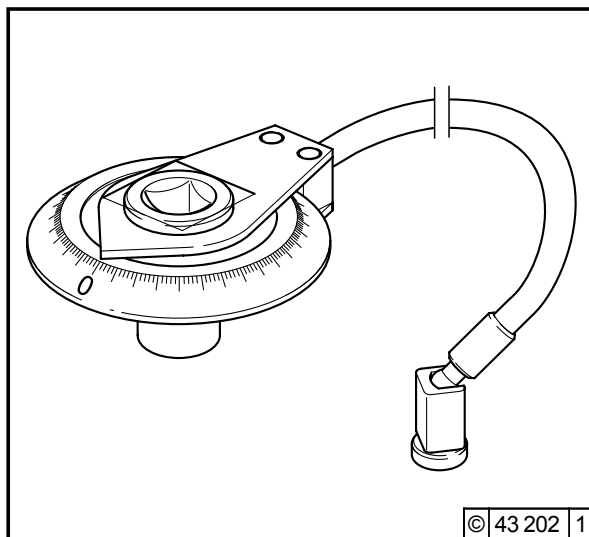


Order No. 8115

Measuring device for checking the prescribed V-belt tensions

9

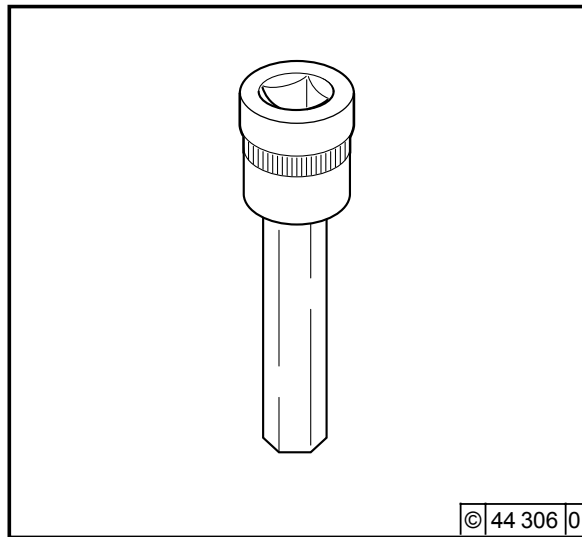
Rotation angle disc



Order No. 8190

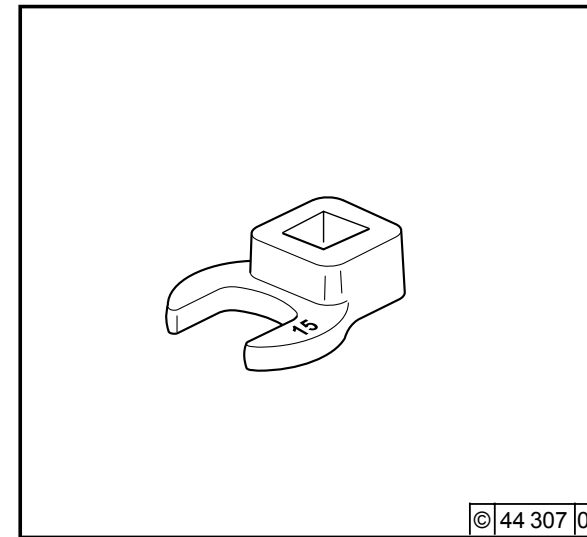
Rotation angle disc for setting the valve/
control piston clearance.

Socket wrench insert



Order No. 8193 (5 mm) valve clearance
Order No. 8194 (4 mm) control piston
clearance. Wrench inserts for rotation angle
disc.

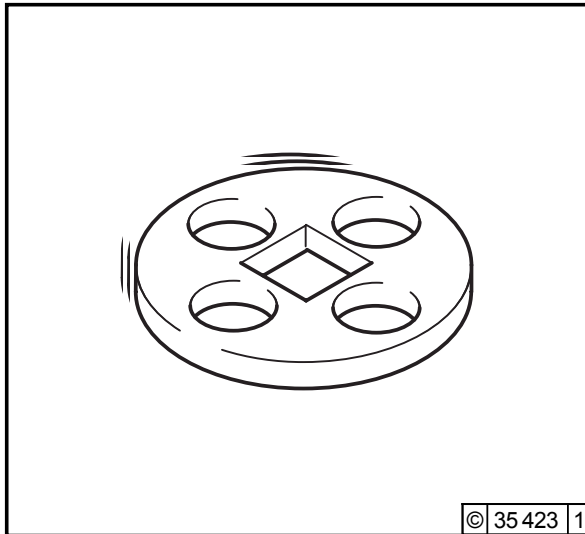
Crow's foot wrench



Order No. 8199

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

Turning gear



Order No. 100 330

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

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 address).

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

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