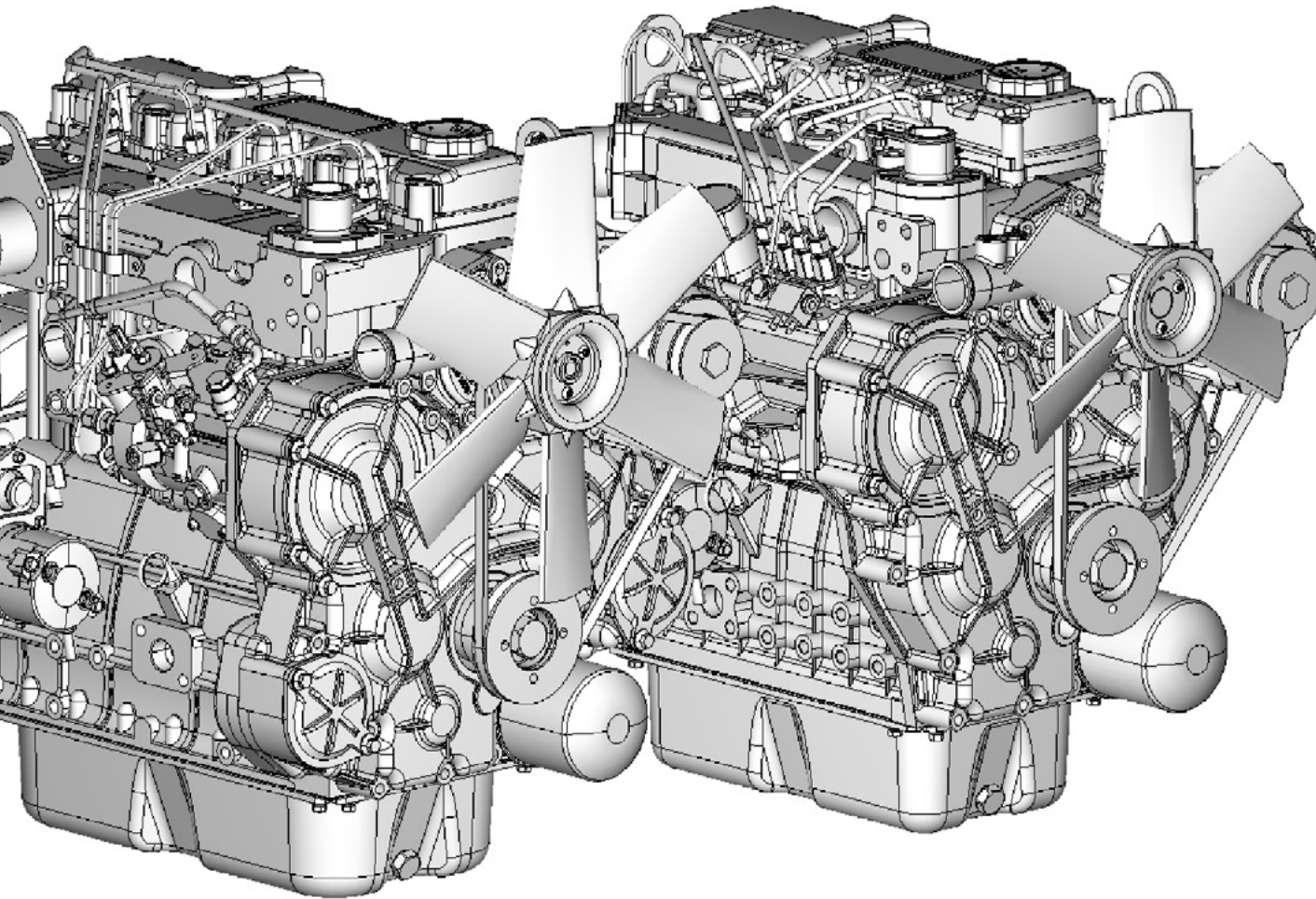


Operation Manual

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- 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 of 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.

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0312 1419 en

Engine number

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

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

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



Foreword

Dear customer,

DEUTZ air/liquid-cooled engines are developed for a broad spectrum of applications. A comprehensive range of variants on offer ensures that the respective special requirements are met.

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

We have done our best to clearly identify the differences, so that you can easily find the operating, maintenance and repair instructions appropriate 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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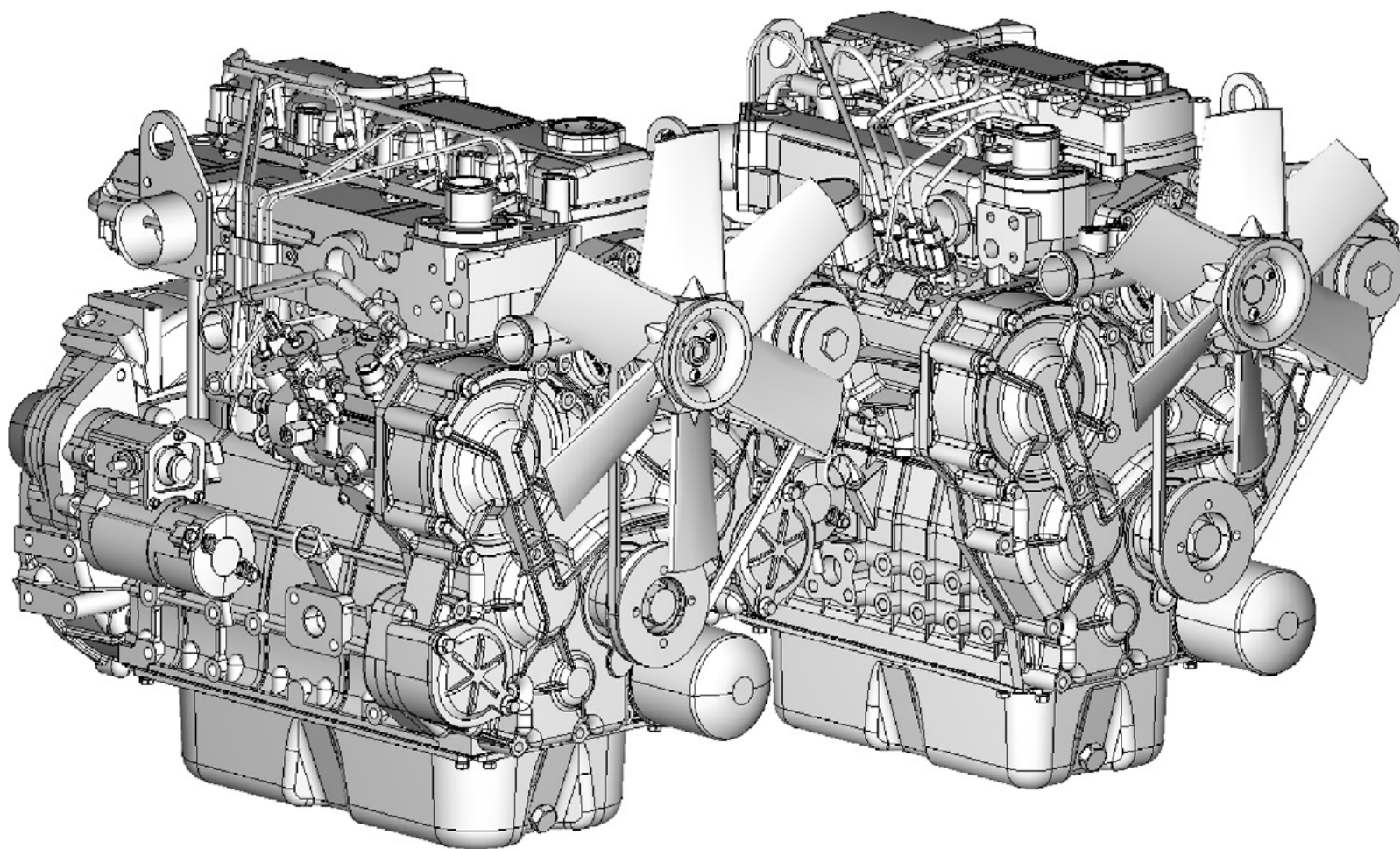
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10 Service



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

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. 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.

Asbestos



DEUTZ original parts are asbestos-free.

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

California Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

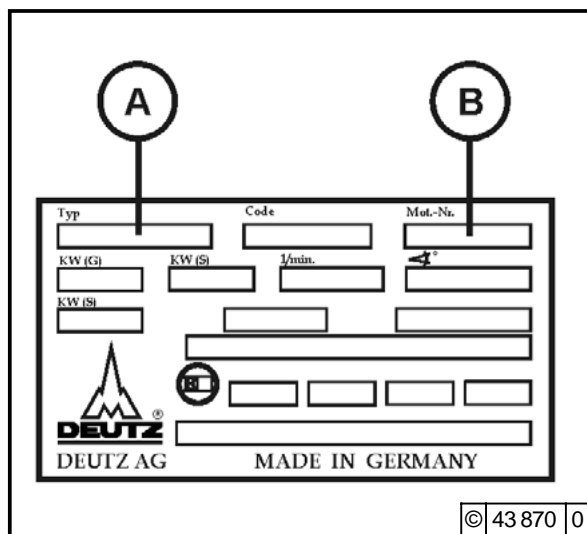
- 21 Engine type
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Engine description

21 Engine type

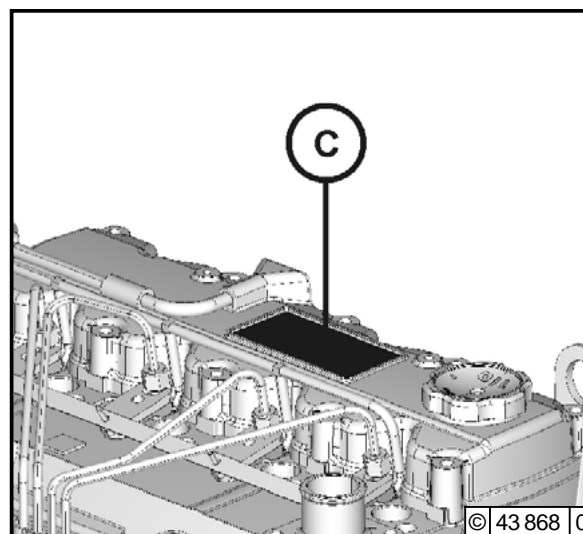
2

211 Company plate



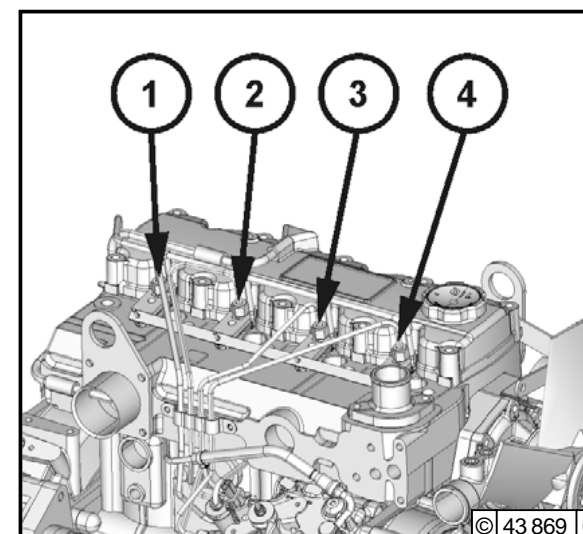
The engine type **A**, engine number **B** and the power data are stamped on the company plate. The engine type and number must be stated when purchasing spare parts.

212 Location of company plate



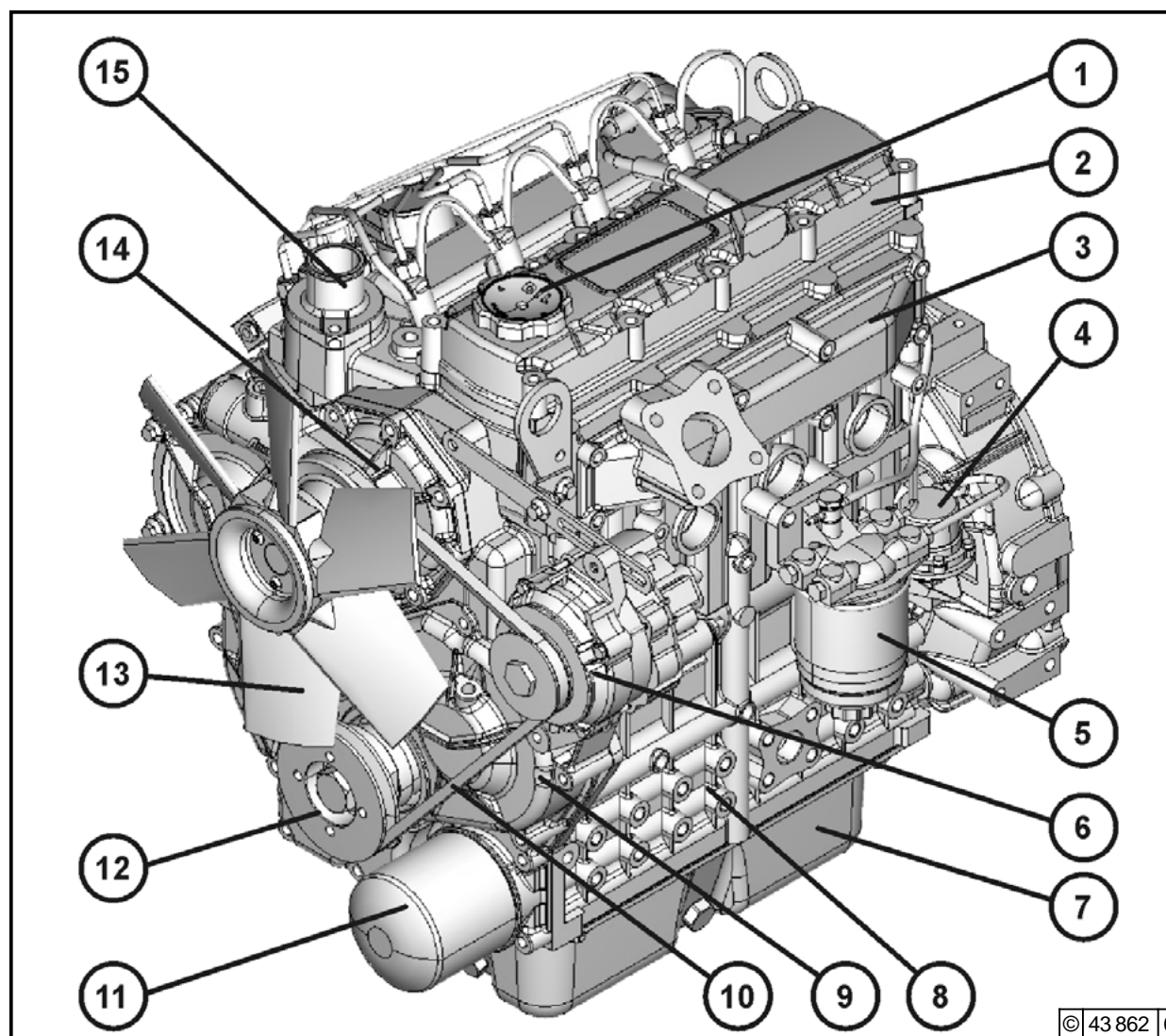
The company plate **C** is fixed to the valve covering hood.

213 Cylinder numbering



The cylinders are counted consecutively, starting from the flywheel.

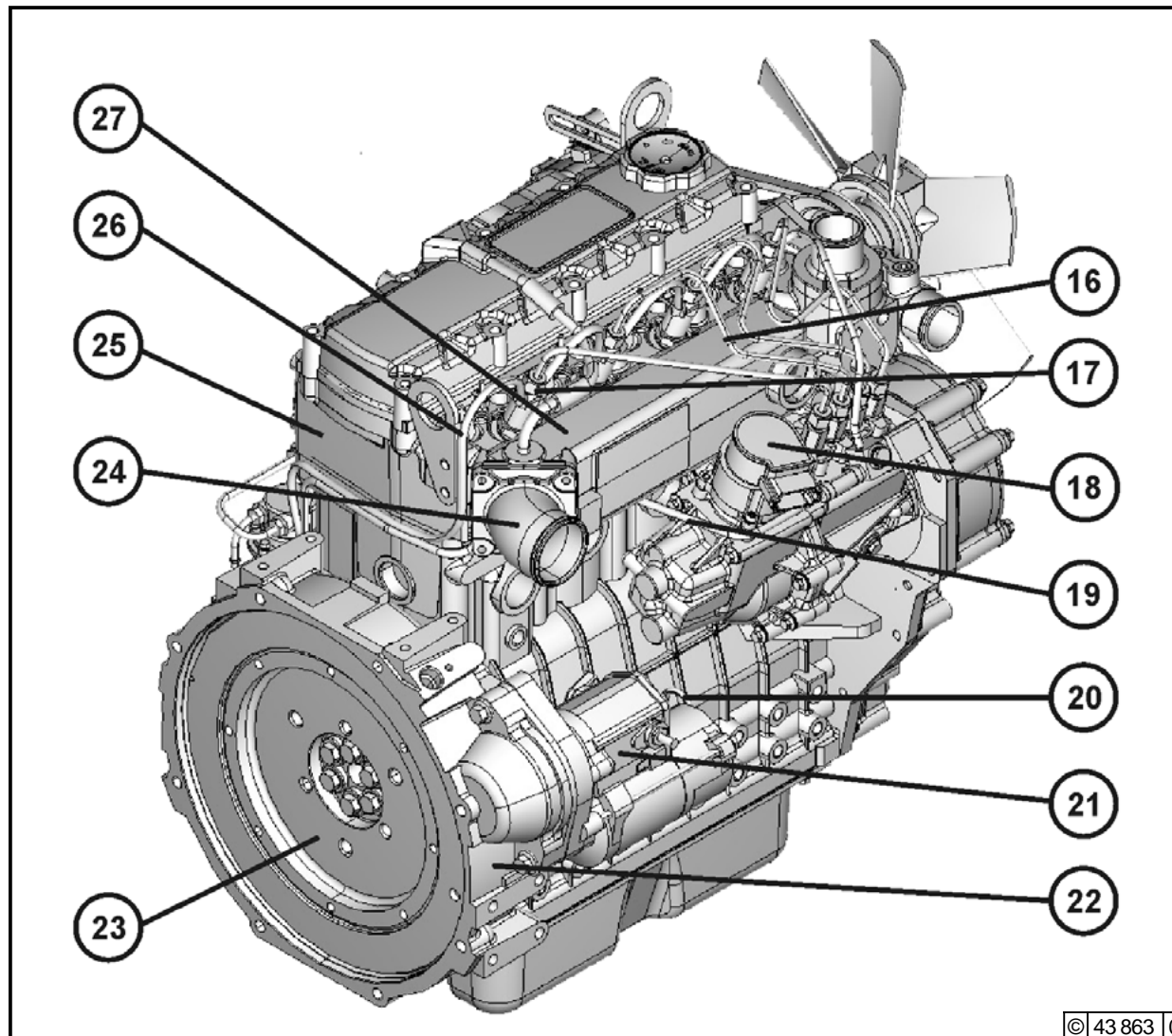
221 Operation side Example:D 2008 Q4



- 1 Oil filler neck (valve cover)
- 2 Valve cover
- 3 Exhaust manifold
- 4 Fuel supply pump
- 5 Exchangeable fuel filter
- 6 Generator
- 7 Oil tray
- 8 Crankcase
- 9 Auxiliary drive possibility e.g. hydr. pump
- 10 Narrow V-belt
- 11 Exchangeable lube oil filter
- 12 V-belt pulley on crankshaft
- 13 Fan
- 14 Coolant pump, coolant inlet from cooler
- 15 Coolant outlet from engine to cooler

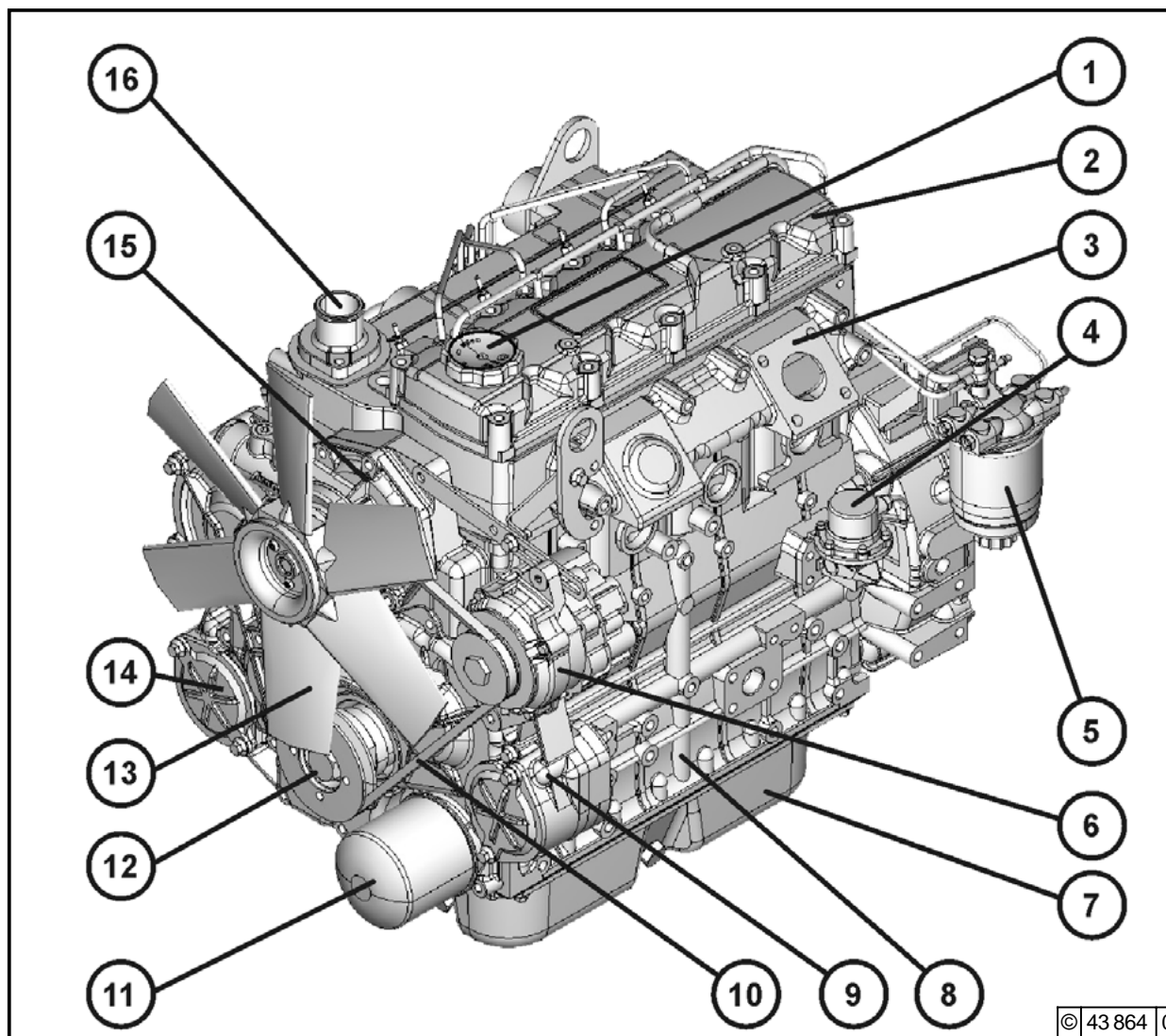
222 Exhaust side
Example:D 2008 04

2



- 16 Injection line
- 17 Injection valve
- 18 Speed governor
- 19 Injection pump
- 20 Oil dipstick
- 21 Starter
- 22 Connection housing (SAE)
- 23 Flywheel with gear rim
- 24 Air intake pipe
- 25 Crankcase
- 26 Fuel return line
- 27 Charge air manifold from air filter

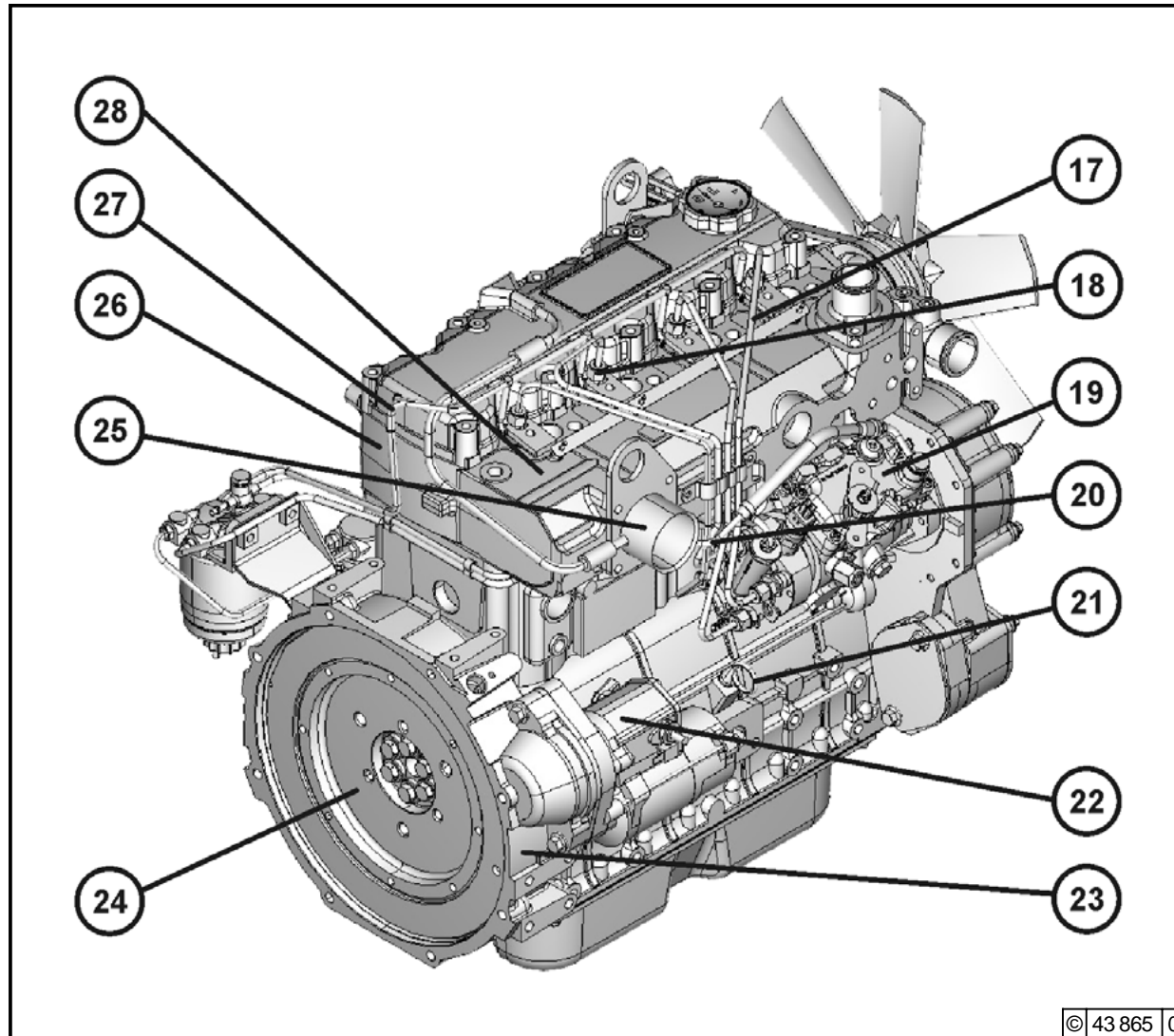
223 Operation side Example:D 2009 Q4



- 1 Oil filler neck (valve cover)
- 2 Valve cover
- 3 Exhaust manifold
- 4 Fuel supply pump
- 5 Exchangeable fuel filter with water separator
- 6 Generator
- 7 Oil tray
- 8 Crankcase
- 9 Auxiliary drive possibility e.g. hydr. pump
- 10 Narrow V-belt
- 11 Exchangeable lube oil filter
- 12 Crankshaft drive flange
- 13 Fan
- 14 Auxiliary drive possibility e.g. hydr. pump
- 15 Coolant pump, coolant inlet from cooler
- 16 Coolant outlet from engine to cooler

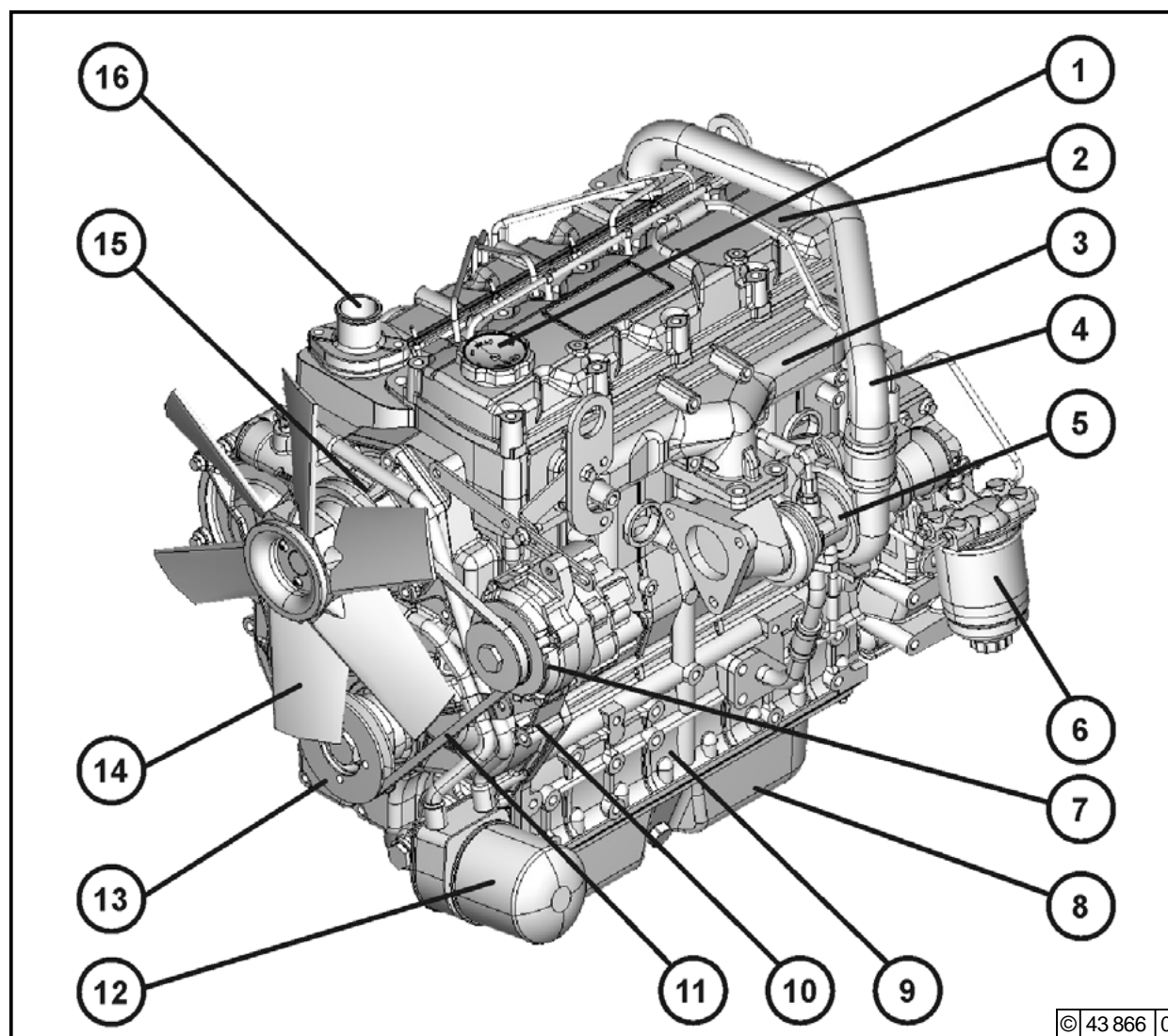
224 Exhaust side Example: D 2009 04

2



- 17 Injection line
- 18 Injection valve
- 19 Speed governor/injection pump
- 20 Injection line
- 21 Oil dipstick
- 22 Starter
- 23 Connection housing (SAE)
- 24 Flywheel with gear rim
- 25 Air intake pipe
- 26 Crankcase
- 27 Fuel return line
- 28 Charge air manifold from air filter

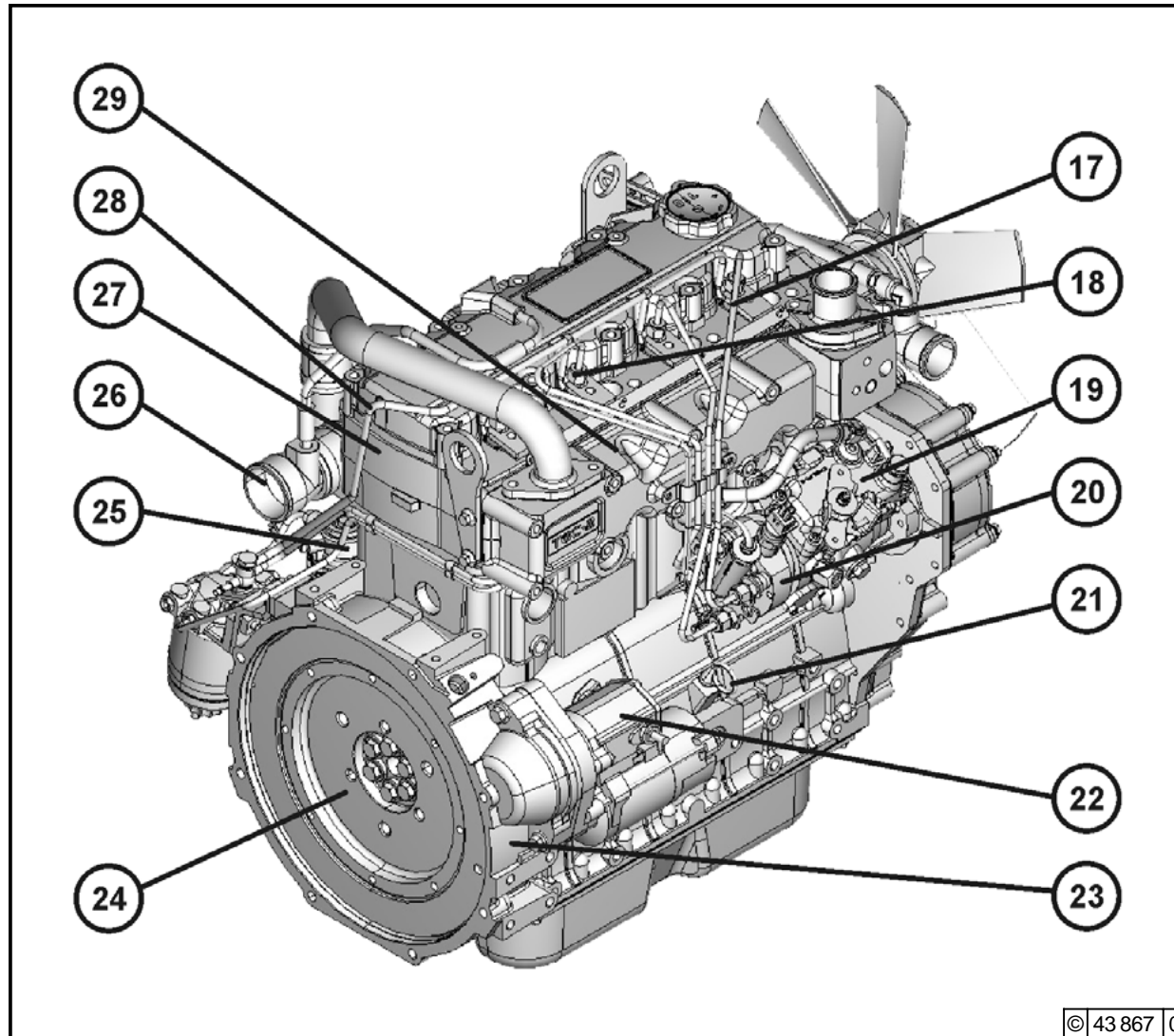
225 Operation side
TD 200904



- 1 Oil filler neck
- 2 Valve cover
- 3 Exhaust manifold
- 4 Charge air line from turbocharger to charge air manifold
- 5 Turbocharger
- 6 Exchangeable fuel filter with water separator
- 7 Generator
- 8 Oil tray
- 9 Crankcase
- 10 Gearcase
- 11 Narrow V-belt
- 12 Exchangeable lube oil filter
- 13 V-belt pulley on crankshaft
- 14 Fan
- 15 Coolant pump, coolant inlet from cooler
- 16 Coolant outlet from engine to cooler

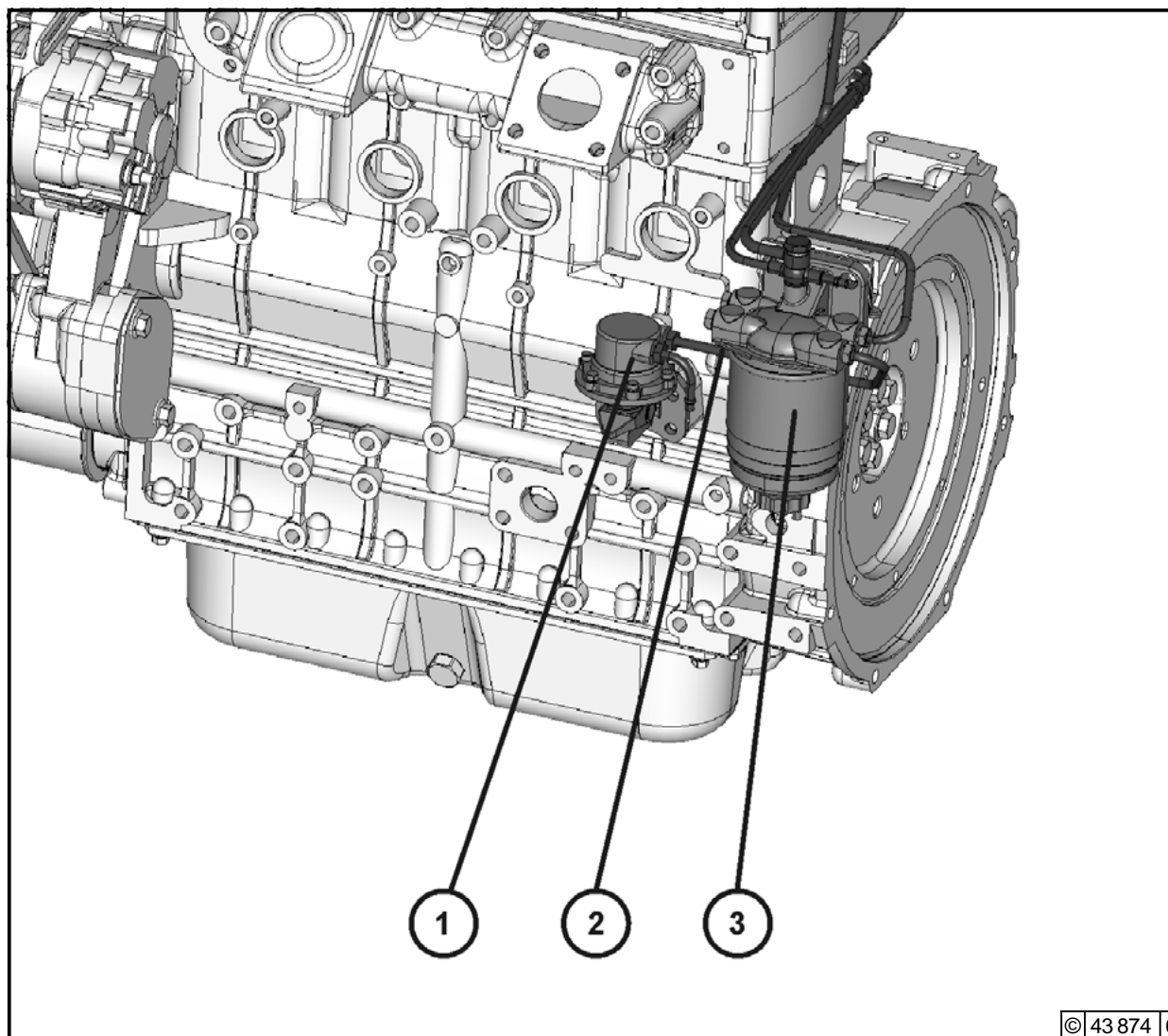
226 Exhaust side
TD 2009 04

2

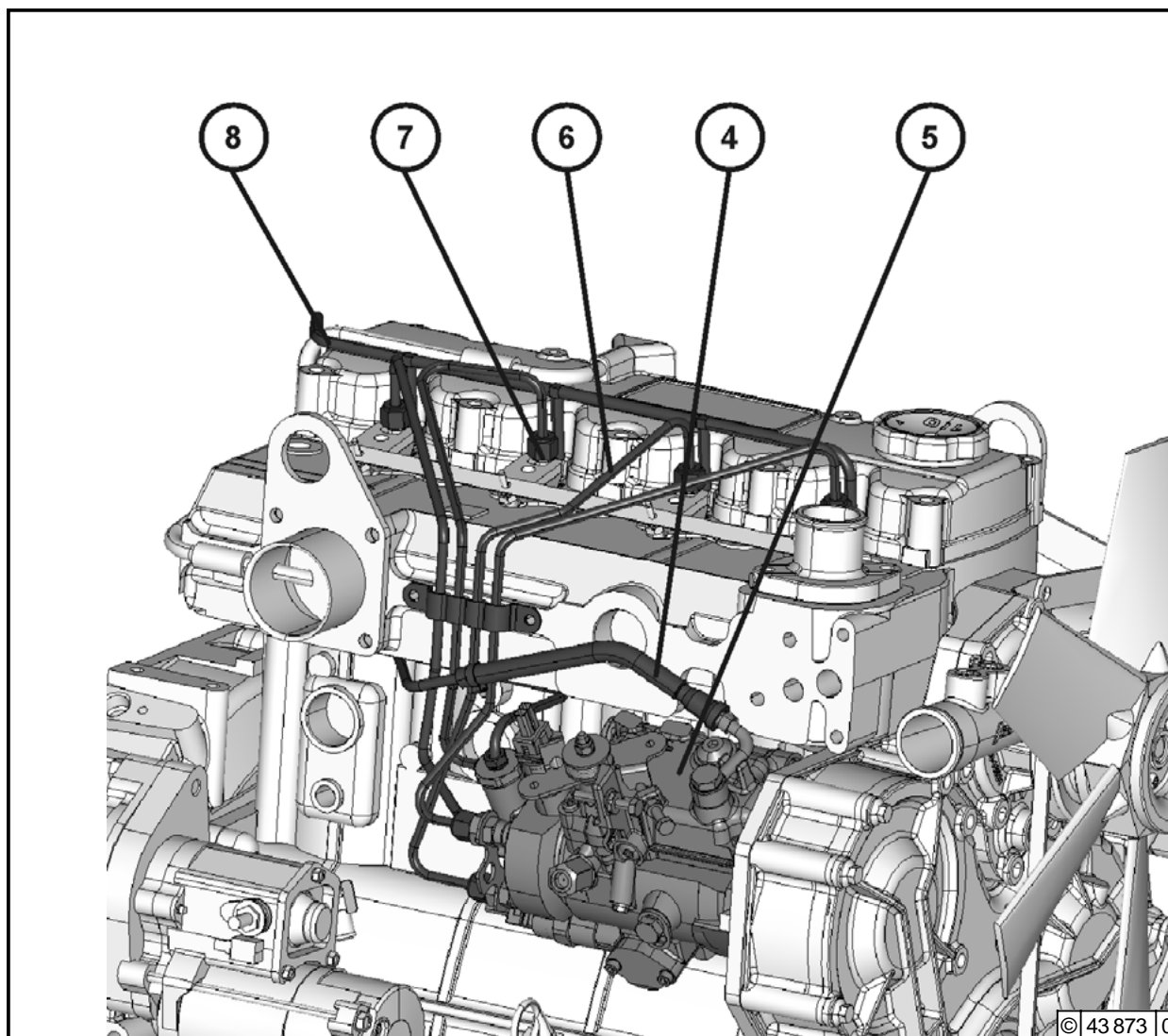


- 17 Injection line
- 18 Injection valve
- 19 Speed governor
- 20 Injection pump
- 21 Oil dipstick
- 22 Starter
- 23 Connection housing (SAE)
- 24 Flywheel with gear rim
- 25 Fuel supply pump
- 26 Air intake pipe from air filter
- 27 Crankcase
- 28 Fuel return line
- 29 Charge air manifold

231 Fuel circuit



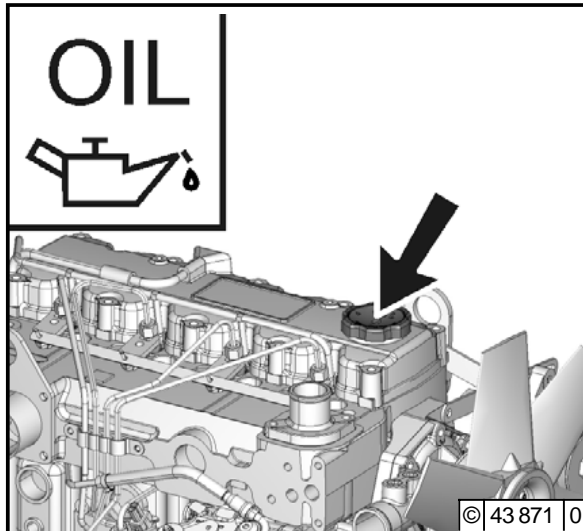
- 1 Fuel feed pump (connection line from customer fuel container)
- 2 Fuel line from feed pump to fuel filter
- 3 Exchangeable fuel filter



- 4 Fuel line from filter to injection pump
- 5 Injection pump
- 6 Injection line to injection valve
- 7 Injection valve
- 8 Fuel return line to customer fuel container

- 3.1 Initial commissioning**
- 3.2 Starting**
- 3.3 Operation monitoring**
- 3.4 Switching off**
- 3.5 Operating conditions**

3.1.1 Engine oil filling

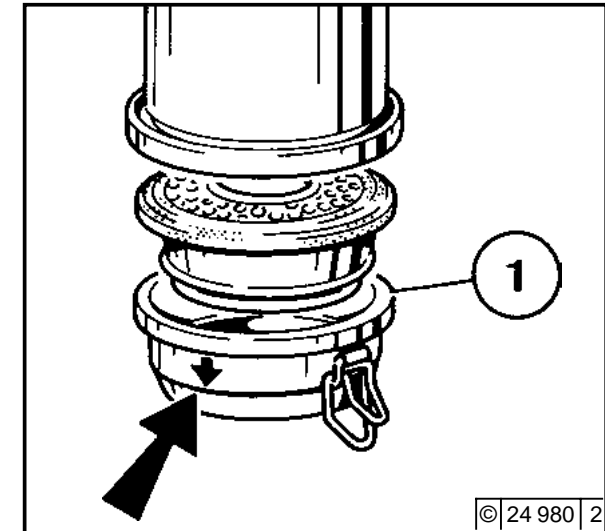


The engines are generally supplied without oil filling.
Fill the engine with lube oil via the oil filler neck (A).
For quality and viscosity of oil see 4.1.

3.1.1.1 Initial engine oil filling

- Fill the oil tray with oil up to the marking "Max" on the oil dipstick (for oil filling quantities see 9.1).
- Start the engine and run at a low idling speed for approx. 2 minutes.
- Switch off the engine
- Check the oil level. If necessary, fill with oil up to upper "**Max**" line marking.

3.1.2 Filling oil bath air filter with engine oil



Fill the oil pan 1 of the oil bath air filter with engine oil up to the arrow marking.
For quality and viscosity of oil see 4.1.



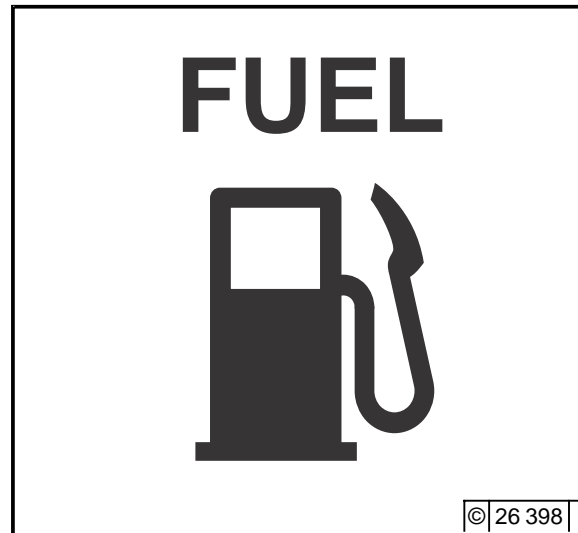
Do not pour oil into the dust collecting tank of the pre-separator, if there is one present.

3.1.3 Initial coolant filling with cooler

- Fill honeycomb cooler with coolant up to the marking " Max ".
- Also fill the supply hoses and the external honeycomb cooler to coolant capacity (per manufacturer specifications).
- Allow the engine to warm up until the thermostat has opened (at approx. 86-90 °C).
- Leave the engine running for approx. 2 minutes.
- Switch off the engine
- Check the oil level. If necessary, fill with coolant up to upper " **Max** " line marking.

If the engine is not warmed up following the initial filling, the oil level will be above the " **Max** " marking on the oil dipstick. Therefore, it is only possible to assess the oil level after the warm up.

3.1.4 Fuel filling



Only use standard branded diesel fuel. For fuel quality see 4.2. Depending on the outside temperature, use either summer or winter diesel fuel.



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

3.1.5 Other preparations

- Check battery and cable connections, see 6.6.1.
- Transportation eyelets
If installed, remove, see 6.6.3
- **Trial run**
After preparations carry out a short trial run of approx. 10 min. Do not apply load to the engine in doing this.
Work during and after the trial run
 - Check engine for tightness.
- **With engine not running**
 - Check oil level, see 6.1.2, if necessary re-fill oil, see 3.1.1
 - Check coolant level, see 3.1.3
 - Re-tighten V-belts, see 6.5
- **Running-in**
It is recommended to check the oil level twice a day during the running-in phase (approx. 200 oh). After the running-in phase checking once a day is sufficient.

3.1.6 Additional maintenance work

The following additional maintenance work is to be carried out for the commissioning of new and overhauled engines:

After 50-150 oh

- Change lube oil, see 6.1.2
- Change oil filter cartridge, see 6.1.3
- Change fuel filter cartridge, see 6.2.1
- Check V-belt tension, if necessary re-tighten, see 6.5.
- Check engine for tightness (leakages).
- Check engine bearing, re-tighten if necessary.

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 has been mounted

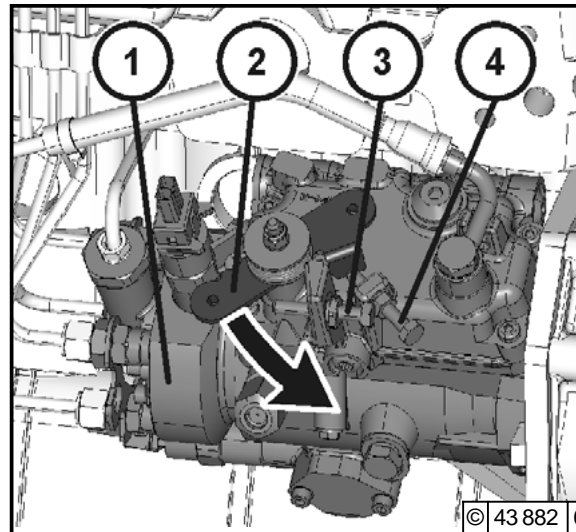
and all tools have been removed from the vehicle.

When starting with heating flange do not use any additional starting devices (e.g. injection with start pilot). Danger of accidents!

Caution: Under no circumstances may the engine be tested with a dismantled speed governor:

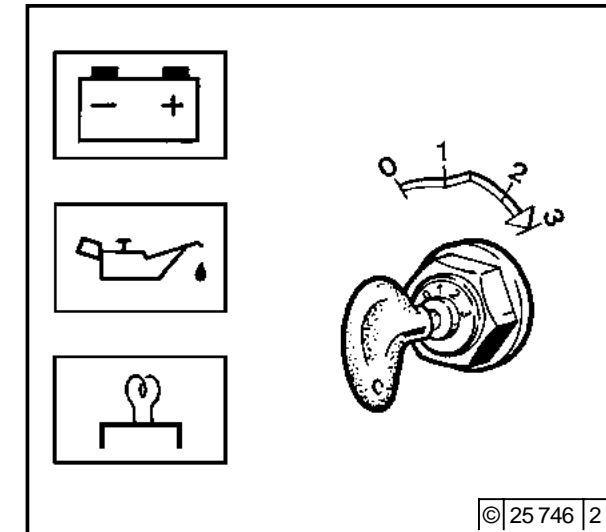
Separate battery connections!

In cold ambient temperatures warm-up the engine first - do not operate it straight away at full load!



- Separate engine from devices which it powers, by decoupling, as far as possible.
- Bring the speed adjustment lever 1 to the idling position (idling setting screw 4).
- Bring the shutdown lever 2 to operating position (direction of arrow, 3 max. speed stop).

without cold start aid



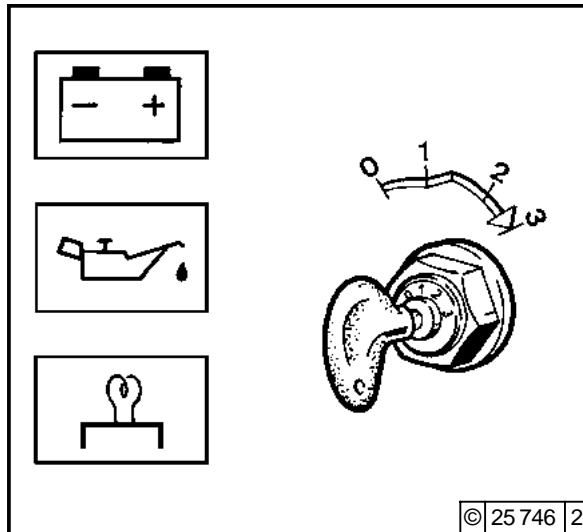
- Insert key.
 - Step 0 - no operating voltage
- Turn key to the right.
 - Step 1 = operating voltage
 - Warning lights light up
- Push in the key and turn further to the right against the spring load
 - Step 2 = without function
 - Step 3 = start
- Release key as soon as the engine starts up
 - Warning lights go out

Start the engine for a maximum of 20 seconds uninterrupted. If the engine does not start up, wait for one minute and then repeat the starting process.

If the engine does not start up after two starting processes determine the cause as per fault table (see 7.1).

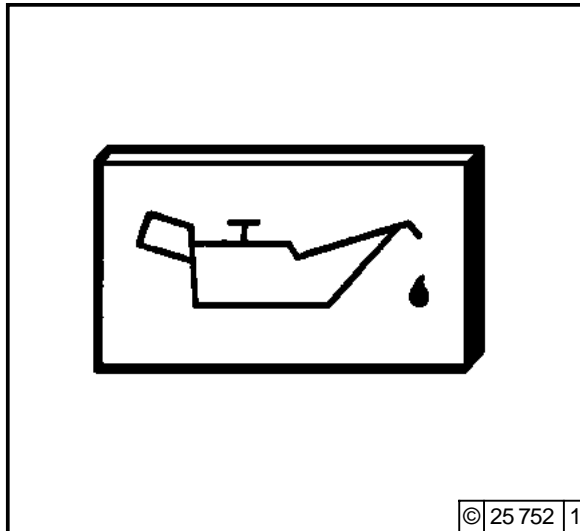
Note: Setting screws 3+4 are factory set and may not be changed

with cold start aid
- heating flange



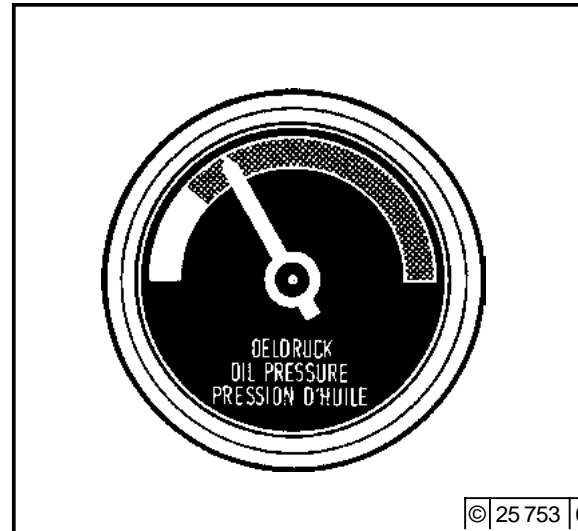
- Insert key.
 - Step 0 = no operating voltage
- Turn key to the right.
 - Step 1 = operating voltage
 - Warning lights light up
- Push in the key and turn further to the right against the spring load
 - Step 2 = pre-heating, hold for approx. one minute
 - Pre-heating light lights up
 - Step 3 = start
- Release key as soon as the engine starts up.
 - Warning lights go out

3.3.1 Engine oil pressure Oil pressure warning light



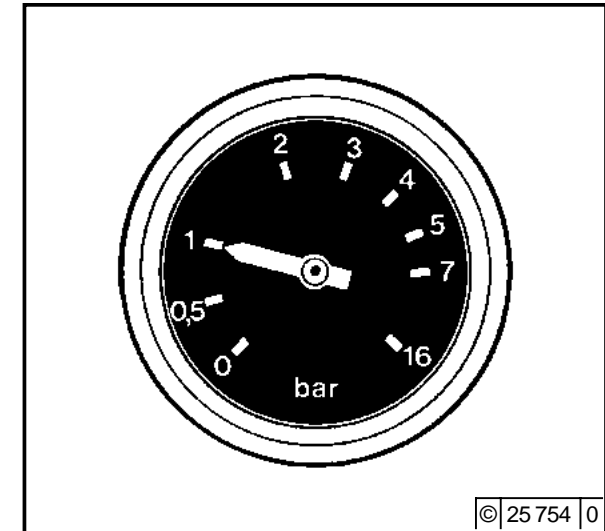
- Oil pressure warning light lights up when operating voltage is switched on, and when the engine is not running.
- Oil pressure control light must be extinguished during engine operation.

Oil pressure display



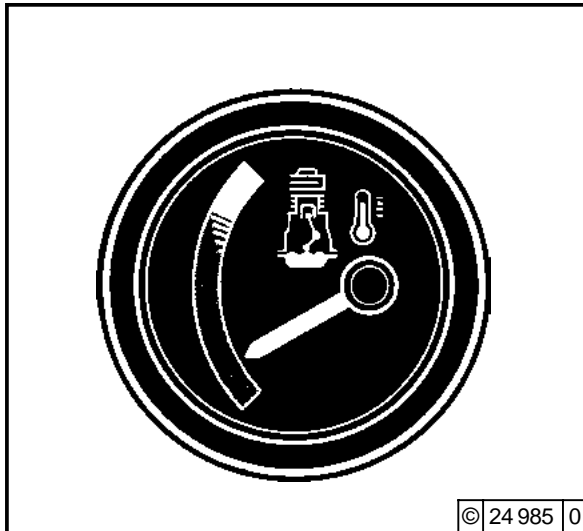
- Needle must be in the green field in the total operating range.

Oil pressure gauge



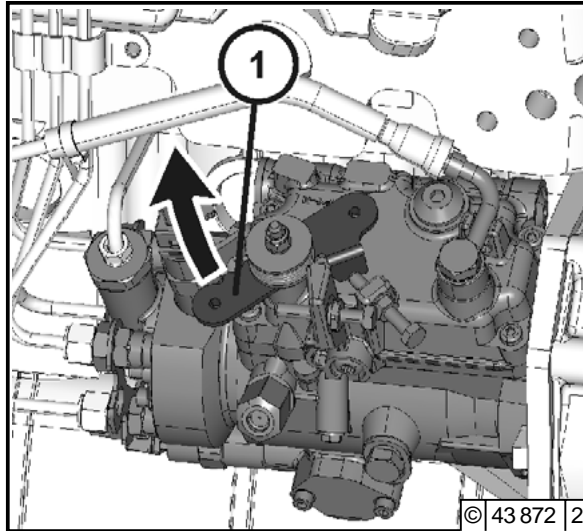
- Needle of oil pressure measuring instrument must indicate the minimum oil pressure (see 9.1).

3.3.2 Engine temperature Temperature display



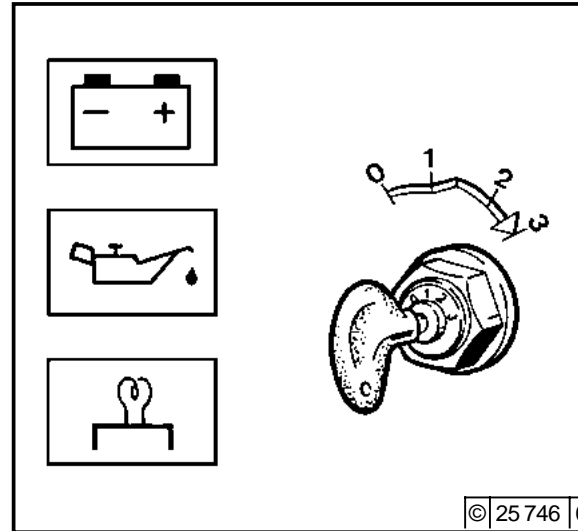
- The needle of the temperature display should always be in the green area, and only as an exception in the yellow/green area. If the needle rises into the orange area the engine is getting too hot. Switch off the engine and determine the cause as per fault table (see 7.1).

3.4.1 Mechanical switching-off



- Position the speed adjustment lever 1 to low speed.
- Turn the speed adjustment lever 1 in the direction of the arrow until it reaches idle stop. Charge warning light and oil pressure warning light light up after the engine has not been running.
- Turn the key to the left (to step 0) and remove. Warning lights go out

3.4.2 Electrical switching off (ignition key)

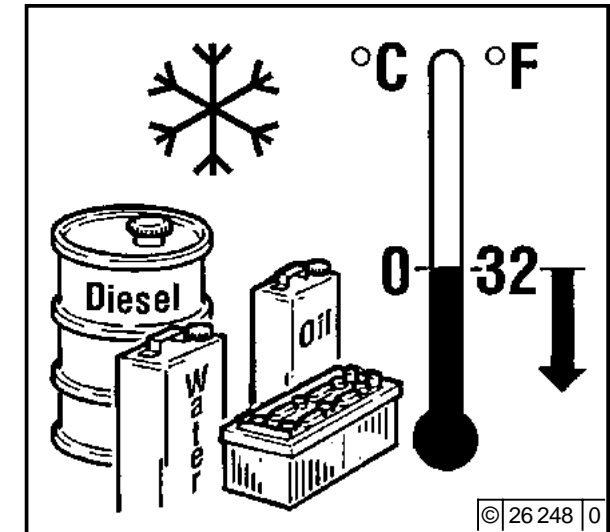


- Turn the key to the left (to step 0) shutdown magnet switches the engine off and remove. Warning lights go out

If possible, do not suddenly switch-off engine from full-load operation.

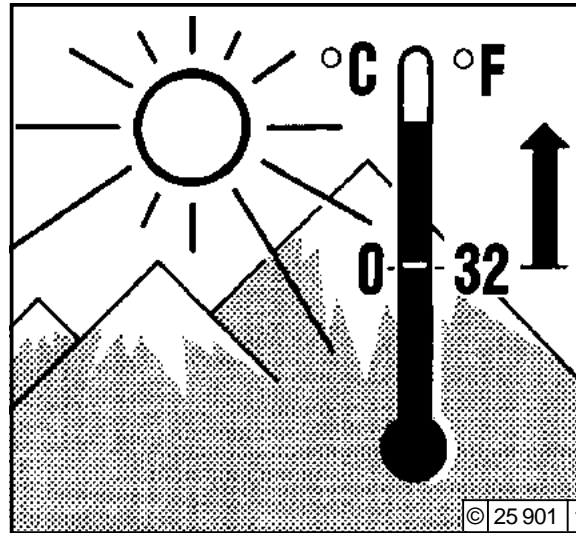
3.5.1 Winter operation

- Lube oil viscosity
 - Select the viscosity (SAE class) according to ambient temperature when starting the engine, see 4.1.2.
 - Observe shorter oil change times when operating under -10°C , see 6.1.1.
- Diesel fuel
 - Under 0°C use winter fuel, see 4.2.2.
- Additional maintenance work
 - Drain the liquid sludge from the fuel container weekly. (Loosen the sludge bleed screw)
 - If necessary, adjust the oil filling of the oil bath air filter and engine oil to the outside temperature.
 - At temperatures under -20°C , possibly after the starter has slowed-down, occasionally lubricate the gear rim on the flywheel with cold resistant grease through the pinion hole. (e.g. Bosch grease FT 1 V 31).
- Cold start aids
 - When there is a frost, start the engine with heating flange if necessary, see 3.2.1. This does not only lower the starting limit temperature, but also eases 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. $+20^{\circ}\text{C}$ (dismantle and store in a warm room) lowers the starting limit temperature by $4-5^{\circ}\text{C}$.



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 300 m and 25 °C is permissible. When using the engine under adverse conditions (high altitude or high temperatures) it is necessary to reduce the amount of fuel injected and with it the engine power.
- In case of doubt regarding engine usage, ask your engine or equipment 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 DEUTZSERVICE.



- 4.1 Lube oil
- 4.2 Fuel
- 4.3 Coolant

4.1.1 Quality

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

Recommended oils:		
Deutz	DQCII	DQCIII*+DQCIV#
ACEA	E3-96/E5-02/	E4-99/
	E7-04	E6-04
API	CH-4/CG-4	-
	CI-4	
DHD	DHD-1	

DQCIII * see chap. 6.1.1.2

DQCIV # only fully synthetic oils

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

Minimum requirement:	
Deutz	DQCI
ACEA	E2-96
API	CF/CF-4

*For oil change intervals see 6.1.1

For oil filling amounts see 9.1

4.1.2 Viscosity

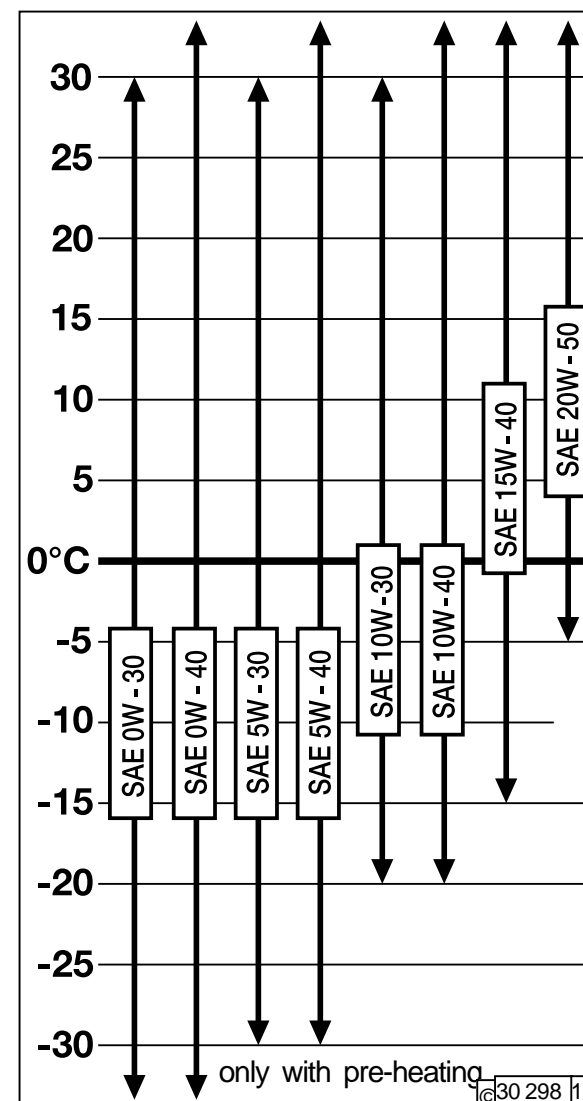
Generally, multi-viscosity oils are should be used. Single-viscosity oils can also be used in enclosed, heated spaces at temperatures $>5^{\circ}\text{C}$.

Since lube oil changes its viscosity (viscidty) depending on temperature, the ambient temperature of the location of engine operation is decisive for the selection of viscosity class (SAE class).

Refer to the oil viscosity diagram on the right to achieve optimal operating proportions. Falling below the temperature limits occasionally can impair the cold starting ability, but will not lead to engine damages.

In order to minimise wear, the operating limits should not be exceeded over a long period of time.

Synthetic lube oils are advantageous due to their greater temperature and oxidisation stability.



4.2.1 Quality

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

The following fuel specifications are permitted: (see TR 0199-99-3005)
The Technical Circular provides details on fuel specifications and can be obtained from the DEUTZ Service Organisation.

● Diesel fuel

- EN 590
- ASTM D 975-88 grade no. 1-D and 2-D
- NATO code F-54
- JIS K2204 grade 1 and 2

● Light fuel oils

- DIN 51603
- ASTM D 396 grade no. 1 and 2
- BS 2869 class A 2

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

4.2.2 Winter fuel

At low temperatures paraffin discharges can lead to blockages in the fuel system and cause operating faults. Use winter fuel at outside temperatures under 0 °C (to -15 °C) (generally offered by petrol stations in good time before the cold season begins). Frequently it is possible to buy diesel fuel with additives, which has an operational temperature of up to approx. -20 °C ("Super diesel").

- Paraffin should be added at temperatures below -15 °C or -20 °C. The mixing ratios required are as per the diagram on the right.

If it is necessary to use summer diesel fuel under 0 °C, paraffin can also be added by up to 60% as per the diagram on the right.

Generally, sufficient resistance to cold can also be achieved by adding a flow ameliorant (fuel additive). For questions regarding this please contact your DEUTZ Service

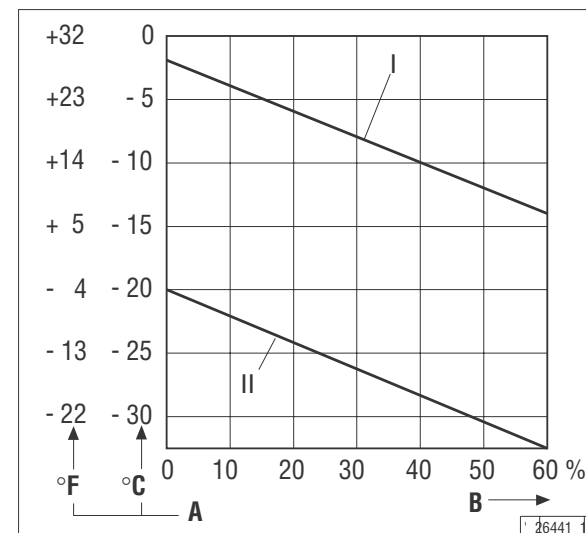


Diagram key:	
I	Summer diesel fuel
II	Winter diesel fuel
A	Outside temperature
B	Paraffin mixing proportion



Diesel fuels must never be mixed with petrol (normal and super)!



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

4.3.1 Water quality for coolant

The water may not fall short of or exceed the following values.

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

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

* Carbonate hardness proportion of total hardness min 3 dGH

4.3.2 Coolant preparation

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

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

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

The inspection of the concentration of cooling system preservative can be carried out with standard testing devices.

(Example: gefo glycomat (R)).

4.3.3 Cooling system preservative

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

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

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

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

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

Order the cooling system preservative from:
DEUTZ AG

Contact your local waterworks for information regarding the water quality.



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



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

- 5.1 Maintenance schedule**
- 5.2 Standard maintenance schedule**
- 5.3 Maintenance diagram**
- 5.4 Maintenance work carried out**

check=● set=○ clean=▲ renew=■										Industrial engines		
check 2x daily before or during the 1st trial run during the running-in phase or when commissioning new and overhauled engines.										The engine maintenance times given are maximum permissible job times. Depending on the usage circumstances, shorter maintenance times may be necessary. Observe the instruction manual of the equipment manufacturer. # Maintenance only to be carried out by authorised service personnel		Section
every 10 oh or daily												
in operating hours (oh) every												
E 10	E 20	E 25	E 30	E 40	E 45	E 60	Years			Activity		
		250	500	1000	2000	3000	6000	1	2			
●	●									Lube oil level, if necessary re-fill	6.1.2/3.3.4	
		°■	°■							Lube oil (° oil change intervals depending on type of engine use), see TR 0199-99-3002	6.1.1/ 6.1.2	
		°■	°■							Oil filter cartridge (at each lube oil change)	6.1.3	
			●	■				■		Fuel diaphragm pump	6.2.4	
			■							Fuel filter cartridge	6.2.1	
						■			■	Injection valve		
●		▲				■				Fuel pre-cleaner / Fuel pre-filter* (change filter insert if necessary)	4.2	
●			●		■				■	Coolant (additive concentration)	4.3.1/ 2/	
●	●									Coolant level	—	
●			●			■				Intake air filter (if available, as per maintenance display)	6.4.3 /6.4.4	
			●							Battery and cable connections	6.7.1	
●			●							Engine monitoring, warning system	3.3 #	
●		●				■				V-belts (if necessary, re-tighten or renew)	6.5.1	
●	●									Engine for tightness (visual inspection for leaks).	—	
●					●					Engine bearing (renew in case of damage)	9.2	
●			●							Fixings, hose connections / clamps (renew in case of damage)	—	
						■				Part overhauling	#	

* 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=■										<h2>Enhancements or modifications for engines with EPA acceptance</h2> <p>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.</p> <p># Maintenance only to be carried out by authorised service personnel</p>	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											
in operating hours (oh) every					Years		Activity				
250	500	1000	3000	6000		1	2				
			■						Injection valve	#	

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

5.2.1 Standard maintenance schedule

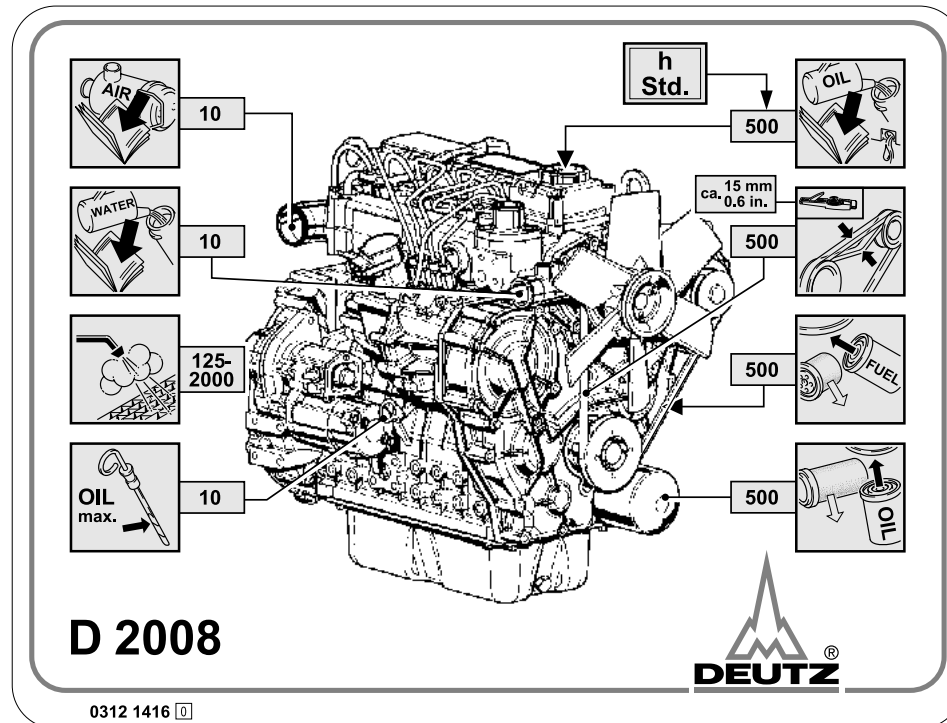
Intervals at/after	Service schedule	Activity	Execution by:	Comments
50 oh	E 10	after commissioning and E 45-E60	authorised specialists	
daily	E 20	daily inspection round	operator	
250 oh	E 25	inspection	authorised specialists	
500 oh	E 30	extended inspection	authorised specialists	
1000 oh	E 40	intermediate overhaul	authorised specialists	
2000 oh	E 45	intermediate overhaul	authorised specialists	
3 000 oh	E60	part overhaul	authorised specialists	

5.3 Maintenance diagram

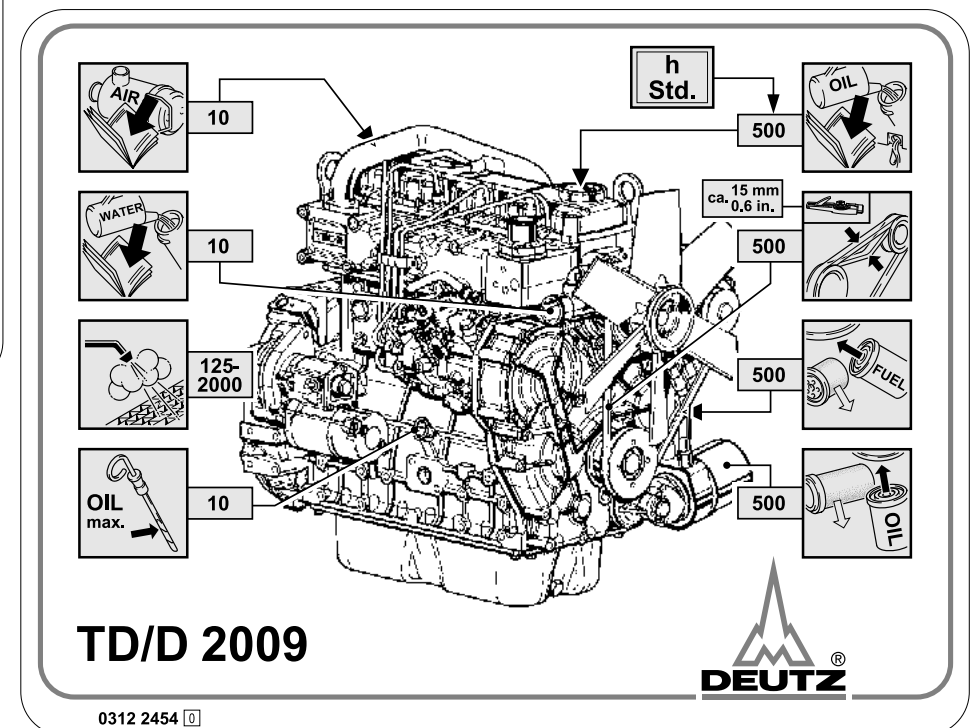
Maintenance

5

The maintenance diagram shown on this page is supplied with every engine in self-adhesive form. It should be stuck onto a well visible location on the engine or equipment.
Check that this is the case!
If not, request a replacement from your engine or equipment supplier!
The maintenance schedule is decisive for standard maintenance, see 5.1.



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



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		
2625			2750		
<p>* after commissioning new and overhauled engines</p> <p>The maintenance work carried out methodically can be recorded in the table and confirmed.</p>					

5.4 Maintenance work carried out

Maintenance

5

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

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.					

5.4 Maintenance work carried out

Maintenance

5

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
8875			9000		
9125			9250		
9375			9500		
9625			9750		
9875			10000		
10125			10250		
10375			10500		
10625			10750		
10875			11000		
10125			11250		
10375			11500		
10625			11750		
The maintenance work carried out methodically can be recorded in the table and confirmed.					

[illegible]

- 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 components**
- 6.8 Engine cleaning**

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 of diesel fuel.
 - Constant ambient temperature to -10 °C (+14 °F).
- The oil change times should be halved for fuels with a sulphur content of > 0.5 to 1% or a constant ambient temperature below -10 °C (+14 °F).
- For fuels with a sulphur content higher than 1% ask your responsible **service representative**.

6.1.1.1 Lube oil change intervals

Lube oil quality					
		Minimum requirement	Recommended oils:		
Deutz lube oil quality class		DQCI	DQCII	DQCII	DQCIV
ACEA specification		E2-96	E3-96/E5-02/E7-04	E4-99/E6-04	E4-99/E6-04
API specification		CF/CF-4	CH-4/CG-4	-	-
worldwide specification		-	DHD-1	-	-
special DEUTZ release list		-	-	see 6.1.1.2	only fully synthetic
Standard lubricant code designation for building machines and building vehicles		EO... EO...A, EO...B	EO...C	-	-
Engine		Lube oil change intervals in oh			
Series	Engine version	oil demands			
		normal	normal	normal	normal
D2008	Naturally aspirated engines	250*	500*	500*	500*
TD/D2009	Charged and naturally aspirated engines	500	500	500	500

* Under particularly severe ambient conditions the oil change intervals should be halved. This includes ambient temperatures greater than 35° C (95° F), high dust exposure, power factor over 70% or high dynamic stress. In case of doubt, please ask your service representative.

6.1.1.2 Release list DEUTZ lube oil quality level DQC II

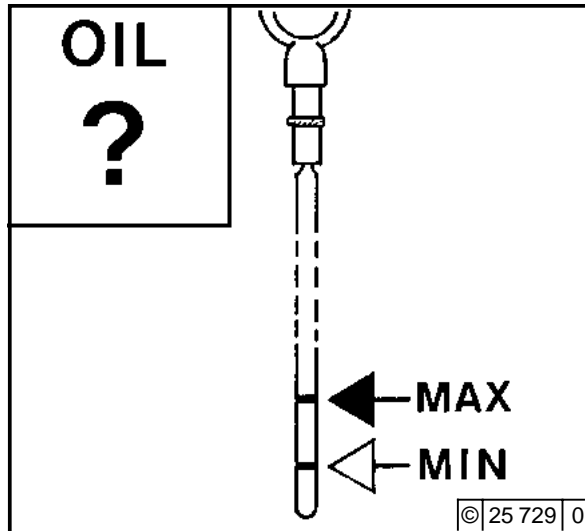
Manufacturer	Lube oil type	SAE class	Availability
DEUTZ	DEUTZ oil TLX-10W40FE	10W-40	Europe
ADDINOL	ADDINOL Super Truck MD 1048	10W-40	Europe, Asia
	ADDINOL Ultra Truck MD 0538	5W-30	Europe, Asia
AGIP	Agip Sigma Ultra TFE	10W-40	worldwide
	Autol Valve Ultra FE	10W-40	Germany
ARAL	Aral MegaTurboral	10W-40	worldwide
	Aral SuperTurboral	5W-30	worldwide
AVIA	TURBOSYNTH HT-E	10W-40	Germany
BAYWA	BayWa Super Truck 1040 MC	10W-40	South Germany
	BayWa Turbo 4000	10W-40	South Germany
BP OIL International	BP Vanellus E7 Plus	10W-40	Europe
	BP Vanellus E7 Supreme	5W-40	Europe
Castrol	Castrol SYNTRUCK	5W-40	Europe, North America, Brazil Argentina, Australia, South Africa
	Castrol DYNAMAX	7.5W-40	Europe, North America, Brazil Argentina, Australia, South Africa
CEPSA	EUROTRANS SHPD	10W-40	Spain, Portugal
CHEVRON	Chevron Delo 400 Synthtic	5W-40	North America
DEA	DEA Cronos Synth	5W-30	Germany, Europe
	DEA Cronos Premium LD	10W-40	Germany, Europe
	DEA Cronos Premium FX	10W-40	Europe

ESSO	Essolube XTS 501	10W-40	Europe
FUCHS EUROPE	Fuchs Titan Cargo MC	10W-40	worldwide
	Fuchs Titan Unic Plus MC	10W-40	worldwide
MOBIL OIL	Mobil Delvac 1 SHC	5W-40	Europe, SE Asia, Africa
	Mobil Delvac 1	5W-40	worldwide
	Mobil Delvac XHP Extra	10W-40	Europe, SE Asia
Lube oil refinery Salzbergen	Wintershall TFG	10W-40	Europe
Shell International	Shell Myrina TX /	5W-30	Europe, code
	Shell Rimula Ultra	10W-40	country specific, varies
	Shell Myrina TX /		Europe, code
	Shell Rimula Ultra		country specific, varies
Texaco	Ursa Super TDX 10W-40	10W-40	Europe
	Ursa Premium FE 5W-30	5W-30	Europe
TOTAL	TOTAL RUBIA TIR 8600	10W-40	worldwide
	EXPERTY	10W-40	worldwide

This table will be extended if necessary.

6.1.2 Checking oil level / changing engine oil

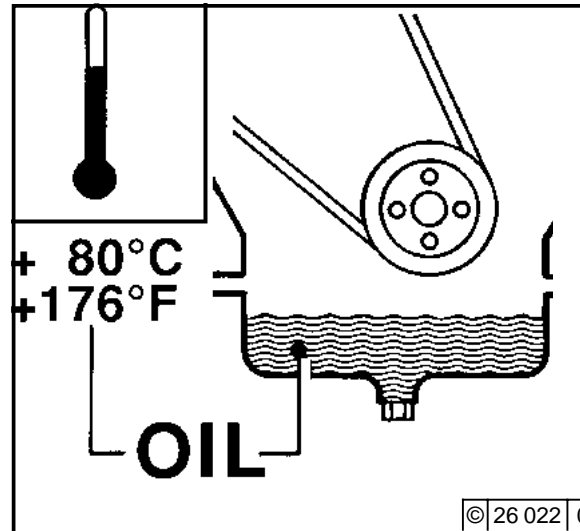
6.1.2.1 Checking oil level



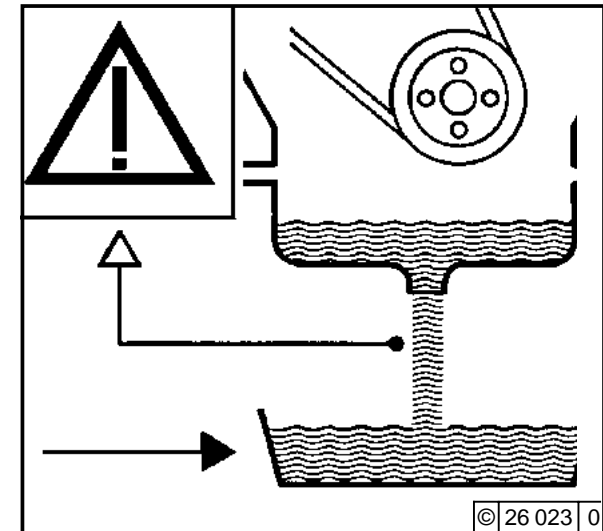
- Oil level on switched off engine, check
- Position the engine or vehicle so as to be level.
- Extract oil dipstick.
- Wipe with a fibre-free, clean cloth.
- Insert until it stops and extract again.
- Check oil level and re-fill to "MAX" if necessary.
 - If the oil level lies just above the "**MIN**"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

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

6.1.2.2 Changing engine oil



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

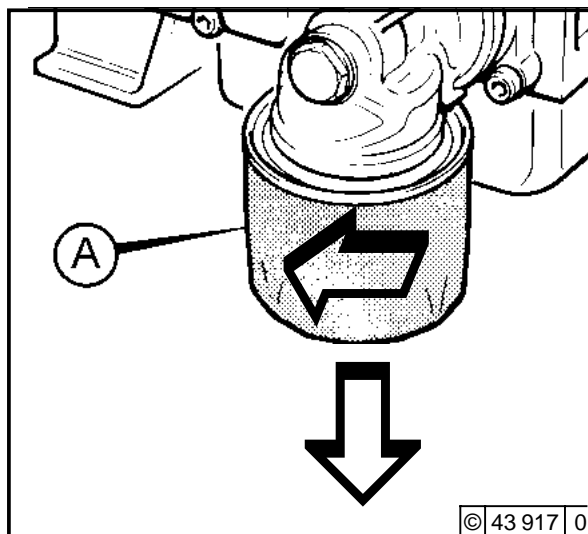


- Position oil drip cup under the engine.
- Unscrew oil drain screw.
- Drain off oil.
- Screw in oil drain screw with new sealing ring and tighten. (For tightening torque see 9.2).
- Pour in lube oil
 - For quality / viscosity data see 4.1.
 - For filling amounts see 9.1.
- Check oil level, see 6.1.2.1

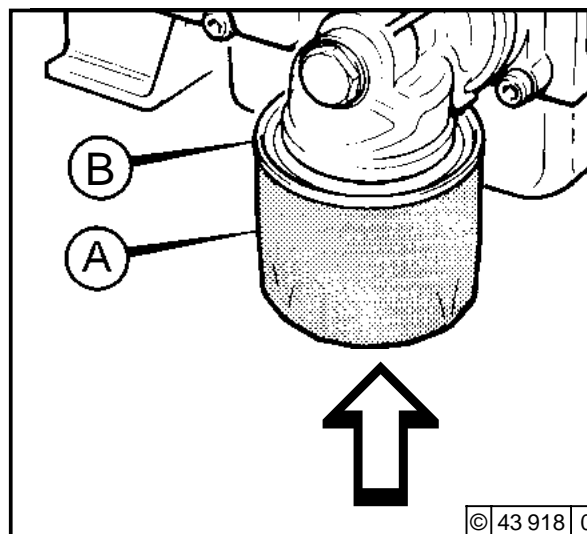


Caution when draining hot oil: danger of scalding !
Collect the used oil, do not allow to seep into floor!
Dispose of according to instructions!

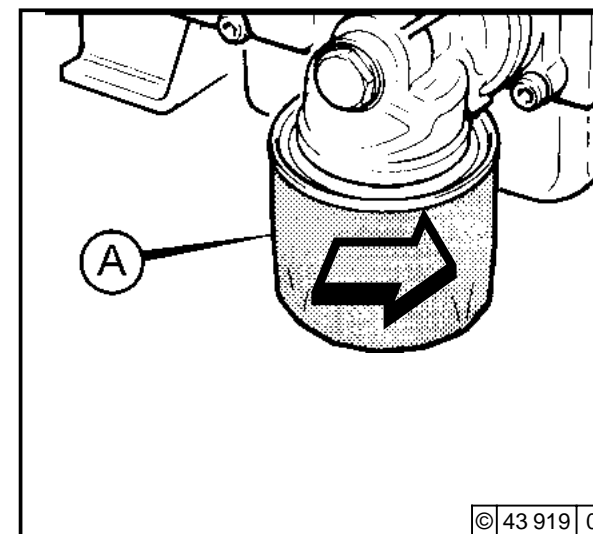
6.1.3 Changing oil filter



- Loosen the lube oil filter cartridge A in the direction of the arrow with a standard tool and unscrew.
- Collect any oil which may run out.



- Clean the sealing surface B of the filter support for any possible dirt.
- Lightly oil the rubber seal of the new lube oil cartridge A.

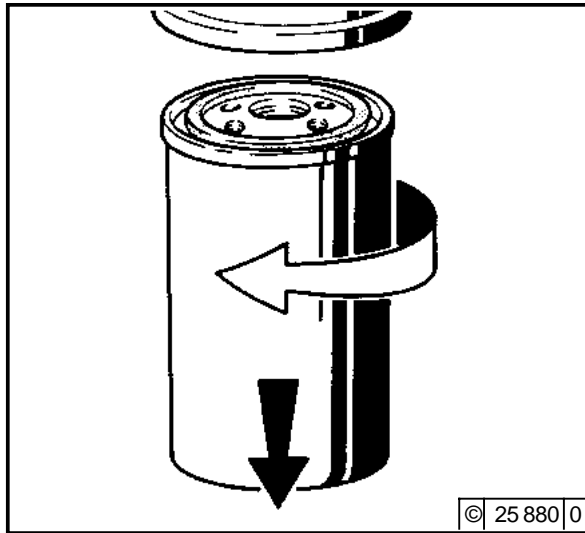


- Screw on the cartridge in the direction of the arrow by hand until the seal makes contact.
- Tighten the lube oil filter cartridge A with one more half turn.
- Check oil level, see 6.1.2.
- Check oil pressure, see 3.3.1.
- Check the seal of the lube oil cartridge for tightness.

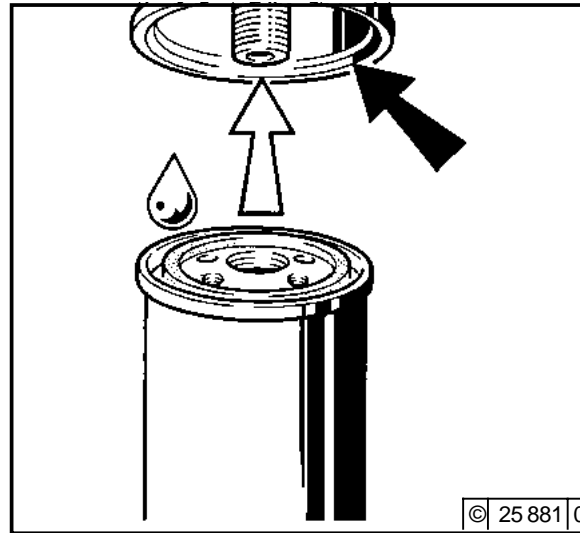


Careful with hot oil: Danger of scalding!

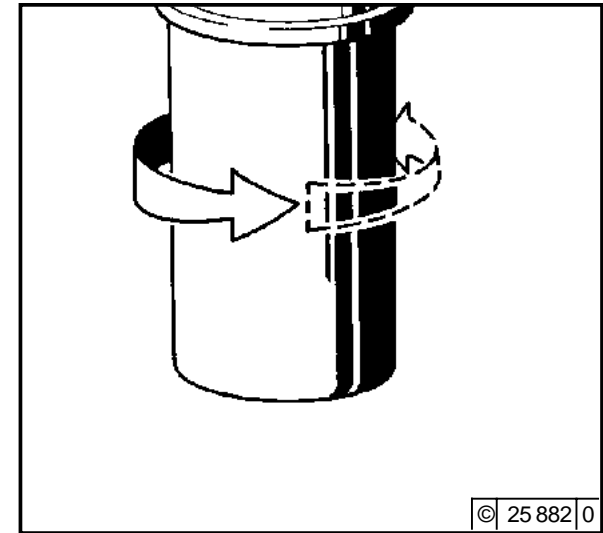
6.2.1 Changing fuel filter



- Close fuel stopcock.
- Loosen fuel filter cartridge with standard tool and unscrew.
- Collect fuel which runs out.



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



- Tighten the fuel filter cartridge with one more half turn.
- Open fuel stopcock.
- Check for tightness.



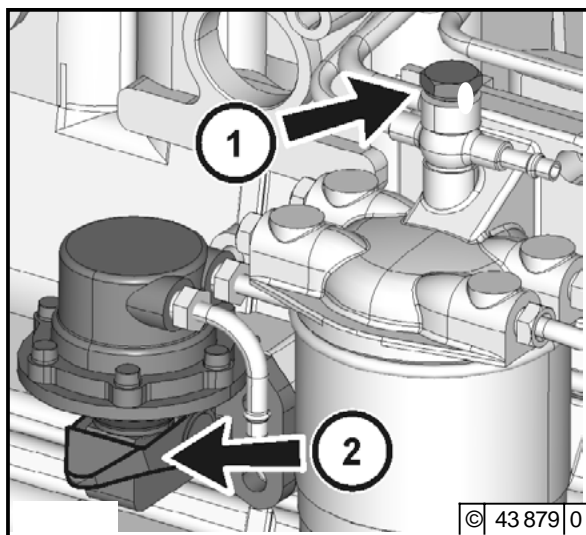
No open fire when working on the fuel system!
Do not smoke!

It is not necessary to bleed the fuel system.

6.2 Fuel system

Care and maintenance work

6.2.2 Bleeding fuel system

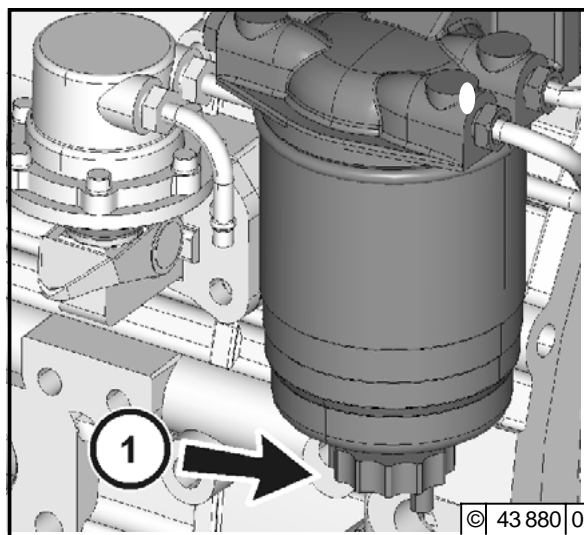


- Position collecting vessel underneath filter.
- Open fuel stopcock.
- Loosen bleed screw 1
- Turn the lever on the fuel pump 2 until the fuel escapes from the bleed screw 1 without bubbles.
- Tighten bleed screw 1
- Dispose of the fuel from the collecting vessel in an environmentally sound manner.
- Check tightness after commissioning.



If possible, do not let the tank run empty! No open fire when working on the fuel system!
Do not smoke!

6.2.3 Draining water from fuel system

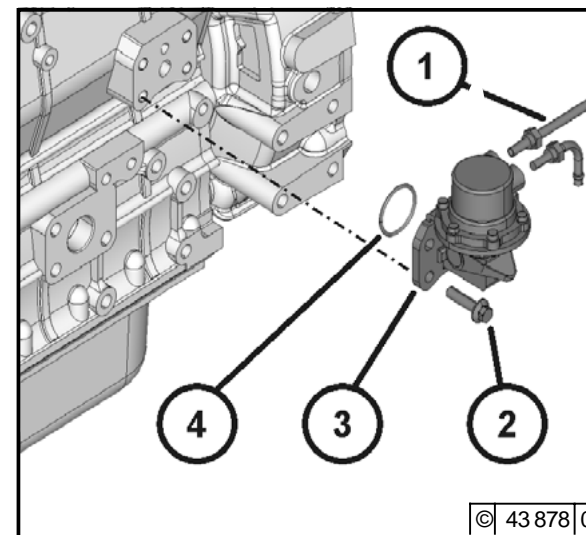


- Position collecting vessel underneath filter.
- Loosen drainage screw 1
- Drain water from the drainage screw 1.
- Tighten drainage screw 1.
- Dispose of the water from the collecting vessel in an environmentally sound manner.
- Check tightness after commissioning.



If possible, do not let the tank run empty! No open fire when working on the fuel system!
Do not smoke!

6.2.4 Changing fuel diaphragm pump



- Position collecting vessel underneath fuel diaphragm pump 3.
- Loosen screw on fuel line 1 to filter support and separate from fuel diaphragm pump 3.
- Loosen screw 2.
- Remove fuel diaphragm pump 3.
- Install fuel diaphragm pump 3 with new sealing ring 4.
- Tighten fuel line 1 to filter support.
- Bleed fuel system, see 6.2.2
- Check tightness after commissioning.



No open fire when working on the fuel system!
Do not smoke!
Dispose of used fuel in an environmentally sound manner

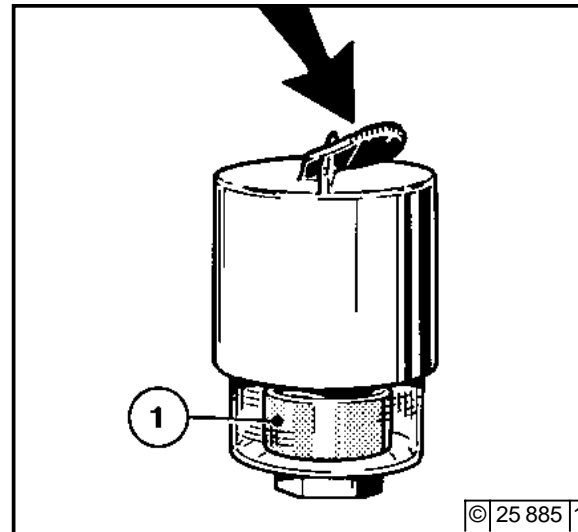
6.3.1 Cleaning intervals

- The soiling of the cooling system 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 on the right can be used as guidelines.

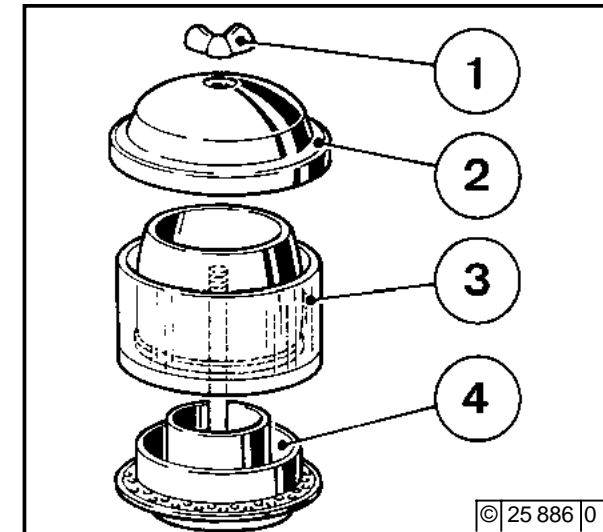
Checking or cleaning intervals Guideline oh	Type of engine application
2000	Ships, electronic units in enclosed spaces. pumps
1000	Vehicles on paved roads
500	Tractors, fork lift trucks, drivable electronic units
250	Vehicles on building sites and unpaved roads Building machines, compressors, mining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

6.4.1 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 pre-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.



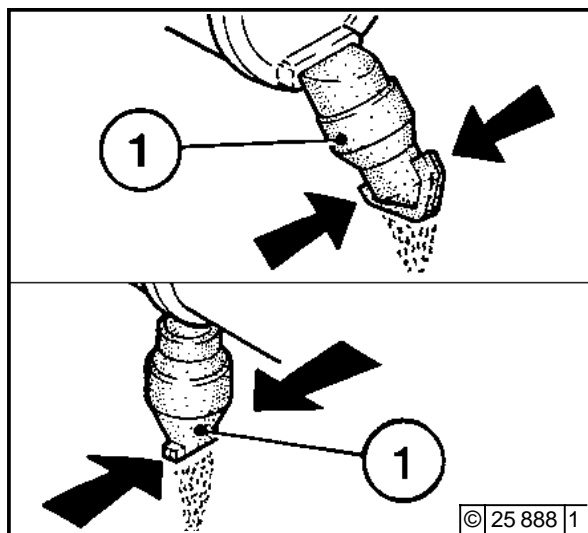
6.4.2 Emptying cyclone pre-separator



- 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.

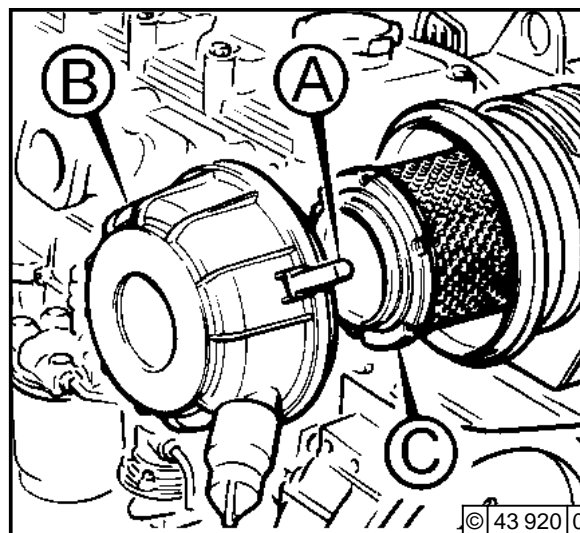
Never fill the dust container with oil, replace damaged containers.

6.4.3 Dry air filter dust discharge valve



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

Filter cartridges



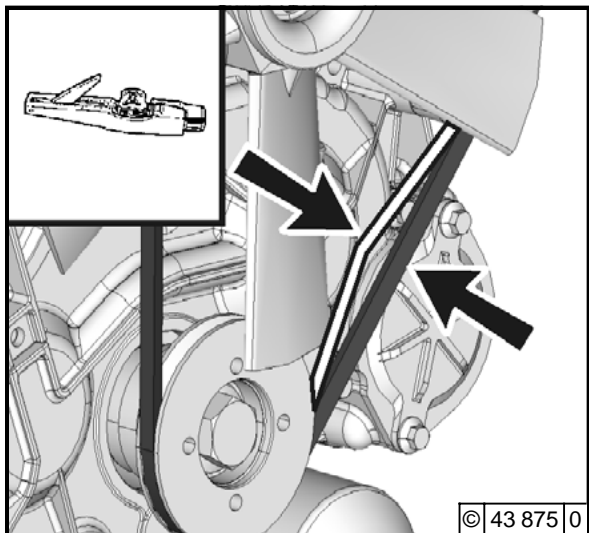
- Open clamping bracket A.
- Remove filter hood B and pull out filter cartridge C.
- Clean filter cartridge, renew after a year at the latest.
- Clean filter cartridge C.
Blast out from the inside out with dry compressed air (max. 5 bar) (only beat out in extreme cases or only wash according to manufacturer's specifications, not damaging the cartridge).
- The seal of the filter cartridge C can be damaged by frequent removal and installation. Check filter cartridge C for damage to the filter paper (shine light through) and check the seal. Exchange if necessary.

- Renew the safety cartridge after five filter maintenances, after two years at the latest (never clean).
To do this:
 - Loosen the hexagonal nut and pull out the cartridge.
 - Insert new cartridge and re-tighten with hexagonal nut.
- Insert filter cartridge C, put on hood B and fasten clamping bracket A.

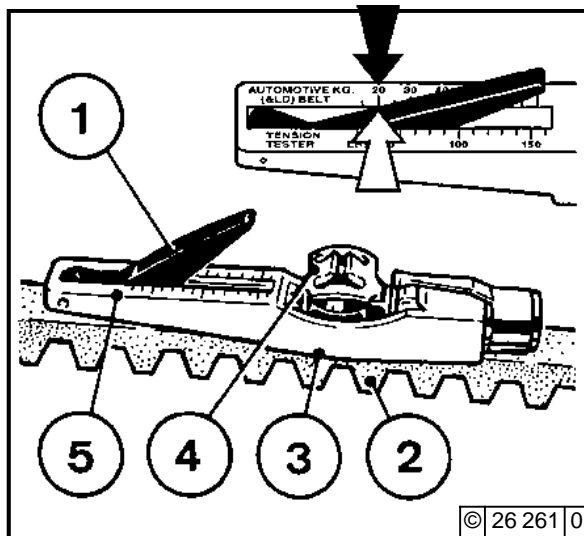


Never clean filter cartridge C with petrol or hot liquids!

6.5.1 Checking V-belt



- 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.
- Use a V-belt tension measuring device (see chap. 9.3) to check the V-belt tension.
 - 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.



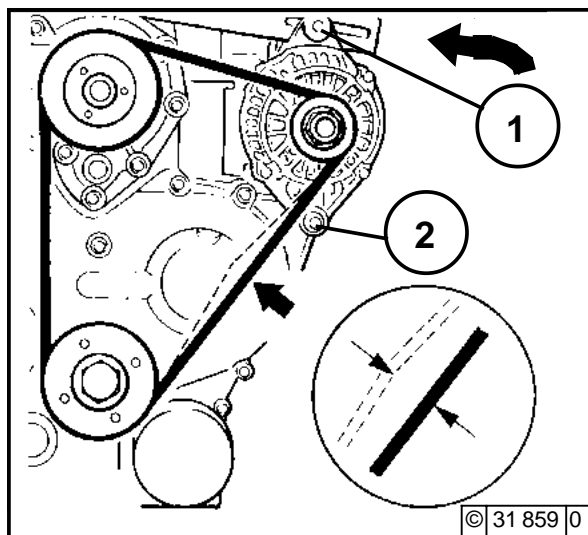
- Carefully lift the measuring device, without altering the position of the indicator arm 1.
- Read off the measured value on the intersection (arrow), scale 5 and indicator 1. For setting values see 9.1.
- If necessary, re-tighten and repeat measurement.



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

Check the belt tension of new V-belts after 15 minutes running time.

6.5.2 Tightening/changing V-belts



Tightening

- Loosen screw 1.
- Actuate the generator against the direction of the arrow.
- Re-tighten screw 1.
- Check V-belt tension.

Changing

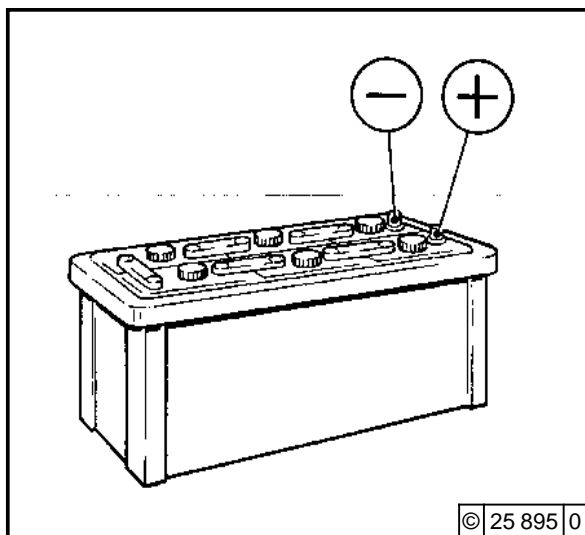
- Loosen screws 1 and 2.
- Adjust the generator in the direction of the arrow.
- Remove V-belt and put new belt on.
- Actuate the generator against the direction of the arrow.
- Re-tighten screws 2 and 1.
- Check V-belt tension (see 6.5.1).



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

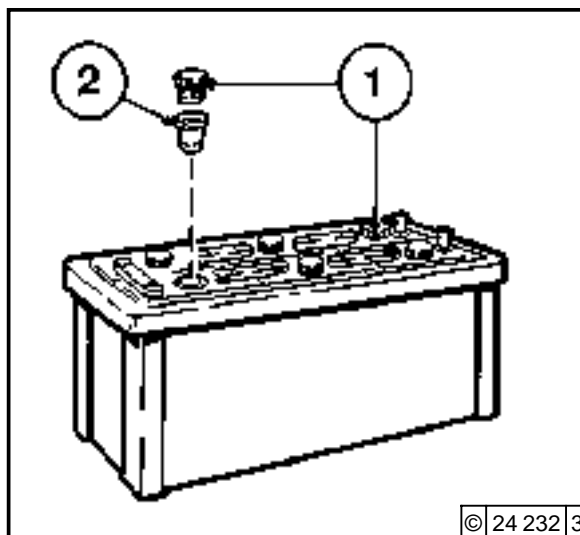
6.6.1 Battery

6.6.1.1 Checking battery and cable connections



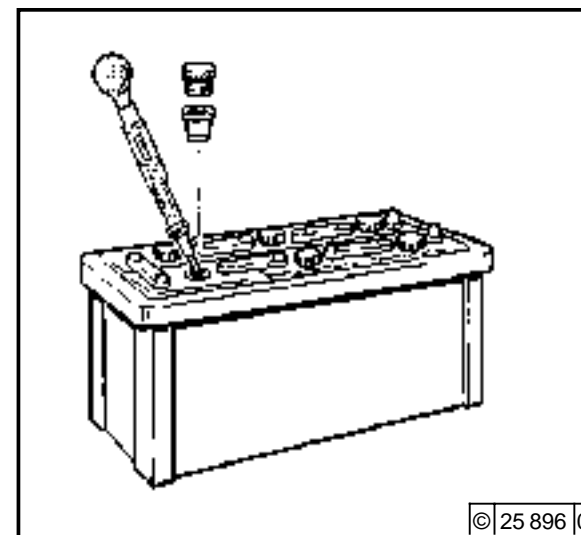
- Keep the battery clean and dry.
- Loosen soiled connection terminals.
- Clean the battery poles (+ and -) and terminals, and grease with an acid-free and acid-resistant grease.
- Ensure that the terminal connections contact well when assembling. Tighten the clamping screws by hand.

6.6.1.2 Checking the acid level



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

6.6.1.3 Checking acid density



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

The measured values (see following table) provide information on the charged level of the battery.

The acid temperature when measuring should be +20 °C if possible.

Acid density				
in [kg/ l]		in [°Bé (Baumé degree)*]		Charge level
Normal	Tropics	Normal	Tropics	
1.28	1.23	32	27	well charged
1.20	1.12	24	16	half charged, re-charge
1.12	1.08	16	11	discharged, charge immediately

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



The gases released by the battery are explosive! Avoid sparks and open fire in the vicinity of the battery!

Do not allow acid to get on skin or clothes!

Wear protective glasses!

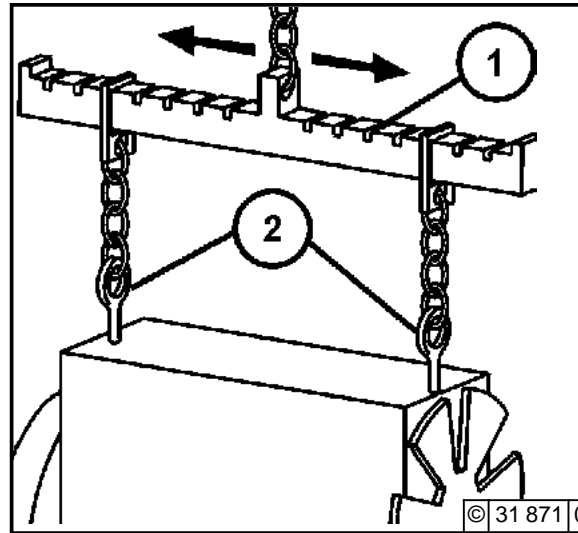
Do not place any tools on the battery!

6.6.2 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 exchange battery connections.
- Replace defective charge warning light immediately.
- Cover generator and governor when washing the engine.
- Under no circumstances may the voltage of a three-phase current system be tested by tapping against the earth cable.
- When carrying out electrical welding work, clamp the earth terminal of the welding device directly to the part to be clamped.

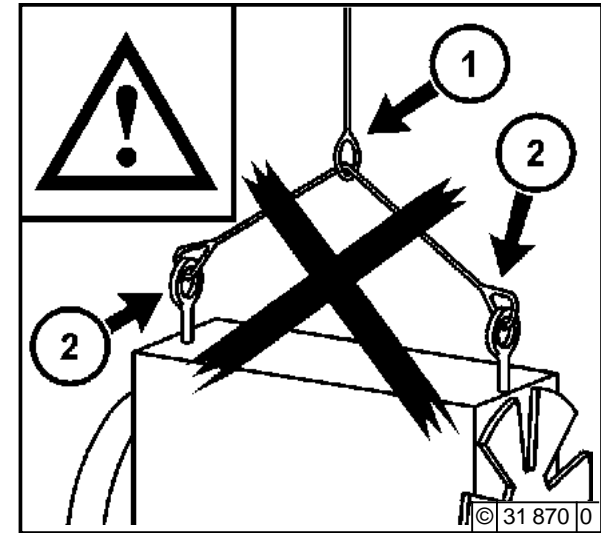
6.6.3 Transportation suspension



- Only use the correct suspension equipment 1 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 (1).
- Fastening devices can slip, engine capsizes (1).
- Short fastening device causes bending moments in the suspension. This can damage the suspension. (2)



Engine can fall.
Danger to life!

6.7.1 Engine cleaning

Preparation

- Switch off engine
- Remove engine cover, cool air hood. Re-assemble after cleaning and before trial run.
- Cover electrical / electronic components and connections (e.g. generator, starter, governor, lifting magnet).

With compressed air

- Blast out engine paying particular attention to cooler and cooling fins (blast out beginning from the exhaust side).
Remove any dirt blown inside.

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, repeat process if necessary.
- Warm up the engine so that the water residues evaporate.

With a high pressure device

- Clean engine with steam jet (max. spray pressure 60 bar, max. steam temperature 90 °C).
- Warm up the engine so that the water residues evaporate.



Only carry out cleaning work on the engine when it is not running!

7.1 Fault table

- Faults can often be put down to the engine not being operated correctly or not being maintained.
- For every fault, check whether all operating and maintenance instructions were 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 AG

7.1 Fault table

Faults, causes and remedies

7

Faults										Measures		
	Engine doesn't start up, or starts up with difficulty									Check	P	
	Engines starts up, but runs irregularly or misfires									Set	E	
	Engine gets too hot. Temperature warning system is activated									Change	W	
	Engine lacks power									Clean	R	
	Engine doesn't work on all cylinders									Fill up	A	
	Engine has no, or too little, oil pressure									Lower	S	
	Engine oil consumption is too high											
	Engine smoulders - blue											
	- white											
	- black											
Causes										Section		
●									Not declutched (if possible)	Operation	P	
●								●	Starting limit temperature not reached		P	
		●			●				Oil level too low		A	
		●	●			●	●		Oil level too high		P	
					●	●	●		Engine is tilted too far		S	
●					●				Incorrect SAE class of engine lube oil and oil quality		Operating substance	W
●	●		●					●	Fuel quality does not comply with instruction manual	W		
		●	●						●	Air filter soiled / turbocharger defective	P / W	
		●	●						●	Air filter maintenance switch / display defective	Combustion air	P / W
			●						●	Charge air line leaking		P
		●								Fan defective / V-belt torn or loose	Cooling system	P / W
		●								Cool air heating / heat short circuit		P
		●								Resistance in cooling system is too high / flow volume too low		P
●										Battery defective or not charged	Electrics	P / A

Faults										Measures											
<div>Engine doesn't start up, or starts up with difficulty</div> <div>Engines starts up, but runs irregularly or misfires</div> <div>Engine gets too hot. Temperature warning system is activated</div> <div>Engine lacks power</div> <div>Engine doesn't work on all cylinders</div> <div>Engine has no, or too little, oil pressure</div> <div>Engine oil consumption is too high</div> <div>Engine smoulders - blue</div> <div> - white</div> <div> - black</div>										Check										P	
										Set										E	
										Change										W	
										Clean										R	
										Fill up										A	
										Lower										S	
										Causes										Section	
●										Cable connections in starter circuit are loose or oxidised										Electrics	P
●										Starter defective or pinion doesn't mesh											P
	●		●	●						Injection line leaking											P
●	●	●	●	●				●	●	Injection valve defective										Engine	P / W

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 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
- Corrosion protection agent only for exterior corrosion protection according to specification:
Nato Code C 632
- Recommended cleaning agent for removal of corrosion protection:
Petroleum benzine
(hazard class A3)

8.1.1 Protecting engine from corrosion

- Clean engine with high-pressure appliance (with cold cleaner if absolutely necessary).
- Warm up the engine and switch off.
- Drain off engine oil, see chapter 6.1.2 and pour in corrosion protection oil.
- Clean oil discharge filter if necessary, see chapter 6.4.3, and pour in corrosion protection oil.
- Drain fuel from 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 the engine several times by hand to apply corrosion protection to the cylinders and combustion chamber.
- Remove V-belt, pack up and store.
- Spray the grooves of the V-belt pulley with corrosion protection agent.
- Seal intake and exhaust openings.

8.1.2 Removing engine corrosion protection

- Remove corrosion protection agent from grooves of V-belt pulley.
- Assemble V-belt. If necessary, re-tighten after a short operating time, see 6.5.
- Remove seals from intake and exhaust openings.
- Start up the engine.

9.1 Engine and setting data

9.2 Screw tightening torques

Technical data

9.1 Engine and setting data

9

Engine type		----- D 2008 L03 -----	D 2008 L04 -----
Number of cylinders	-----	----- 3 -----	----- 4 -----
Cylinder arrangement	-----	----- In-line -----	
Bore	[mm]	----- 76 -----	
Stroke	[mm]	----- 86 -----	
Total displacement	[cm ³]	----- 1170 -----	----- 1560 -----
Compression ratio	[ε]	----- 23.5 -----	
Working principle	-----	----- Four-stroke diesel engine -----	
Combustion process	-----	----- Naturally aspirated engine with direct injection -----	
Direction of rotation	-----	----- Left seen on fly wheel -----	
Weight without cooling system (with starter, with generator)	ca [kg]	----- 155 -----	----- 189 -----
Engine power (at rpm)	[kW]	----- 3000 -----	
Speed (example)	[rpm]	----- Forced feed lubrication / 20 W 20 -----	
Lubrication / oil SAE	-----		
Maximum oil temperature in oil tray	[°C]	----- 130 -----	
Minimum oil pressure in warm engine, oil temp. 110°C/ 230°F at:			
max. 3000 rpm	[kPa/bar]	----- 480 / 4.8 -----	----- 400 / 4 -----
Engine with thermostat:			
Oil change volume without external cooler / without filter approx.	[ltr.]	----- 4.8 -----	----- 6.9 -----
Oil change volume without external cooler +			
filter change (standard 0.5 ltr.) approx.	[ltr.]	----- 5.3 -----	----- 7.4 -----
Valve clearance:			
Hydraulic tappet: Setting valve clearance is not necessary			
Start of pumping	[°KW before TDC]	----- .1) -----	
Engine ignition sequence	-----	----- 1 - 2 - 3 -----	----- 1 - 3 - 4 - 2 -----
V-belt tension: pre-tighten/re-tighten			
(after the engine has been driven under load for 15 minutes):	[N]	----- 450 / 350 ±20 -----	

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

²⁾ Approx. value can vary depending on oil tray or cooler version (external cooling system). The upper oil dipstick marking is always decisive.

Technical data

9.1 Engine and setting data

9

Engine type -----		D 2009 L03 -----	D 2009 L04 -----	TD 2009 L04 -----
Number of cylinders -----		3 -----	4 -----	4 -----
Cylinder arrangement -----		In-line -----		
Bore -----	[mm]	90 -----		
Stroke -----	[mm]	90 -----		
Total displacement -----	[cm ³]	1718 -----	2289 -----	2289 -----
Compression ratio -----	[ε]	19.6 -----	18 -----	18 -----
Working principle -----		Four-stroke diesel engine -----		
Combustion process -----		Naturally aspirated -----	Naturally aspirated -----	with charging -----
-----		engine -----	engine -----	-----
-----		and direct injection -----		
Direction of rotation -----		Left seen on fly wheel -----		
Weight without cooling system (with starter, with generator) -----	ca [kg]	180 -----	205 -----	220 -----
Engine power (at rpm) -----	[kW]	1) -----		
Speed (example) -----	[rpm]	max. 3000 -----		
Lubrication / oil SAE -----		Forced feed lubrication/ 20 W 20 -----		
Maximum oil temperature in oil tray -----	[°C]	130 -----		
Minimum oil pressure in warm engine, oil temp. 110°C/ 230°F at: max. 3000 rpm -----	[kPa/bar]	200 / 2 ³⁾ . -----	200 / 2 ³⁾ . -----	220 / 2,2 ³⁾ . -----
Oil change volume without filter approx. -----	[ltr.]	4.9 ²⁾ . -----	6.5 ²⁾ . -----	6.5 ²⁾ . -----
Oil change volume with filter change (standard 0.5 ltr.) approx. -----	[ltr.]	5.8 -----	7.5 -----	7.5 -----
Valve clearance:				
Hydraulic tappet: Setting valve clearance is not necessary -----				
----- Start of pumping -----	[°KW before TDC]	1) -----		
Engine ignition sequence -----		1-2-3 -----	1 - 3 - 4 - 2 -----	1-3-4-2 -----
V-belt tension: pre-tighten/re-tighten (after the engine has been driven under load for 15 minutes): -----	[N]	450 / 350 ±20 -----		

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

²⁾ Approx. value can vary depending on oil tray or cooler version (external cooling system). The upper oil dipstick marking is always decisive.

³⁾ Date for engines without engine oil heating.

Installation	Pre-tightening [Nm]	Re-tightening				Total Nm	Comments
		1st step	2nd step	3rd step	4th step		
Cylinder head cover						27	
Rocker arm setting screw	—	—	—	—	—	27 ± 2	
Intake elbow	—	—	—	—	—	27	M8x125
Air intake pipe	—	—	—	—	—	27	
Exhaust manifold	—	—	—	—	—	27	
Oil drain screw sheet metal oil tray	—	—	—	—	—	32	M14x1.50
Injection valve fastening	—	—	—	—	—	28	
Lube oil filter cartridge	—	—	—	—	—	27	
Starter	—	—	—	—	—	41	

Notes

Warnings to Place on Equipment

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Warning in the Manual

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

or

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

CALIFORNIA PROPOSITION 65 INFORMATION

TO CALIFORNIA CUSTOMERS AND TO CUSTOMERS SELLING DIESEL ENGINE EQUIPMENT INTO OR FOR USE IN CALIFORNIA.

Proposition 65, a California law, requires warnings on products which expose individuals in California to chemicals listed under that law, including certain chemicals in diesel engine exhaust.

Obligations of Manufactures of Diesel-Powered Off-Road Equipment. The California Superior Court has approved either of the following two methods of compliance with Proposition 65 requirements by manufactures of off-road equipment containing diesel engines. (The court order containing these provisions is attached.)

1. **On-Equipment Warning.** Place the warning pictured in attachment 1 on all equipment shipped by you into or for sale in California after January 1, 1996. The warning must be in a location where it is easily visible to the operator of the equipment when (s)he is operating the equipment. The warning must be secured to the equipment. If warnings or operating instructions are provided through a digital display, you may use that method of providing warning.
2. **Operator Manual Warning.** When the operator manual is next revised or by December 31, 1995 whichever is earlier, place the warning in attachment 2 in the operator manual. The warning may be either printed in the manual or on a sticker.

The warning must appear in one of the following locations:

- Inside The front cover
- Inside the back cover
- Outside the front cover
- Outside the back cover
- As the first page of text

Under either alternative, the warning must appear in the same size, print and format as the attachment selected or be of an equally conspicuous size and format. If the warning is provided in an on-screen display, the warning must contain the language in the attachment and must be provided at the time of or in connection with ignition in the same manner as other safety warnings electronically communicated on screen.

Obligation of Resellers of Diesel Engines. This letter must accompany any loose diesel engine sold in California. Should you have any questions, please call Deutz Corporation Product Support Department.

For many years DEUTZ has stood for pioneering development in engine construction. As an independent engine 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 a complete overview of DEUTZ partners in your area, their product competencies and their services on the DEUTZ website (see below).

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

Your DEUTZ AG

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