

Operation Manual
1008





Safety guidelines / Accident prevention

- Please read and observe the information given in this Operation Manual. This will enable you to avoid accidents, preserve the manufacturer's warranty and maintain the engine in peak operating condition.
- This engine has been built exclusively for the application specified in the scope of supply, as described by the equipment manufacturer and is to be used only for the intended purpose. Any use exceeding that scope is considered to be contrary to the intended purpose. The manufacturer will not assume responsibility for any damage resulting therefrom. The risks involved are to be borne solely by the user.
- Use in accordance with the intended purpose also implies compliance with the conditions laid down by the manufacturer for operation, maintenance and servicing. The engine should only be operated by personnel trained in its use and the hazards involved.
- The relevant accident prevention guidelines and other generally accepted safety and industrial hygiene regulations must be observed.
- When the engine is running, there is a risk of injury through:
 - turning/hot components
 - engines with positive ignition
 - ignition systems (high electrical voltage)You must avoid contact at all times!
- Unauthorized engine modifications will invalidate any liability claims against the manufacturer for resultant damage. Manipulations of the injection and regulating system may also influence the performance of the engine, and its emissions. Adherence to legislation on pollution cannot be guaranteed under such conditions.
- Do not change, convert or adjust the cooling air intake area to the blower. The manufacturer shall not be held responsible for any damage which results from such work.
- When carrying out maintenance/repair operations on the engine, the use of DEUTZ original parts is prescribed. These are specially designed for your engine and guarantee perfect operation. Non-compliance results in the expiry of the warranty!
- Maintenance and cleaning of the engine should only be carried out when the engine is switched off and has cooled down. You must ensure that the electrical systems have been switched off and the ignition key has been removed. Accident prevention guidelines concerning electrical systems (e.g. VDE-0100/-0101/-0104/-0105 Electrical protective measures against dangerous touch voltage) are to be observed. When cleaning with fluids, all electrical components are to be covered impermeably.

**Operation Manual
1008**

0297 9689 en

**Engine Serial
Number:**

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Please enter the engine serial number here. In this way, questions concerning Customer Service, Repairs and Spare Parts can be more easily dealt with (see Section 2.1).

In view of continuous design improvements or changes, the technical specifications and the illustrations shown in this Operation Manual and Spare Parts Catalogue are subject to alteration. Reprinting and reproduction, in part or in whole, are subject to our written approval.



Foreword

Dear Customer,

The liquid-cooled engines of the trademark DEUTZ are developed for a wide range of applications. The wide choice of optional components permits numerous variations to meet the requirements of each specific application.

Your engine is appropriately equipped for the specific application, which means that not all of the components described in this Operation Manual are necessarily mounted to your engine.

We tried to clearly show the differences, so that you will be able to easily find the particular operating and maintenance instructions relevant to your engine.

Please read this Operation Manual before commissioning your engine, and follow the relevant operating and maintenance instructions..

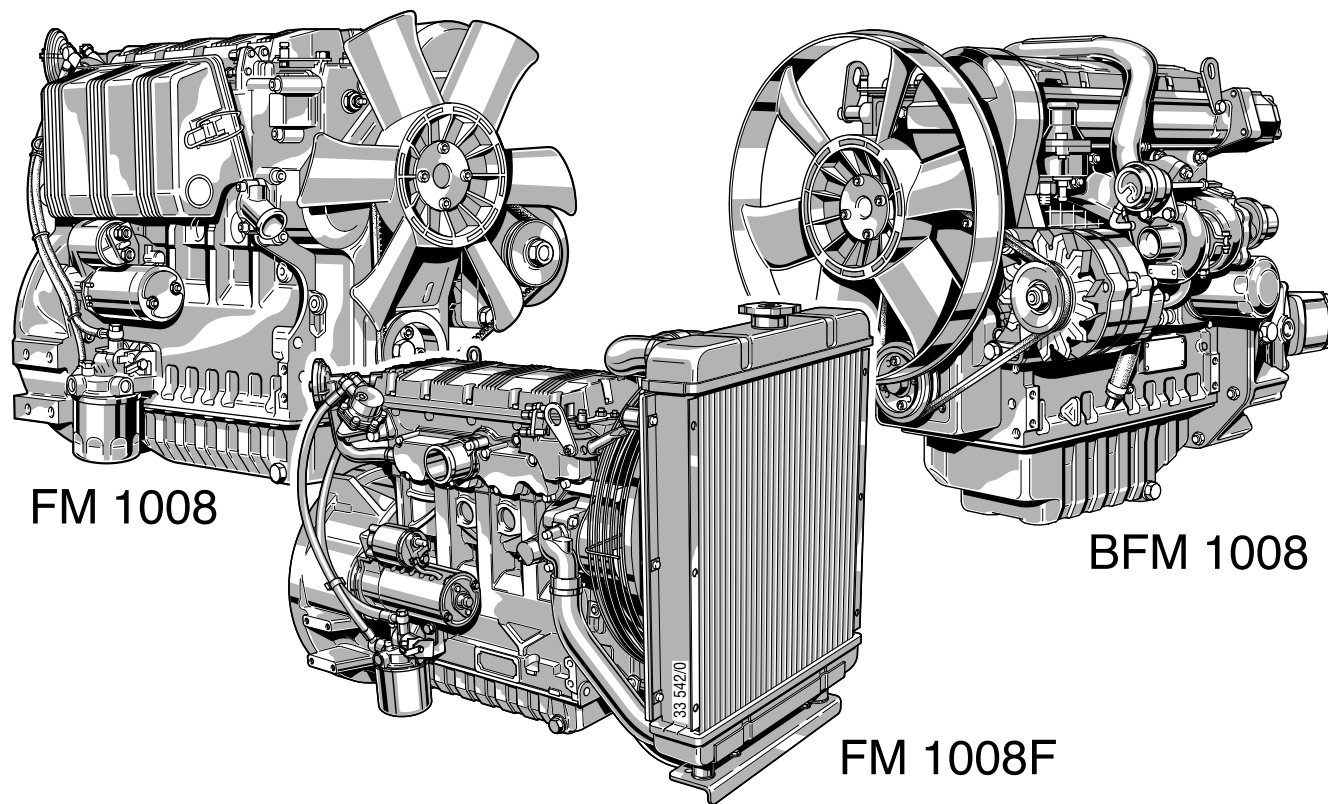
If there are any questions, the people from DEUTZ Service will gladly advise and help you.

Yours sincerely,

DEUTZ AG

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FM 1008

BFM 1008

FM 1008F

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.

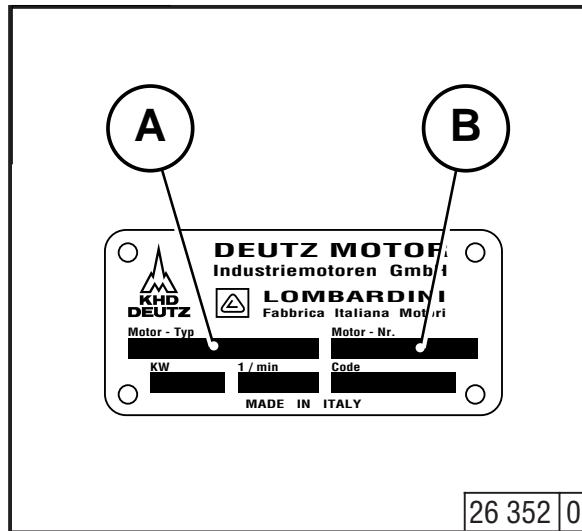
- 2.1 Model Designation**
- 2.2 Engine Illustrations**
- 2.3 Fuel System Schematic**
- 2.4 Cooling System Schemati**

Description of Engine

2.1 Model Designation

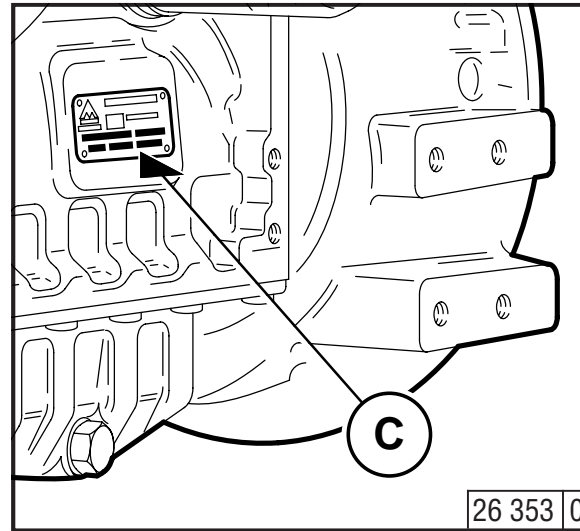
2

2.1.1 Rating Plate



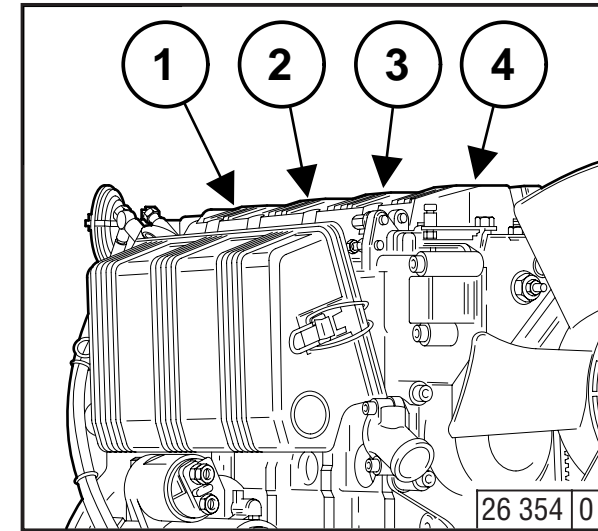
The model designation **A**, the engine serial number **B** and the performance data are stamped on the rating plate.
When ordering spare parts, it is essential to quote the model designation and engine serial number.

2.1.2 Location of Rating Plate



The rating plate **C** is attached to the crankcase.

2.1.3 Numbering of Cylinders



The cylinders are numbered consecutively, beginning at the flywheel end.

2.1.4 Two-Stage Combustion System

The engine employs two-stage combustion of the fuel-air mixture:

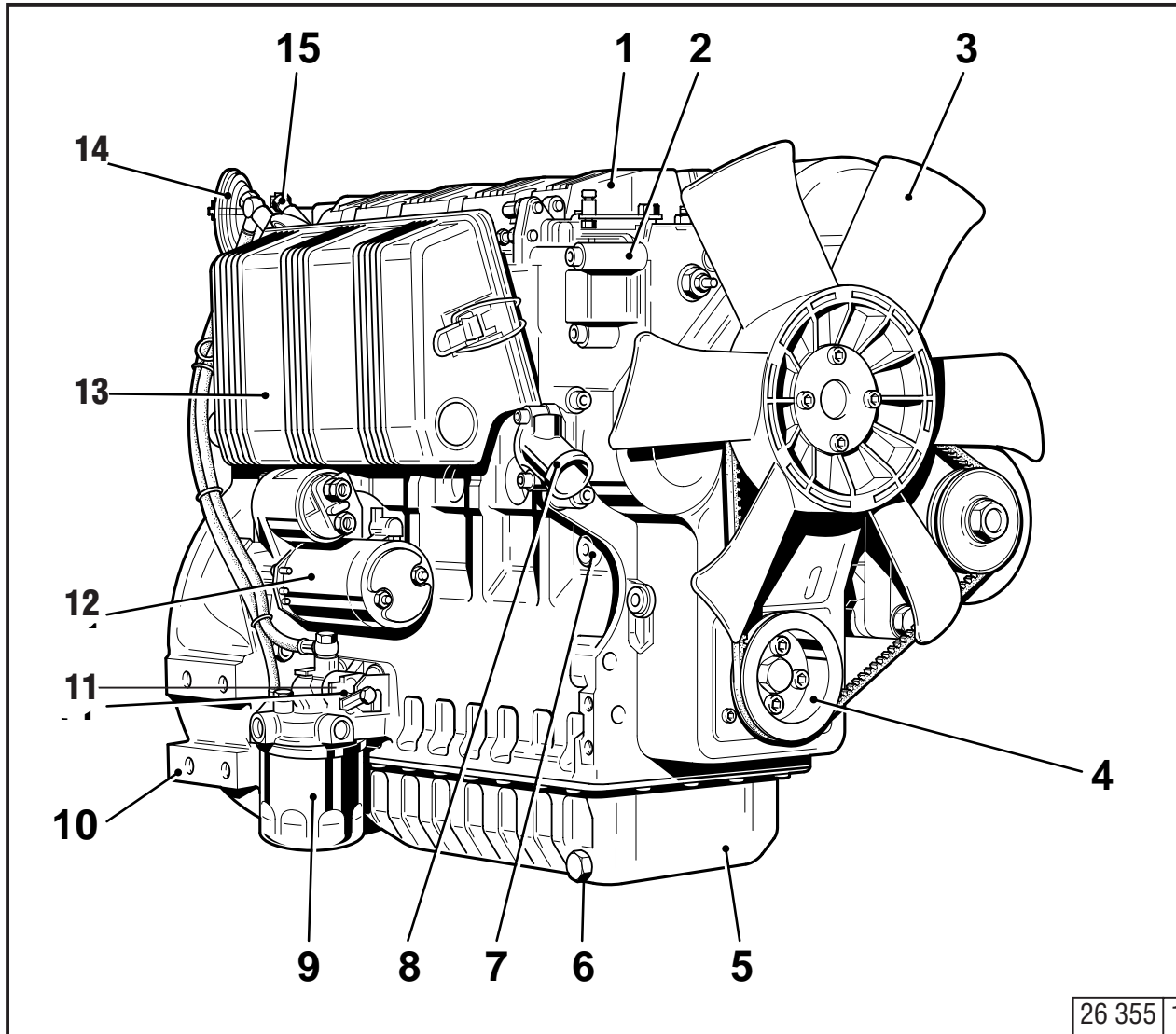
1. Fuel-air mixing and partial combustion take place in the precombustion chamber.
2. Combustion takes place in the piston combustion chamber.

Description of Engine

2.2 Engine Illustrations

2

2.2.1 Starter Side FM 1008



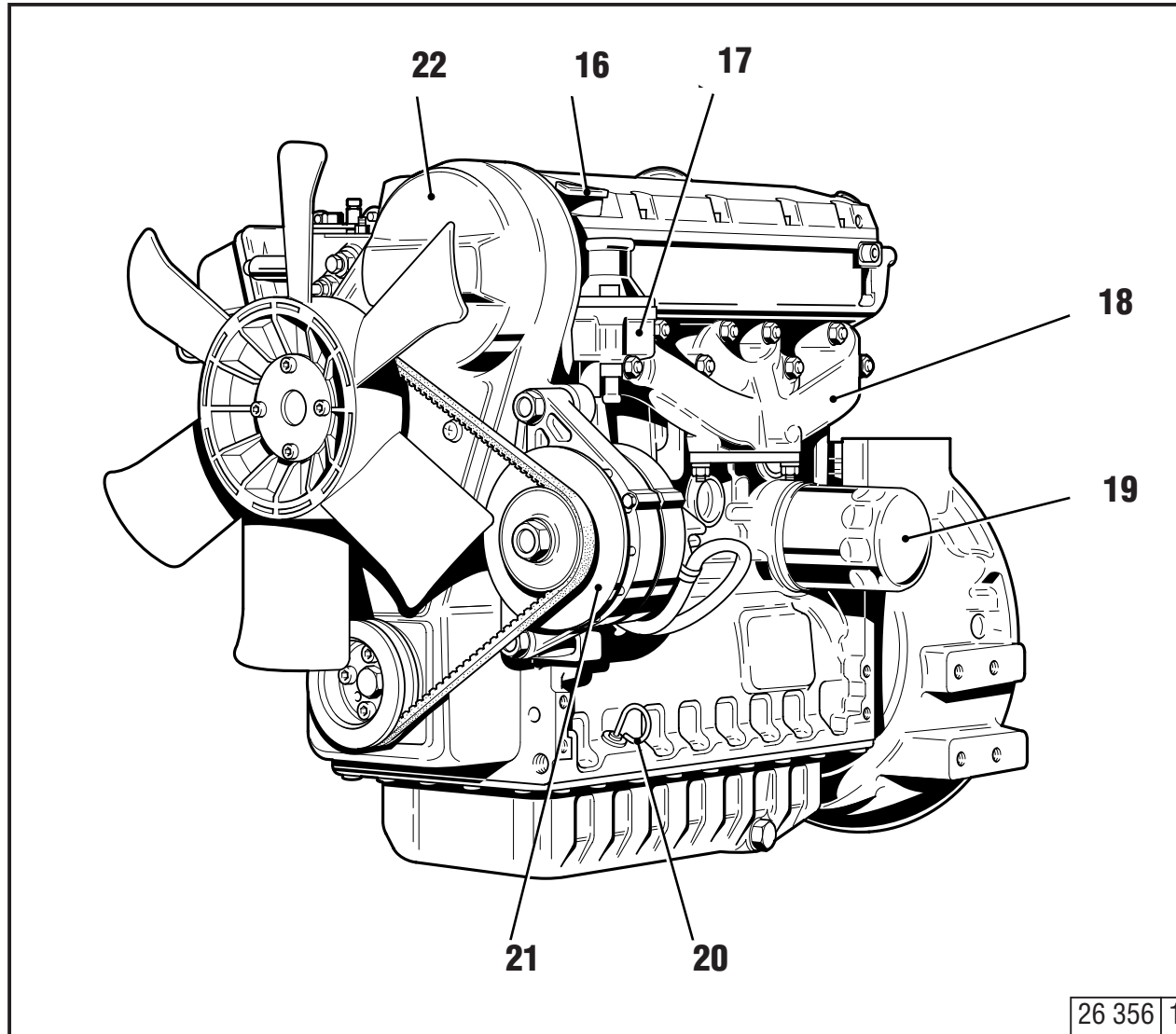
- 1 Rocker cover
- 2 Speed governor
- 3 Blower
- 4 Belt pulley
- 5 Oil pan
- 6 Oil drain plug
- 7 Drain plug for coolant
- 8 Coolant supply line to engine
- 9 Fuel filter
- 10 Adapter housing
- 11 Solenoid valve (stop engine)
- 12 Starter
- 13 Dry type air cleaner
- 14 Crankcase bleeder valve
- 15 Fuel feed pump

2.2 Engine Illustrations

Description of Engine

2.2.2 Exhaust Side FM 1008

2



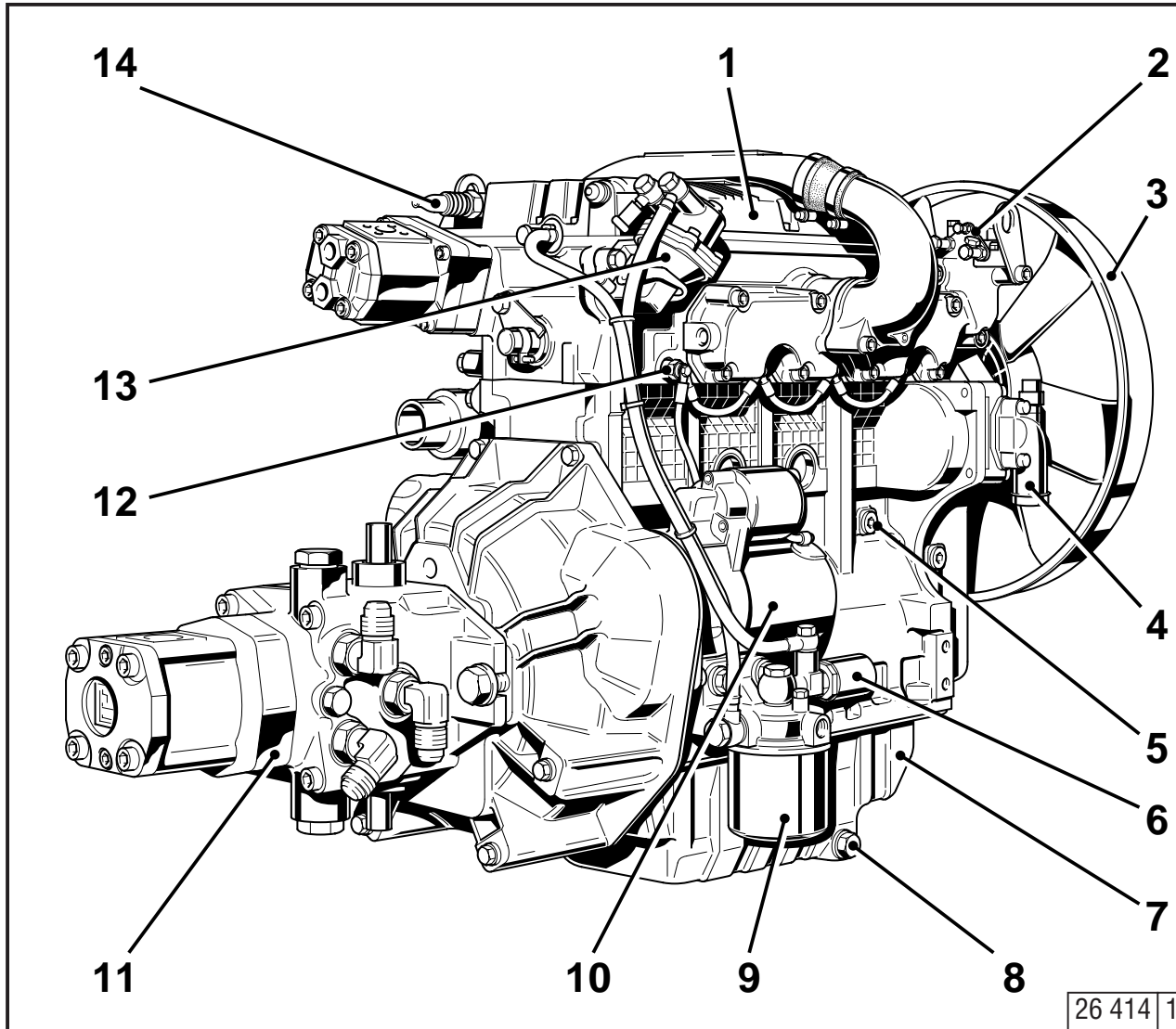
- 16 Oil filler neck
- 17 Coolant thermostat
- 18 Exhaust manifold
- 19 Spin-on lube oil filter
- 20 Oil dipstick
- 21 Alternator
- 22 Toothed belt guard

Description of Engine

2.2 Engine Illustrations

2

2.2.3 Starter Side BFM 1008



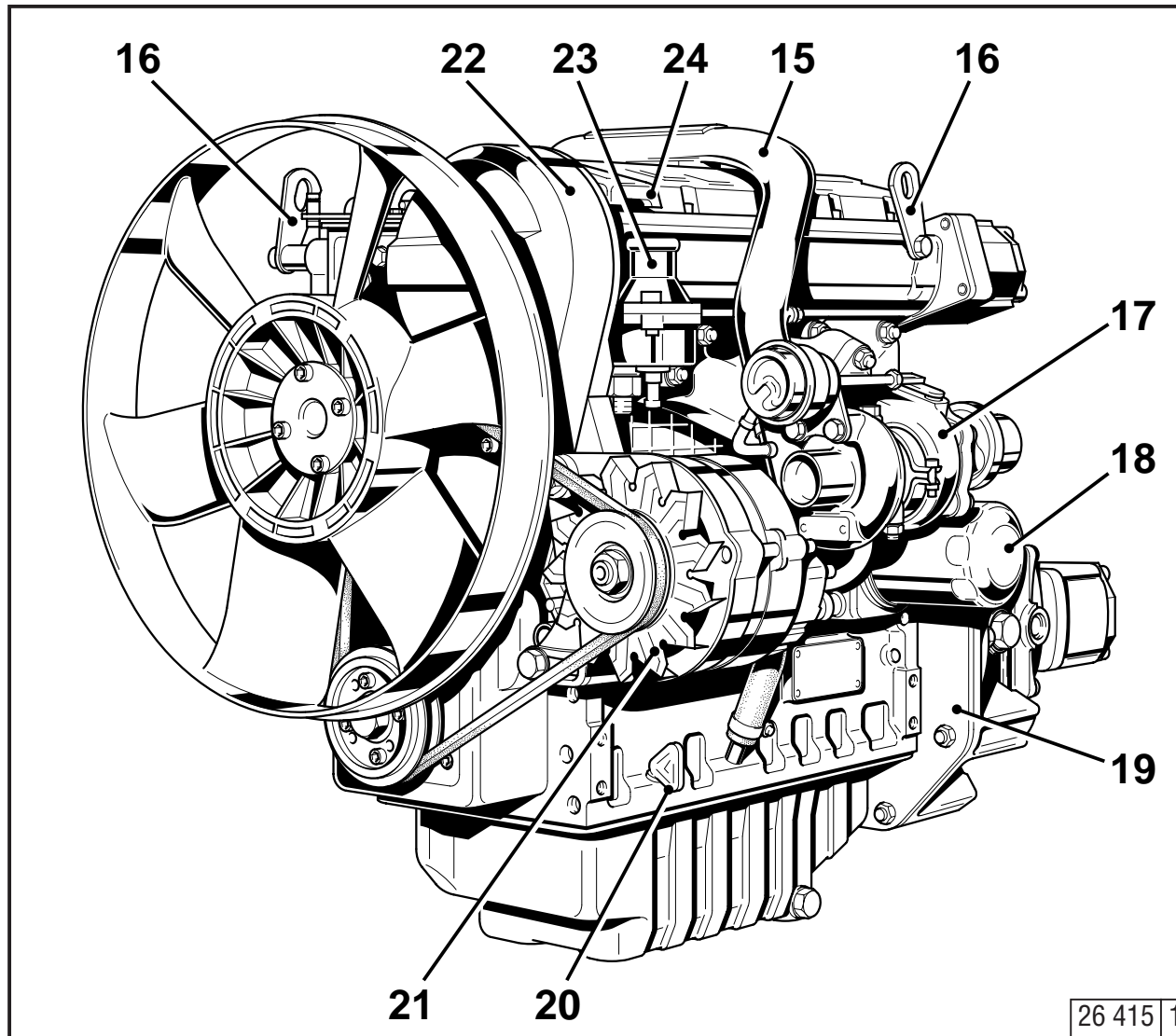
- 1 Rocker cover
- 2 Speed governor
- 3 Blower
- 4 Coolant supply line to engine
- 5 Drain plug for coolant
- 6 Solenoid valve engine stop
- 7 Oil pan
- 8 Oil drain plug
- 9 Fuel filter
- 10 Starter
- 11 Mounting example (hydraulic drive)
- 12 Sheathed type glow plug
- 13 Fuel feed pump
- 14 Oil pressure sensor

2.2 Engine Illustrations

Description of Engine

2.2.4 Exhaust Side BFM 1008

2



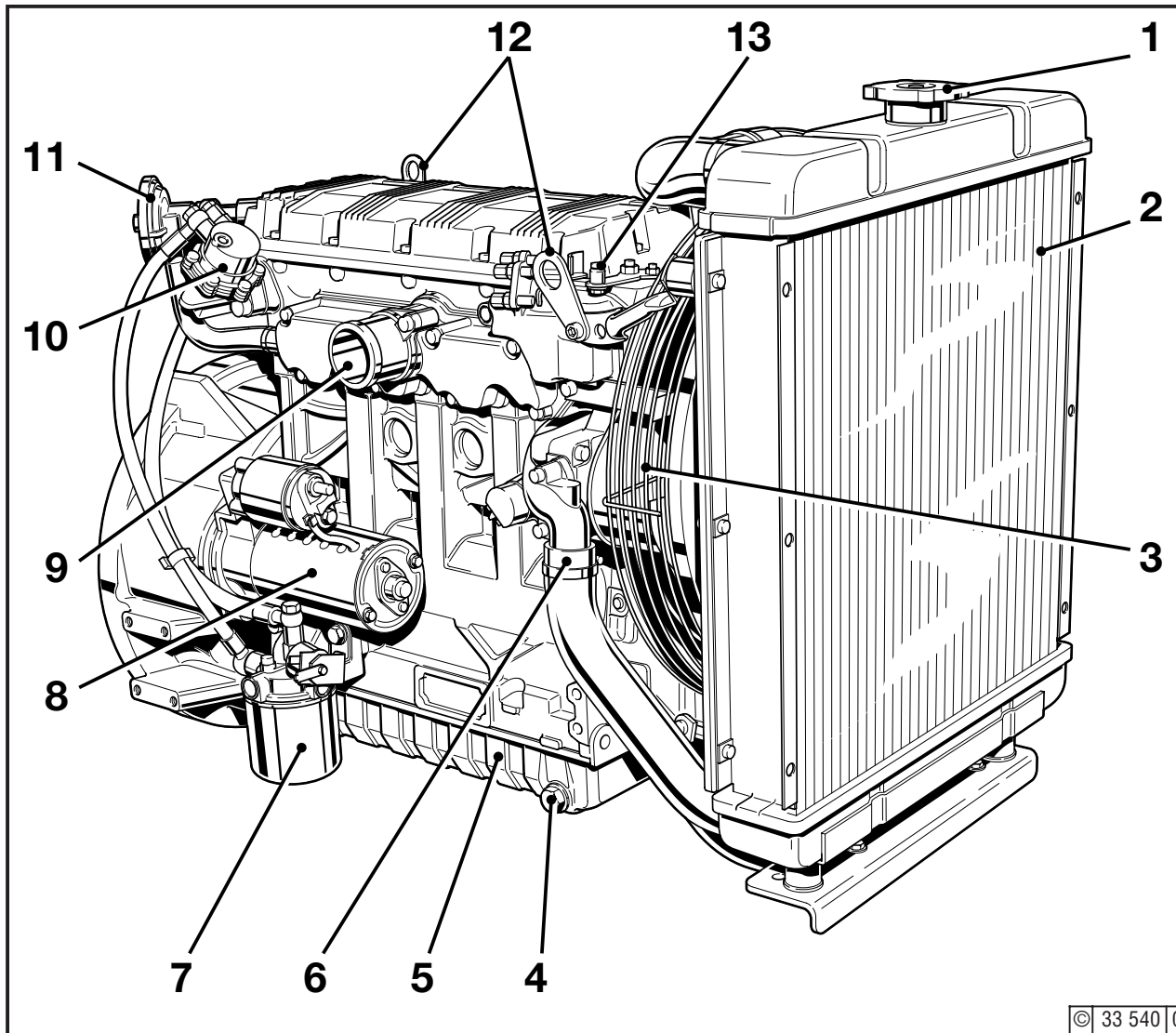
- 15 Exhaust manifold
- 16 Transport device
- 17 Exhaust turbocharger
- 18 Spin-on lube oil filter
- 19 Adapter housing
- 20 Oil dipstick
- 21 Alternator
- 22 Toothed belt guard
- 23 Thermostat valve
- 24 Oil filler cap

Description of Engine

2.2 Engine Illustrations

2

2.2.5 Starter Side BFM 1008

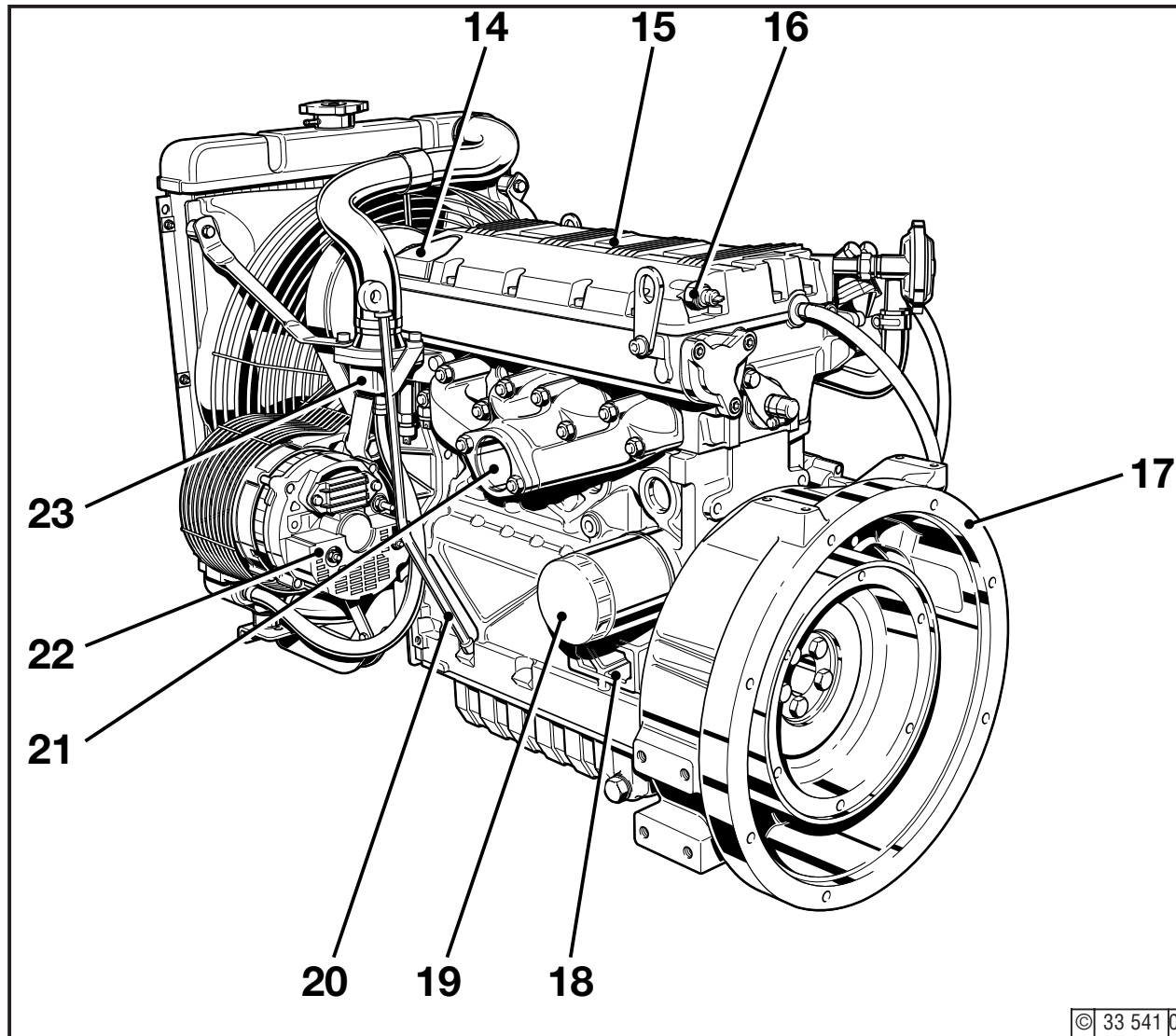


- 1 Coolant filler
- 2 Heat exchanger
- 3 Fan
- 4 Oil drain plug
- 5 Oil pan
- 6 Coolant line from engine to the Heater exchanger
- 7 Fuel filter cadridge
- 8 Starter
- 9 Air intake pipe
- 10 Fuel pump
- 11 Crankcase ventilation
- 12 Lifting tackle
- 13 Speed governor

2.2 Engine Illustrations

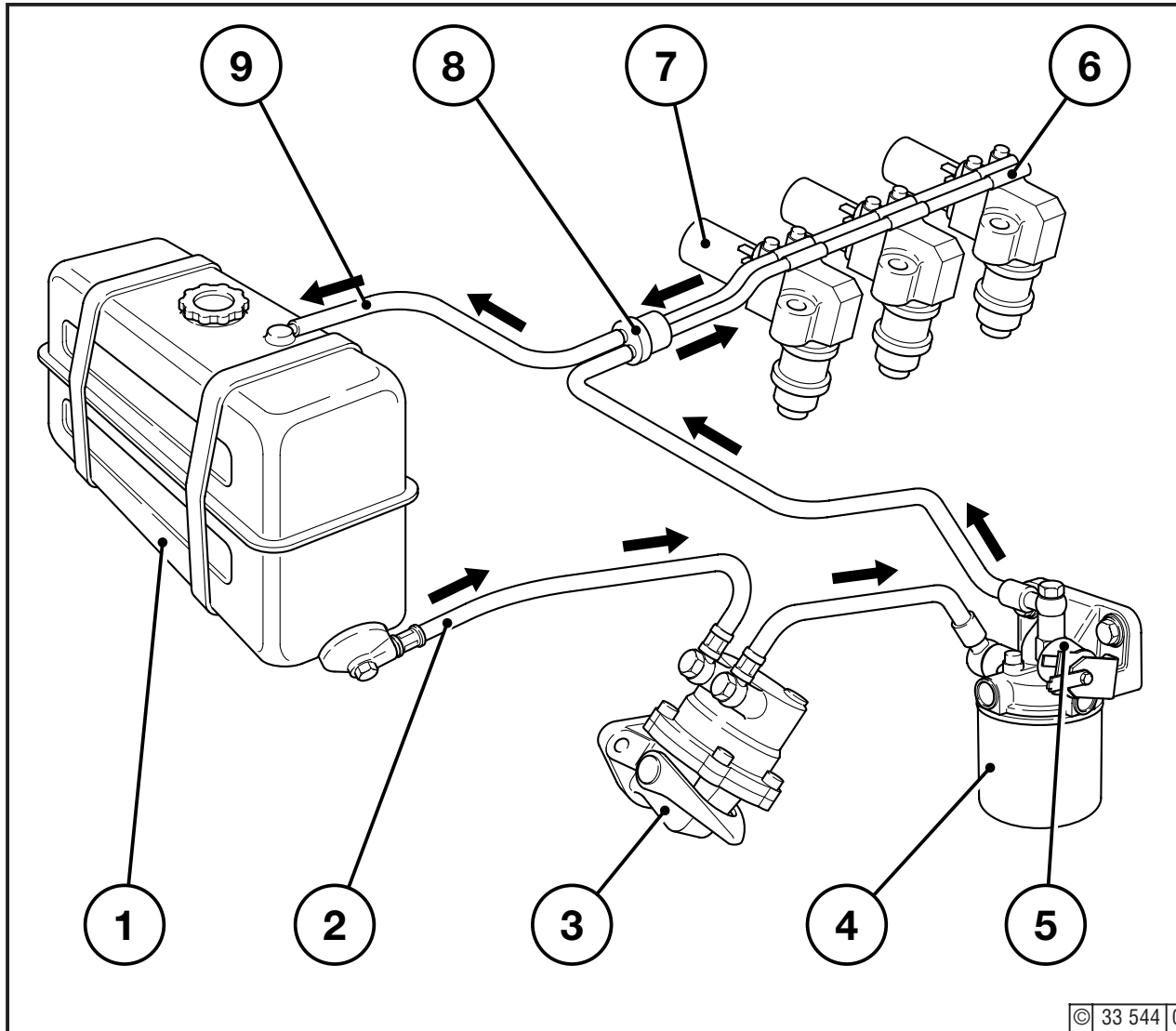
Description of Engine

2.2.6 Exhaust Side BFM 1008 F



- 14 Oil filler
- 15 Cylinder-head cover
- 17 Oil pressure sensor
- 18 SAE housing
- 19 Rating plate
- 20 Dipstick
- 21 Exhaust manifold
- 22 Alternator
- 23 Thermostat valve

2.3.1 Fuel System Schematic

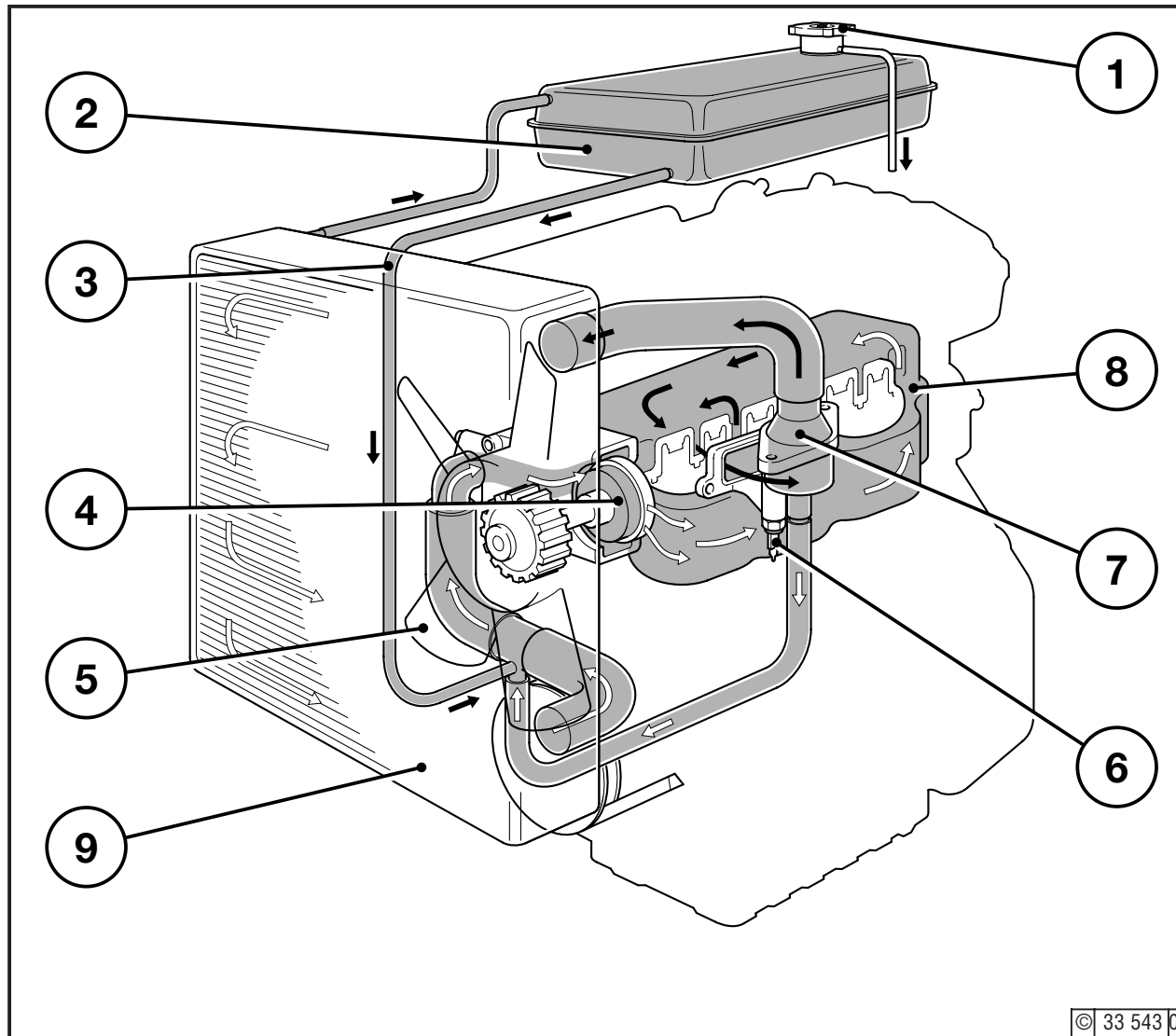


- 1 Fuel tank
- 2 Feeding pipe
- 3 Fuel feeding pump
- 4 Fuel filter
- 5 Electrovalve
- 6 Pipes O/W heads
- 7 Injection pump/Injector
- 8 Gasket
- 9 Drain pipe/Return line to fuel tank

2.4 Cooling System

Description of Engine

2.4.1 Cooling System Schematic



- 1 Filling plug
- 2 Expansion tank
- 3 Coolant connection (inlet)
- 4 Coolant pump
- 5 Fan
- 6 Fluid temperature of Thermostat (connection , warning light)
- 7 Thermostat
- 8 Engine block
- 9 Radiator

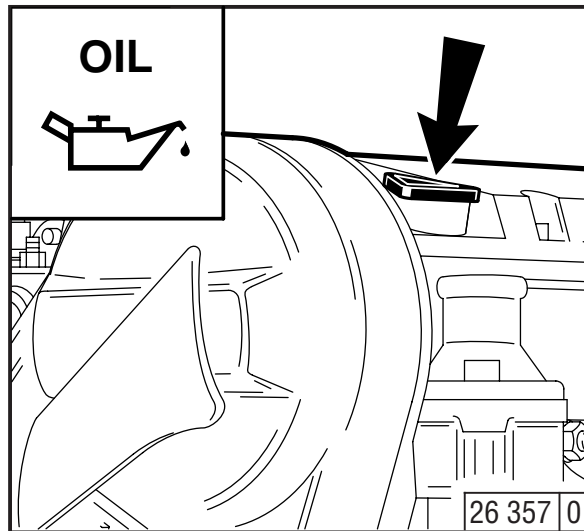
- 3.1 Commissioning**
- 3.2 Starting**
- 3.3 Monitoring Systems**
- 3.4 Stopping**
- 3.5 Operating Conditions**

Engine Operation

3.1 Commissioning

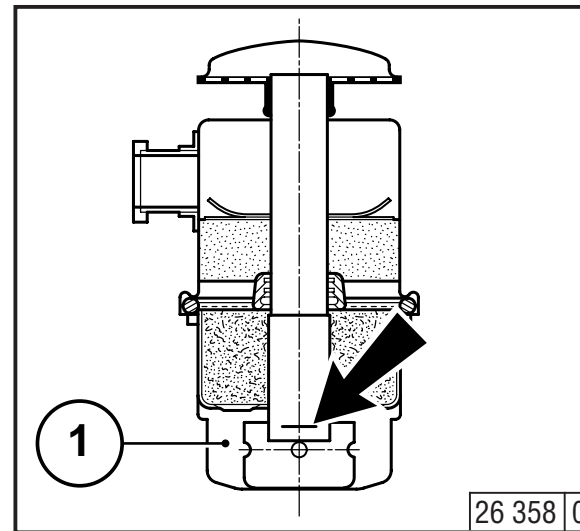
3

3.1.1 Filling in Engine Oil



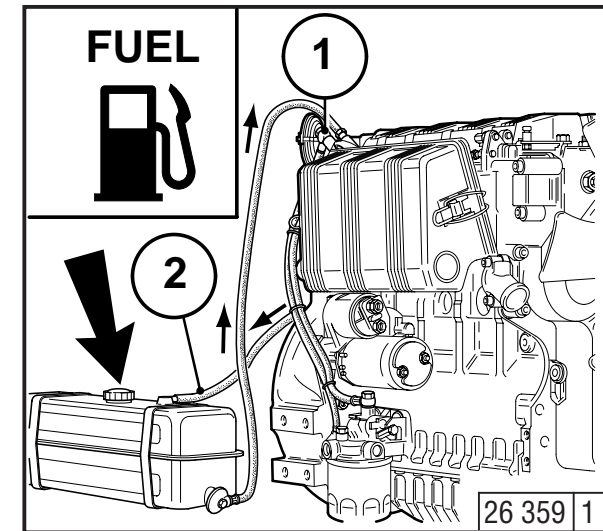
As a rule, the engines are delivered without oil filling.
Fill the engine with lube oil through oil filler neck (arrow).
For oil filling volume, see 9.1.
For oil quality grade and oil viscosity, see 4.1.

3.1.2 Filling Oil Bath Air Cleaner with Engine Oil



Fill oil bowl 1 of oil bath air cleaner (if mounted) with engine oil up to the arrow mark.
For oil quality grade and oil viscosity, see 4.1.

3.1.3 Filling the Fuel Tank



Use only commercial-grade diesel fuel.
Fuel supply connection 1
Fuel return line 2
Fuel quality grade: see 4.2.
In accordance with ambient temperatures, summer- or winter-grade diesel fuel should be used.



Be sure not to fill oil into the pre-cleaner's dust collector, if provided.

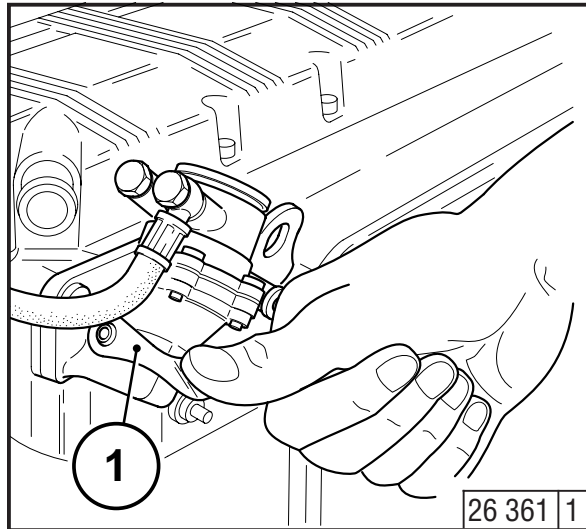


Never fill the fuel tank while the engine is running!
Observe strict cleanliness! Do not spill any fuel!

3.1 Commissioning

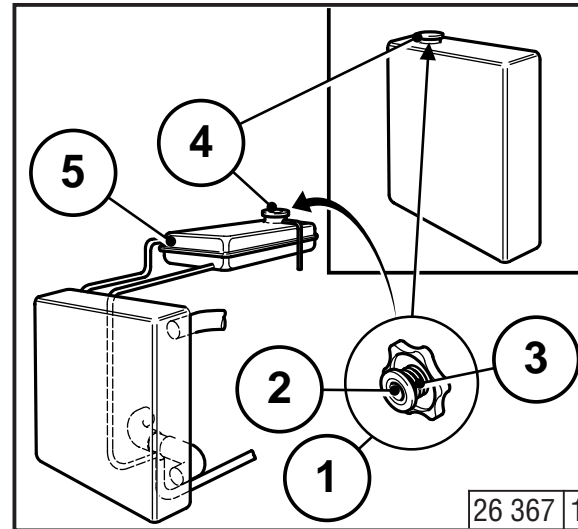
Engine Operation

3.1.4 Bleeding the Fuel System



- Repeatedly actuate fore-pump lever against pressure spring until fuel is flowing continuously (see Section 6.2.1).

3.1.5 Filling/Bleeding the Cooling System



- Unscrew radiator filler cap 1
Top up coolant:
for radiators with separate expansion tank:
- to level mark 5,
for radiators with integrated expansion tank:
- to approx. 5 mm below the lower edge of filler neck 4
- Tighten radiator filler cap 1.
- After starting, check the coolant level.
- The system is ventilated through a pressure relief valve in the radiator filler cap:
 - 2 pressure relief discs
 - 3 pressure relief springs

3.1.6 Other Preparations

- Check battery and lead connections: see 6.7.1.
- **Trial run**
 - Upon completion of preparations, run the engine for a short trial period of about 10 minutes without load.
- **During and after trial run**
 - Check engine for leakages.
- **With engine stationary:**
 - Check oil level, top up with oil if necessary: see 6.1.2.
 - Retension V-belts: see 6.5.
- **Running-in**
 - During the running-in phase, approx. 200 running hours, it is recommended to check the oil level twice daily.
 - After the running-in phase, daily checking will suffice.

3.2.1 Electric Starting

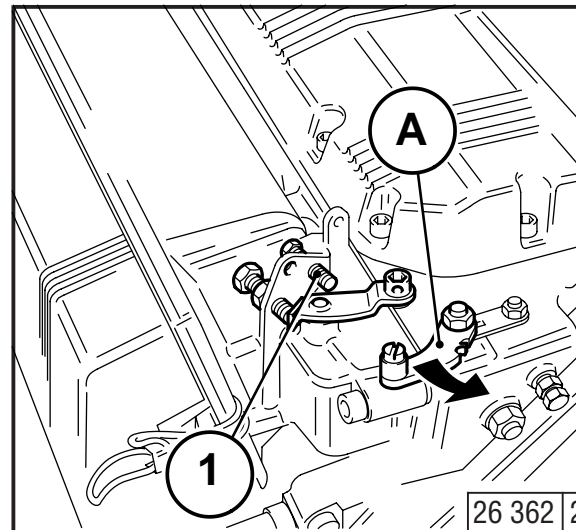


Before starting, make sure that no one is standing in the close vicinity of the engine or driven machine. After carrying out repairs, make sure that all removed panels and guards have been put back into

place and all tools removed from the engine. When starting with glow plugs, do not use any additional starting aids (e.g. injection with start pilot). Danger of accident!

With speed Governor removed, engine must not be started!

Do not loosen connecting cable between battery and alternator.

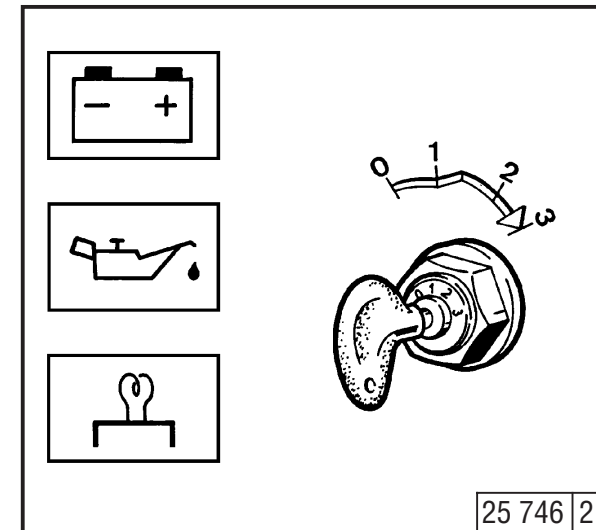


- Disengage the clutch to separate engine from driven equipment.
- Move shut-down lever **A** to „Run“ position (arrow).

Do not actuate starter for more than 20 seconds at a time. If engine does not start, wait 1 minute before repeating attempt.

If engine does not start after two attempts, trace the cause according to Diagnosis Chart (see 7.1).

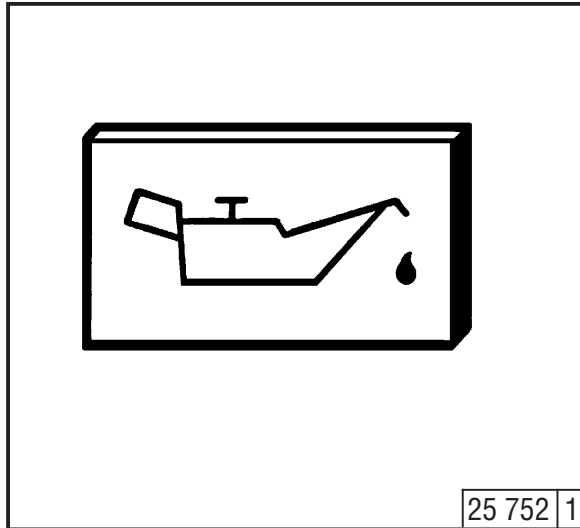
with Glow Plugs



- Insert key
 - Position 0 = No operating voltage.
- Turn key clockwise
 - Position 1 = Operating voltage
 - Pilot lamps light up, preheating until preheating lamp goes out.
- Push key in deeper and turn further clockwise against spring pressure
 - Position 2 = No function
 - Position 3 = Starting
- Release key as soon as engine starts firing.
 - Pilot lamps go out

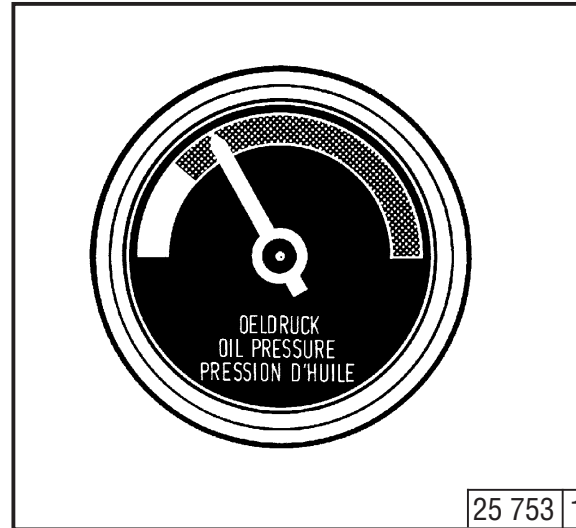
3.3.1 Engine Oil Pressure

Oil Pressure Pilot Lamp



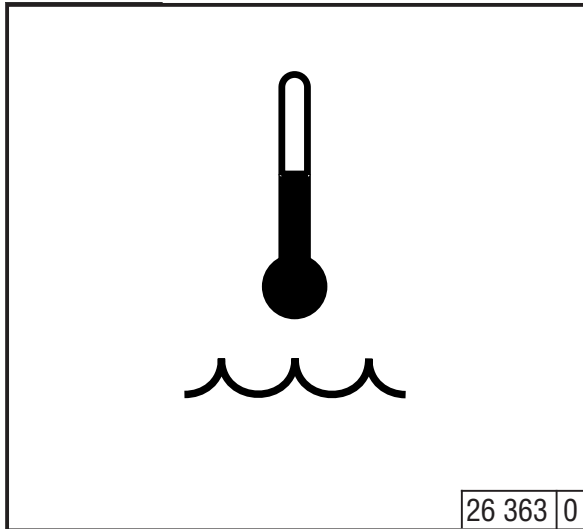
- The oil pressure pilot lamp is on with operating voltage applied and engine stationary.
- When the engine is running, the oil pressure pilot lamp must be out.

Oil Pressure Indicator



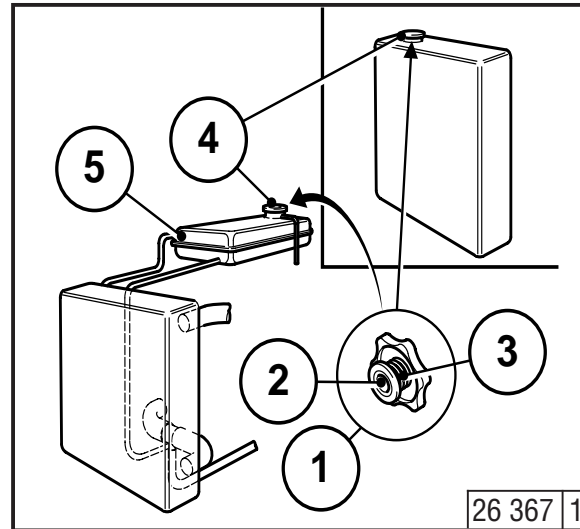
- The pointer must remain in the green sector over the entire operating range.

3.3.2 Coolant Temperature



- Temperature pilot lamp lights up:
 - Check coolant level at once.
 - Top up with coolant, if necessary (see 3.1.5).

3.3.3 Coolant Level

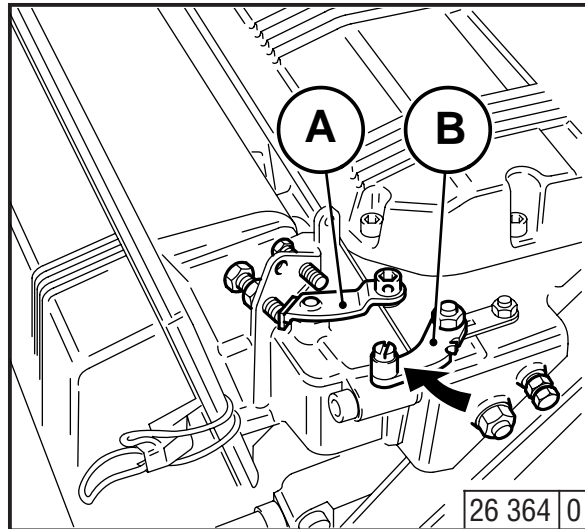


- Unscrew radiator filler cap 1 Top up coolant:
for radiators with separate expansion tank:
 - to level mark 5,
for radiators with integrated expansion tank:
 - to approx. 5 mm below the lower edge of filler neck 4



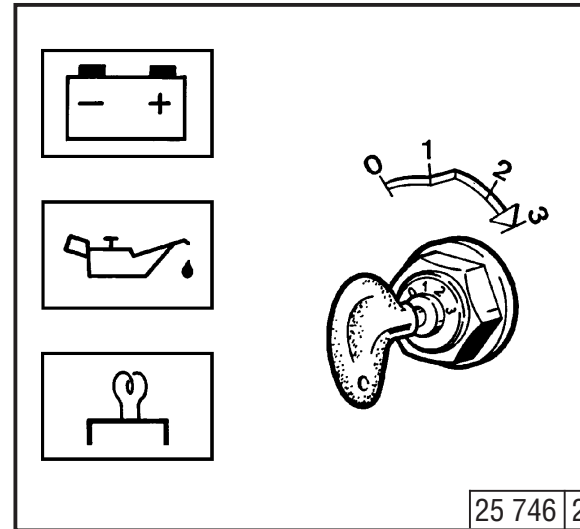
Unscrew filler cap only with engine cold and stationary.

3.4.1 Mechanical Shut-Down



- Move speed control lever A to slow speed position.
- Move shut-down lever B in direction of arrow until engine stops. Charging and oil pressure pilot lamps light up when engine has come to rest.
- Turn key counter-clockwise (to position 0) and withdraw. Pilot lamps go out.

3.4.2 Electric Shut-Down



- Turn key counter-clockwise (to position 0) and withdraw. Pilot lamps go out.

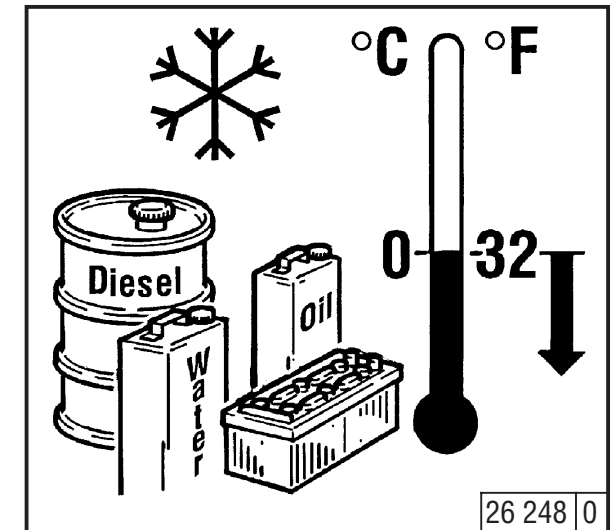
3.5 Operating Conditions

Engine Operation

3.5.1 Operation in Winter

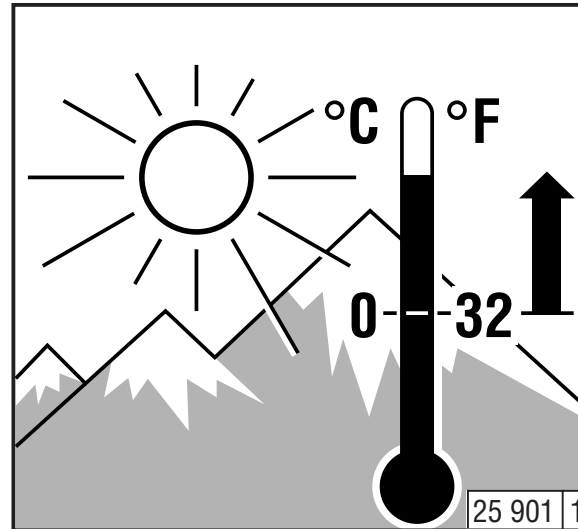
- Lube oil viscosity
 - Select viscosity (SAE-grade) as governed by the ambient temperature prevailing at the time of starting the engine: see 4.1.2.
 - Note shorter periods between oil changes when operating at temperatures colder than $-10\text{ }^{\circ}\text{C}$ ($+14\text{ }^{\circ}\text{F}$): see 6.1.1.
- Diesel Fuel
 - Use winter-grade fuel for operation below $0\text{ }^{\circ}\text{C}$ ($+32\text{ }^{\circ}\text{F}$): see 4.2.2.
- Coolant
 - Mixture of antifreeze and water for protection against freezing to the lowest temperature anticipated (max. $-35\text{ }^{\circ}\text{C}$): see 4.3.1.
- Additional Maintenance Jobs
 - Drain the thick sludge from fuel tank once a week (by undoing the sludge drain plug).
 - Match the oil filling in oil bath air cleaner (if mounted) and engine oil to ambient temperature.
 - At temperatures colder than $-20\text{ }^{\circ}\text{C}$ ($-4\text{ }^{\circ}\text{F}$), lubricate the flywheel ring gear with low temperature grease (e.g. Bosch FT 1V 31) from time to time through the pinion hole (if necessary, remove starter).
- Cold-Starting Aids
 - At temperatures near or below freezing point, start if necessary with glow plugs: see 3.2.1. This not only lowers the starting limit temperature, but proves also useful at temperatures normally not requiring a starting aid.

- Battery
 - Cold starting requires a good state of charge of the battery: see 6.7.1.
 - Lowering the starting limit temperature by $4\text{-}5\text{ }^{\circ}\text{C}$ ($39\text{-}41\text{ }^{\circ}\text{F}$) is possible by raising the battery temperature to about $+20\text{ }^{\circ}\text{C}$ ($+68\text{ }^{\circ}\text{F}$). This is achieved by removing the battery and storing it in a warm room.



3.5.2 High Ambient Temperature, High Altitude

- With increasing altitude and increasing ambient temperature, the density of the air tends to decrease, which affects the maximum power output of the engine, the exhaust gas quality, the temperature level and, in extreme cases, the starting behaviour. Under transient operation conditions, operation at altitudes up to 1000 metres is admissible (up to 30 °C / 86 °F). When operating under unfavourable conditions (higher altitude or higher temperature), a reduction in the amount of fuel injected, and therefore in the engine's power output, is necessary.
- In case of doubt concerning such engine applications, ask your engine or equipment supplier whether, in the interests of operational safety, service life and exhaust gas quality (smoke!), an engine derating had been considered necessary, or simply contact the Service Center nearest to your place.



4.1.1 Quality Grade

Lube oils are differentiated according to their performance and quality class. Commonly used are the **API-** and **ACEA** Europea Engine Oil Sequences de genoemde specificaties.

Approved API oil classes:

Naturally aspirated engines: CF-4, CH-4, CG-4

Turbocharged engines: CF-4, CH-4, CG-4

Approved ACEA oil classes:

Naturally aspirated engines: E1-96 + E2-96

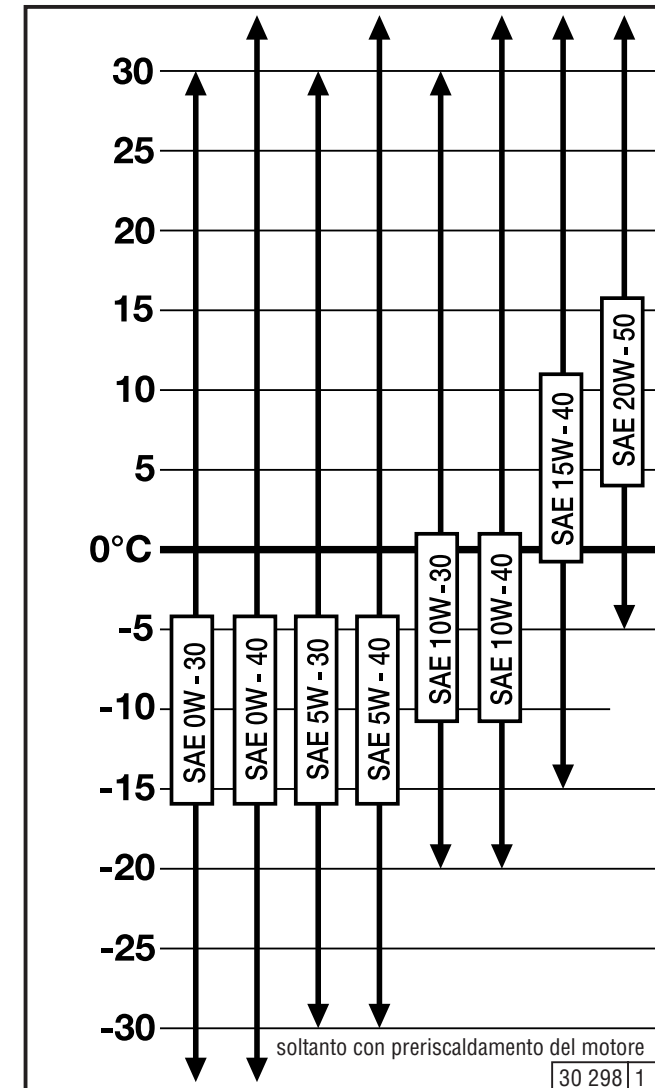
Turbocharged engines: E3-96 + E4-98

4.1.2 Viscosity

As the viscosity of lube oil is greatly influenced by the temperature, the choice of SAE-grade should be governed by the ambient temperature at engine site. Optimum operating behaviour will be attained if you take as guide the adjacent oil viscosity diagram. Should temperatures temporarily fall below the limits of the SAE-grade selected, this will merely affect the cold starting performance but cause no damage to the engine.

Exceeding the application limits should not be over a prolonged period, in order to keep wear down to a minimum.

Oil changes dictated by the time of year can be avoided by using multi-grade oils. Multi-grade oils - particularly light-flowing oils - also tend to reduce fuel consumption.



4.3.1 Water Quality for Coolant Preparation

The values given below must not be exceeded. A test kit (order number 1213 0382) can be obtained from DEUTZ Service to check the quality of the water available.

Water quality	min.	max.
pH-value at 20°C /68° F	6.5	8.5
Chloride ion content [mg/dm ³]	-	100
Sulfate ion content [mg/dm ³]	-	100
Karbonat hardness [°dKH]	3	-
Total hardness [°dGH]	3	12

4.3.2 Coolant Preparation

The preparation and monitoring of coolant in liquid-cooled engines is especially important because corrosion, cavitation and freezing can lead to engine damage.

The coolant is prepared by admixing a cooling system protective liquid with the cooling water.

The cooling system must be monitored continuously (see 5.1). The water level and the cooling system protective liquid concentration should both be checked.

The cooling system protective liquid concentration can be checked with a tester commercially available (e.g. gefo glycomat®).

4.3.3 Cooling System Protective Liquid

The cooling system protective liquid (nitrite-, amine- and phosphate-free, obtainable under order no. 0101 1490 in 5-liter containers) provides effective protection against corrosion, cavitation and freezing.

The concentration of the cooling system protective liquid in the coolant should not fall below/exceed the following limits:

Cooling system protective liquid Water

max. 50% by vol.	50%
min. 35% by vol.	65%

For the quantity, see table and section 9.1.

Other cooling system protective liquids, e.g. chemical corrosion inhibitors, can, in exceptional circumstances, be used in the coolant, in consultation with DEUTZ Service.

Order the cooling system protective liquid from: DEUTZ Service



When **nitrite-based** cooling system protective liquids are mixed with **amine-based** liquids, harmful nitrosamines are formed.



Cooling system protective liquids must be disposed of in accordance with environmental regulations.

5.1 Maintenance Schedule

5.2 Maintenance Chart

5.3 Completed Maintenance Jobs

Routine Maintenance

5.1 Maintenance Schedule

5

once after 2) 50-150	In running hours (h) ¹⁾								check	clean	renew	Job	Section	
	Every 10h and daily resp	every												
		125	250	500	1000	2000	2500	5000						
	●								●		Oil level 9)	6.1.2/ 3.1.6		
●									●		Engine for leakages			
	●								●		Oil bath- and dry type air cleaners ³⁾⁴⁾	6.3 / 6.4		
●									●		Battery and lead connections	6.7.1		
		●	●	●	●	●			●		Cooling system (dep. on engine use) ³⁾⁷⁾	6.3.1/6.3.2		
●		●							●	●	Engine oil (dep. on engine use) ⁵⁾	6.1.1/6.1.2		
●			●							●	Oil filter cartridge	6.1.3		
●			●							●	Fuel filter cartridge	6.2.1		
●				●					●		Valve clearance and rocker arm clearance (readjust if nec.)	6.6.1		
					●				●	●	Adjustment of injection nozzle			
●			●						●		V-belts (retension if nec.)	6.5.1		
							●			●	Toothed belts 10)			
							●			●	Fuel strainer/Fuel screen	4.2.1		
					●					●	Fuel tank			
					●					●	Coolant ⁶⁾	6.3.3/6.3.4		
	●								●		Coolant level 8)	3.3.3		

The specified engine maintenance times are maximum values. Depending on the operating environment, shorter maintenance intervals may be required. Please observe the operating instructions of the equipment manufacturer.

- 1) Max. perm. guide intervals
- 2) Commissioning new and overhauled engines
- 3) Clean if nec.: see Section 6.3
- 4) Renew if nec.
- 5) Oil change intervals: see Section 6.1.1

- 6) Check additive concentration (antifreeze concentration) before frost is imminent, or every two years.
- 7) Radiator fins
- 8) According to engine design
- 9) During run-in period, check 2x daily
- 10) or after at 5 years at the latest.
Belts shall be changed solely by the service agents responsible for you or bei trained specialist personnel.

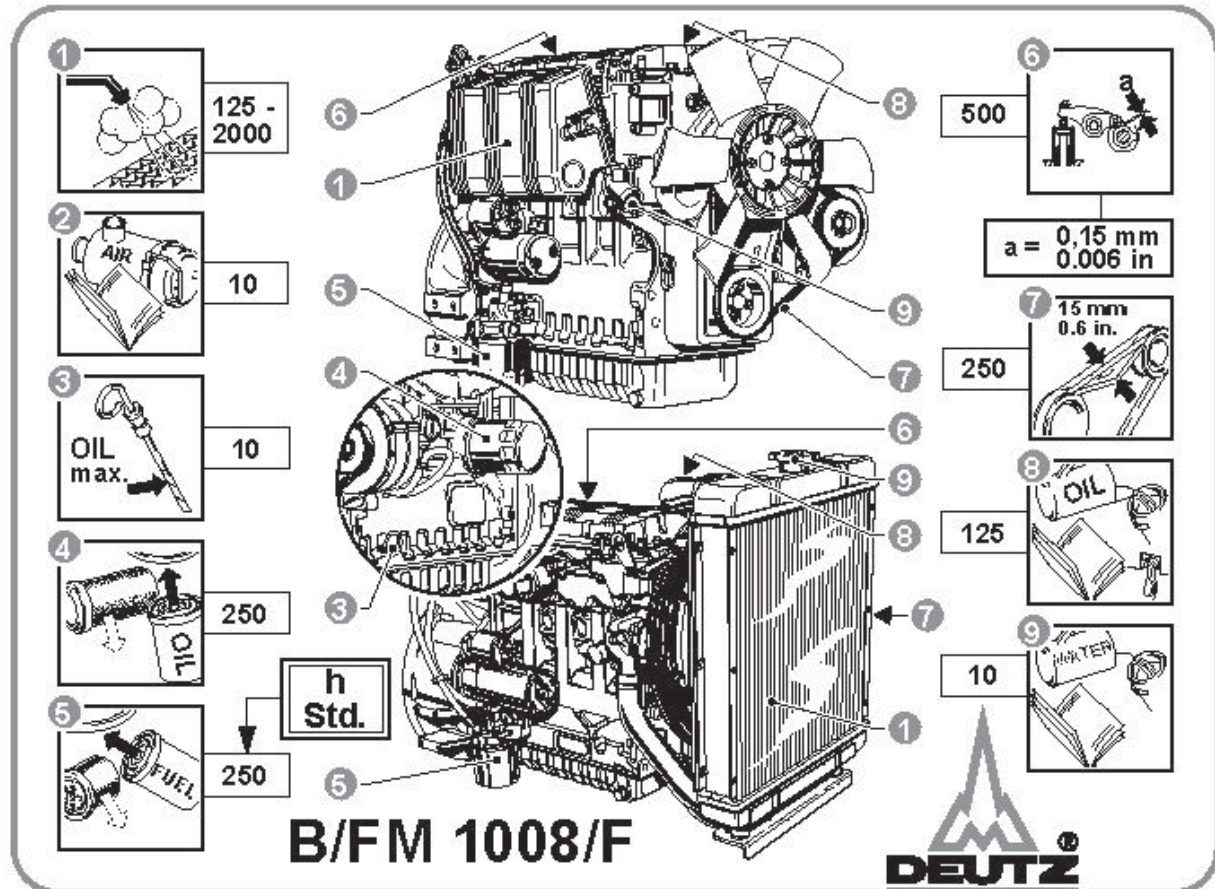
5.2 Maintenance Chart

Routine Maintenance

The Maintenance Chart displayed here is supplied as self-adhesive label along with each engine. Check that this label is stuck at a convenient location on the engine or driven equipment.

If necessary, ask your engine- or equipment supplier for a fresh supply of labels.

Valid for routine maintenance work is the Maintenance Schedule: see 5.1.



0312 0029



Stop engine before carrying out any maintenance work.

Routine Maintenance

5.3 Completed Maintenance Jobs

5

Hours.	Date	Signature / Stamp	Hours	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		

* Commissioning new and overhauled engines
The maintenance jobs duly completed can be recorded in the above table.

Routine Maintenance

5.3 Completed Maintenance Jobs

5

Hours.	Date	Signature / Stamp	Hours	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 jobs duly completed can be recorded in the above table.

6.1 Lubrication System

6.2 Fuel System

6.3 Cooling System

6.4 Combustion Air Cleaner

6.5 Belt Drives

6.6 Adjustments

6.7 Accessories

6.1.1 Oil Change Intervals

- The oil change intervals are dependent on the engine application and on the quality of the lubrication oil.
- Should, within one year, the engine run less than the hours stated in the table, the oil must be changed at least **once a year**.
- The table is subject to the following conditions:
 - For diesel fuel, max. sulfur content 0.5% by wt.
 - Prevailing ambient temperature down to -10 °C (+14 °F)
- In the case of fuels containing more than 0.5 to 1% sulfur, or prevailing ambient temperatures below -10 °C (+14°F), the intervals between oil changes are to be halved..
- In the case of fuels containing more than 1% sulfur, ask the **Service Center** nearest to your place.

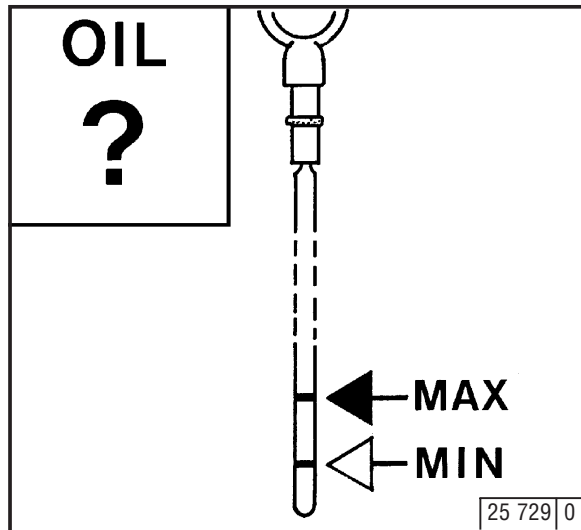
Oil Grade	Naturally Aspirated Engines	Turbocharged engines
API-Classification	CF-4 CH-4 CG-4	CF-4 CH-4 CG-4
ACEA-Classification	E1-96 + E2-96	E3-96 +E4-98

Oil change intervals	[h]
Equipment engines	125

Have the oil changed with engine warm and stationary. (Lube oil temperature approx. 80 °C / 176 °F).

6.1.2 Checking Oil Level / Changing Engine Oil

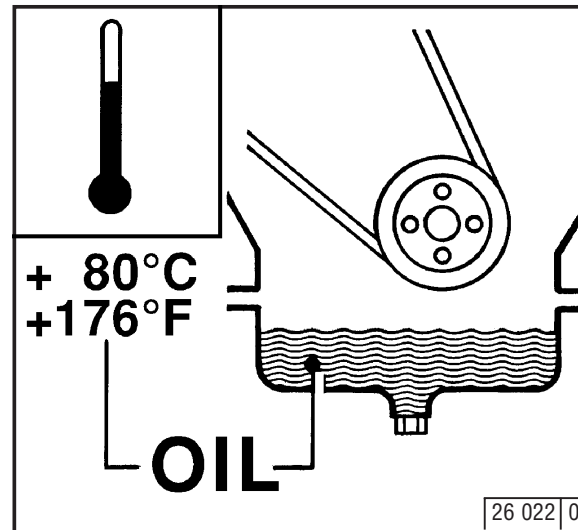
6.1.2.1 Checking Oil Level



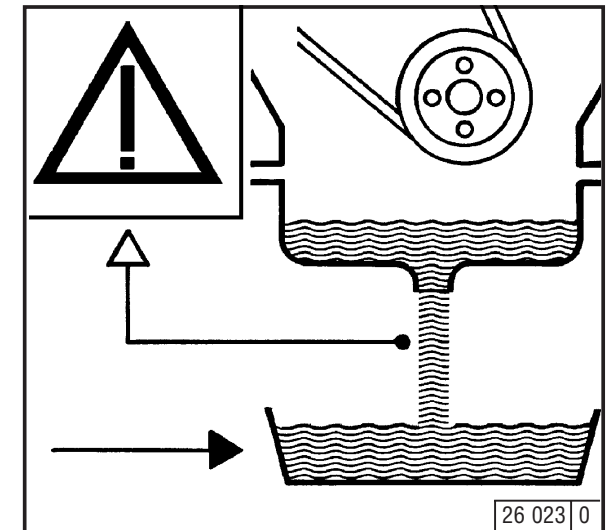
- Ensure that the engine or vehicle is in a horizontal position.
- – **Warm engine:**
Switch off engine, wait 5 minutes and check the oil level.
- – **Cold engine:**
Check oil level.
To this end:
 - Remove the oil dipstick.
 - Wipe the dipstick with a non-fibrous, clean cloth.
 - Insert it to the stop and remove again.
 - Check the oil level, and if necessary, top up to the “**MAX**” mark.
 - If the oil level is only just above the “**MIN**” mark, more oil must be added.

The oil level must not drop below the “**MIN**” mark.

6.1.2.2 Changing Engine Oil



- Allow the engine to warm up.
- Ensure that the engine or vehicle is in a level position.
 - Lube oil temperature approx. 80 °C.
- Turn the engine off.

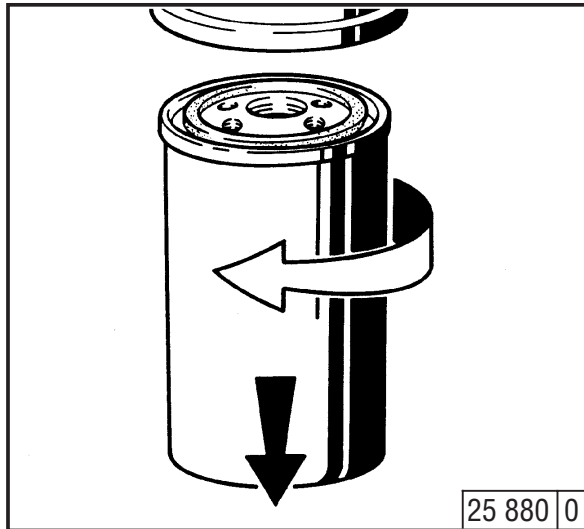


- Place oil tray under the engine.
- Unscrew drain plug.
- Drain oil.
- Fit oil drain plug, with the new gasket and tighten firmly (for torque, see 9.2).
- Pour in lube oil.
 - For grade / viscosity, see 4.1.
 - For quantity, see 9.1.
- Check oil level, see 6.1.2.1.

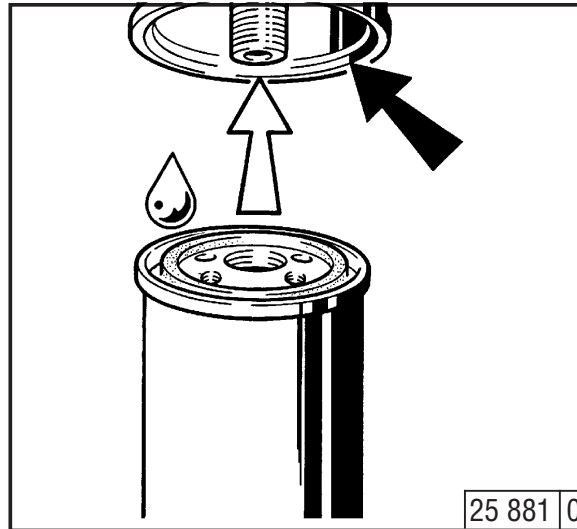


Be careful when draining hot oil – danger of scalds! Do not let used oil run into the soil but catch it in a container ready for proper disposal!

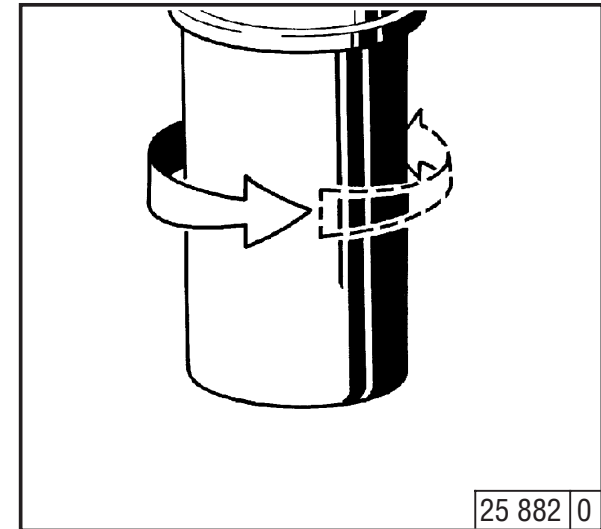
6.1.3 Renewing Oil Filter



- Release lube oil filter cartridge with commercial tool and spin off.
- Catch any escaping oil in receptacle.



- Clean sealing surface of filter carrier, if necessary
- Apply light film of oil to rubber gasket of new lube oil filter cartridge.
- Screw cartridge into place by hand until gasket is evenly seated.

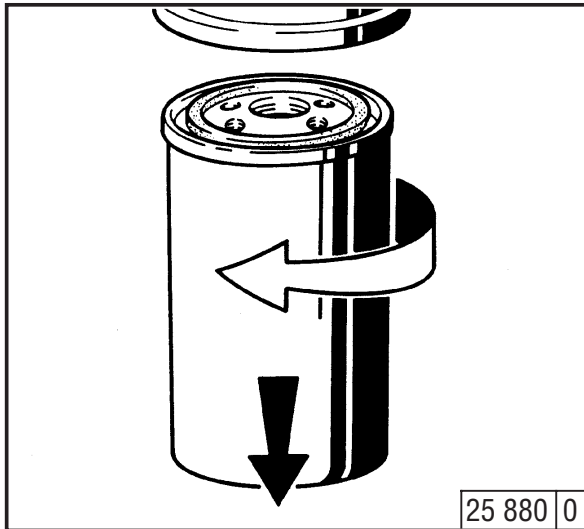


- Tighten lube oil filter cartridge firmly by giving a final half turn.
- Check oil level: see 6.1.2
- Check oil pressure: see 3.3.1.
- Check sealing of lube oil filter cartridge for leaks.

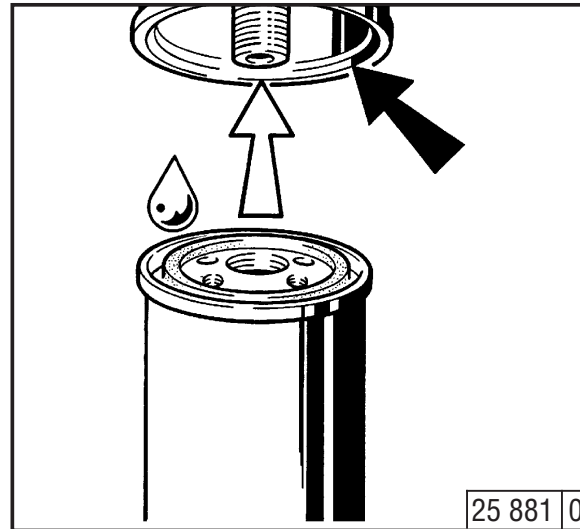


Beware of hot oil: Danger of scalding!

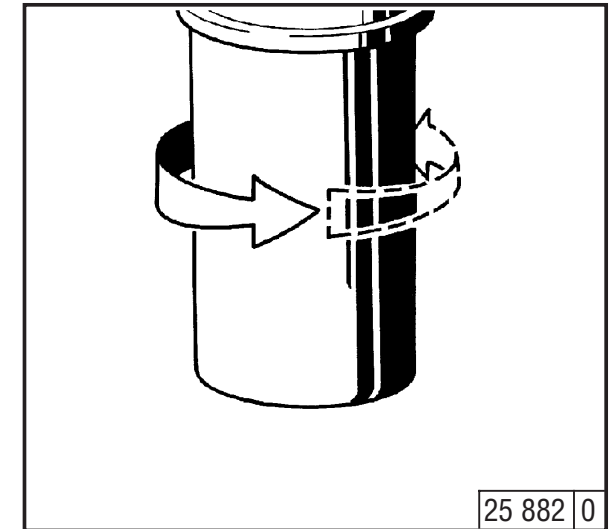
6.2.1 Renewing Fuel Filter



- Close fuel stopcock.
- Release fuel filter cartridge with commercial tool and spin off.
- Catch any escaping fuel in receptacle.



- Clean sealing surface of filter carrier, if necessary.
- Apply light film of oil or diesel fuel to rubber gasket of new fuel filter cartridge.
- Screw cartridge into place by hand until gasket is evenly seated.
- Tighten fuel filter cartridge firmly by giving a final half turn.



- Open fuel stopcock.
- Check for leaks.

When working on the fuel system, keep naked lights away! Do not smoke!



Bleeding of the fuel system is not necessary.

6.3.1 Cleaning Intervals

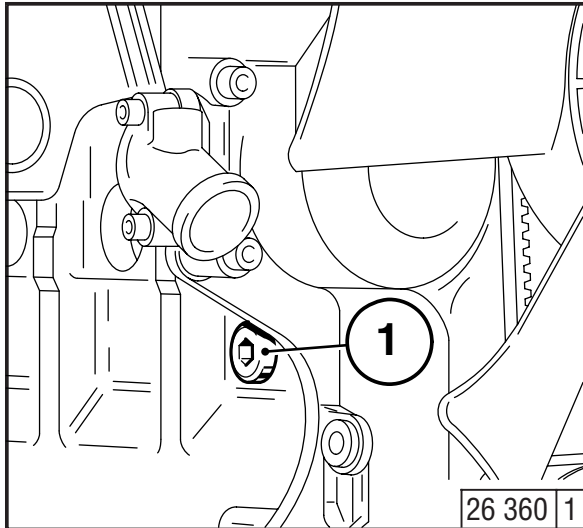
- The degree of soiling of the cooling system is dependent on the type of engine application.
- The danger of soiling is increased due to residues of oil and fuel on the engine. Check extra carefully, therefore, for leakages when applications involve high dust fallout.
- More severe soiling can occur, e.g. in case of:
 - Construction site application due to heavily dust-laden air.
 - Harvesting work, due to the high proportion of chaff and chopped straw, for example, in the vicinity of the implement.
- In view of the varying conditions of application, the cleaning intervals must be determined from case to case. The cleaning intervals stated in the table can be taken as guide values.

Checking or Cleaning Intervals	
Guide Values (run. hours)	Engine Application
2000	Ships, Gensets in closed rooms, Pumps
1000	Vehicles on paved roads
500	Tractors, Lift trucks, Mobile gensets
250	Vehicles on construction sites and unpaved roads, Construction machinery, Compressors, Underground machinery
125	Farm equipment, Tractors doing harvesting work

6.3.2 Cleaning the Cooling System

- Place dirt tray under radiator.
- Cleaning the Cooling System with Compressed Air
 - Blow through the radiator with compressed air, paying particular attention to the cooling fins.
 - Remove loose dirt with a water jet.
- Cleaning with Cold Cleansing Agent/Kerosene
 - Spray radiator with a commercial cold cleansing agent and allow a soaking-in period of about 10 minutes.
 - Wash clean with a powerful water jet (taking care to avoid direct contact of the water jet with sensitive engine components, e.g. alternator, cabling, electronic components).
- When cleaning with kerosene, the engine must be cleaned with compressed air.
- Run engine until warm in order to allow the remaining water to evaporate.

6.3.3 Draining Off Engine Coolant



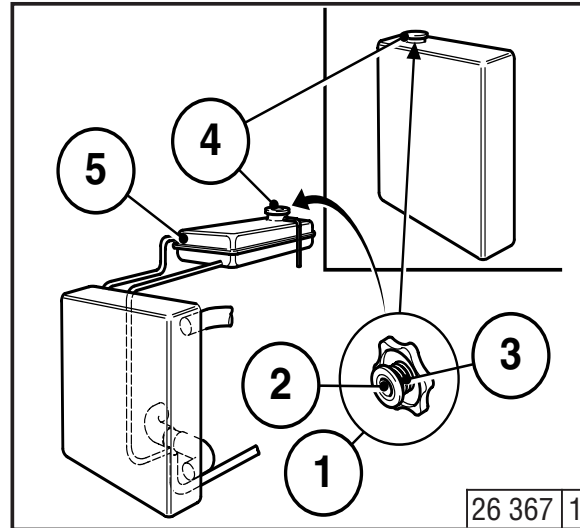
On the Engine

- Place collector under drain plug 1.
- Pull off tube and remove drain plug 1
- Drain off coolant.
- Screw drain plug 1 back on.
- Reattach tube to connection piece

On the radiator

- Unscrew drain plug 1; if there is no drain plug, pull off the lower tube (radiator inlet), place oil collector under tube connection piece.
- Drain coolant.
- Screw drain plug 1 back on; if there is no drain plug, reattach the lower tube (radiator inlet) to the tube connection piece.

6.3.4 Filling/Bleeding the Cooling System



- Unscrew radiator filler cap 1
Top up coolant:

for radiators with separate expansion tank:

- to level mark 5,

for radiators with integrated expansion tank:

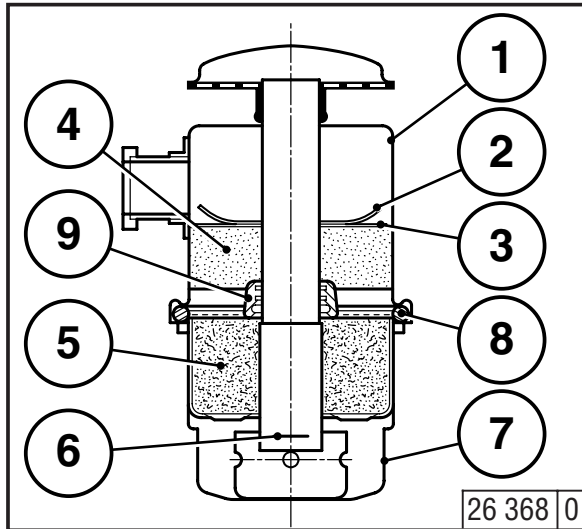
- to approx. 5 mm below the lower edge of filler neck 4

- Tighten radiator filler cap 1.
- After starting, check the coolant level.
- The system is ventilated through a pressure relief valve in the radiator filler cap:
 - 2 pressure relief discs
 - 3 pressure relief springs



When draining off coolant, be sure to catch it in suitable receptacle ready for proper disposal to prevent environmental pollution!

6.4.1 Cleaning the Oil Bath Air Cleaner



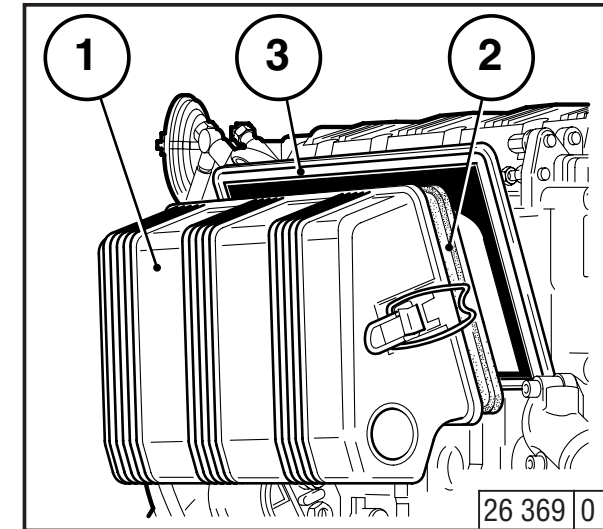
- Stop engine and wait about 10 minutes until the oil has run out of filter housing 1
- Release snap clips 8 and remove oil bowl 7 together with filter element 4, joint washer 9 and filter element 5, loosening filter element at joint by means of a screw driver, if necessary. Take care not to damage rubber gaskets 8+9!
- After removing dirty oil and sludge, clean oil bowl.
- Clean filter elements 4+5 in diesel fuel and allow to drip-dry thoroughly.

- Clean filter housing 1, if necessary.
- Inspect rubber gaskets 8+9, renew if necessary.
- Fill oil bowl with engine oil up to oil level mark (oil viscosity: see 4.1.2).
- Refit oil bowl together with filter elements to filter housing and fasten snap clips. Never clean filter in gasoline!



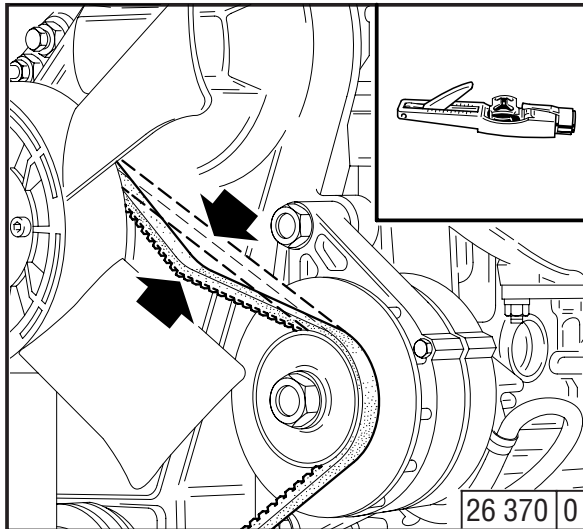
Dispose of used oil in compliance with statutory provisions!

6.4.2 Dry Type Air Cleaner

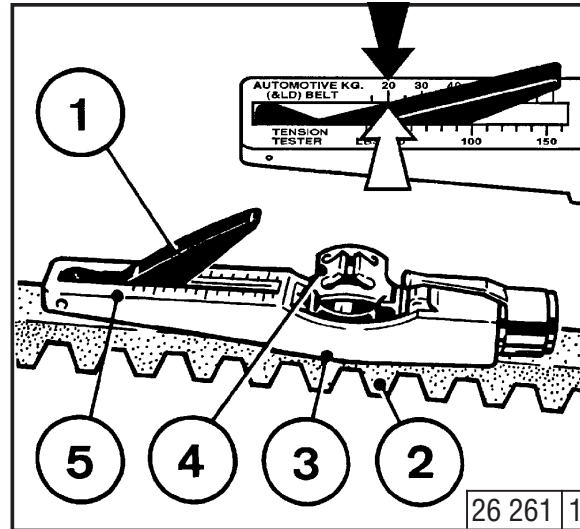


- If dry type air cleaners are used, perform service work only when prompted to do so by the air cleaner service indicator.
- Clogging is indicated by an engine-mounted electric pressure sensor.
- Release both fastening clamps.
- Pull off cover 1 and filter element 2.
- Clean air cleaner support 3 and cover 1.
- Renew filter element 2.
- Pull on cover 1 and filter element 2..
- Fasten with both clamps.

6.5.1 Checking V-belts



- Inspect V-belt over whole length for damage.
- Renew damaged V-belts.
- In the case of new V-belts: check belt tension after 15 minutes of operation.
- Use V-belt tension gauge to check the V-belt tension (see 9.3).
 - Place indicator arm 1 into tension gauge.
 - Position gauge on V-belt 2, midway between the pulleys, with flange 3 on bottom of gauge against the edge of belt.
 - Push slowly on the black pad 4 at right angles to V-belt 2; when you feel and hear the click of the spring, stop immediately..

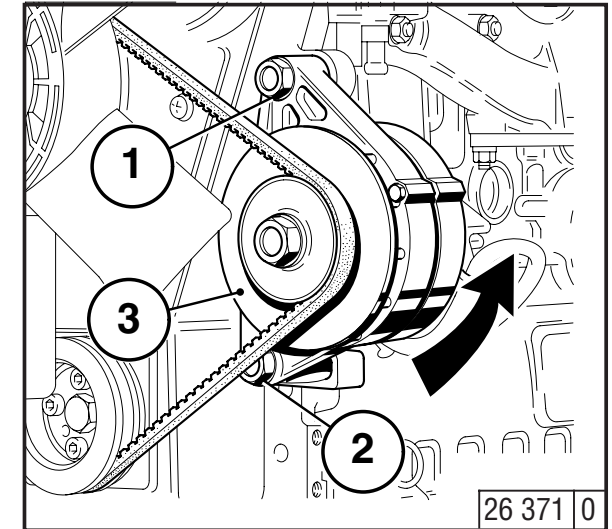


- Remove the gauge carefully so indicator arm 1 is not moved.
- Turn the gauge sideways to see the exact spot where the top of the black indicator arm 1 intersects scale 5 (arrow). Settings: see 9.1.
- If necessary, retension V-belt and repeat measurement.



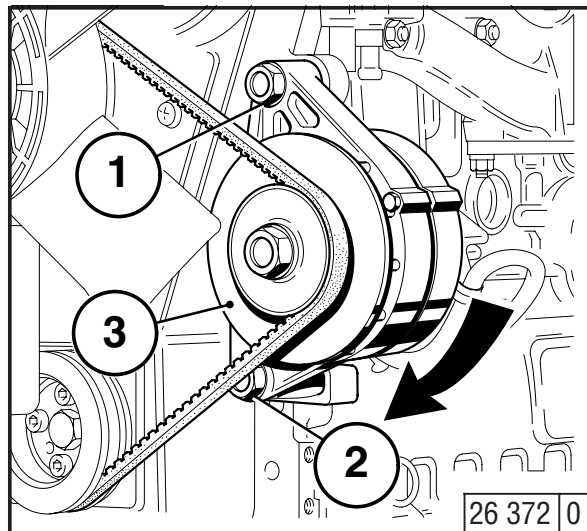
Never check/tension/renew V-belts while engine is running! Refit V-belt guard, if provided.

6.5.2 Tension the V-belt



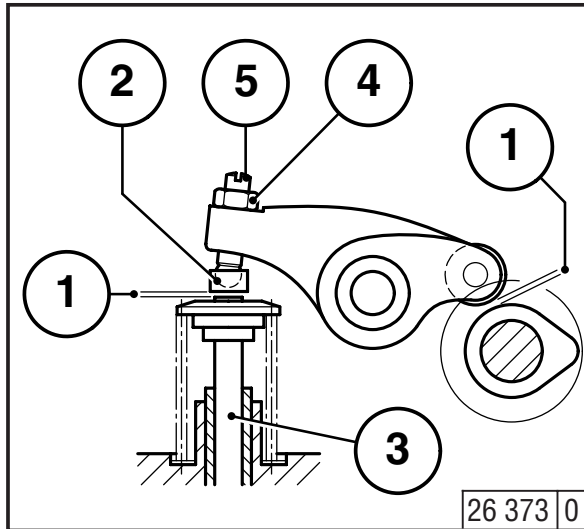
- Loosen bolts 1 and 2.
- Push alternator in direction of arrow until correct V-belt tension is attained (see 6.5.1).
- Tighten bolts 1 and 2.

6.5.3 Renewing the V-belt

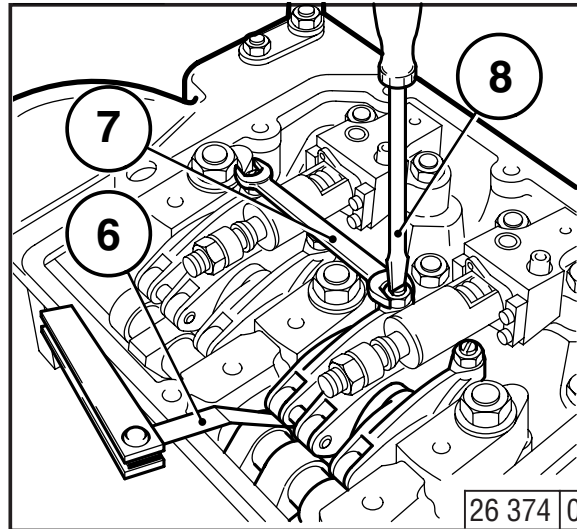


- Loosen bolts 1 and 2.
- Push alternator 3 in direction of arrow until V-belt is exposed.
- Remove V-belt and place on new belt.
- Tension V-belt 2 in opposite direction of arrow until correct V-belt tension is attained.
- Tighten bolts 1 and 2.

6.6.1 Checking/Adjusting Valve Clearances



- Remove rocker cover.
- Position crankshaft as per Setting Schematic: see 6.6.1.1.
- Before adjusting valve clearance, allow engine to cool down for at least 30 minutes: oil temperature below 80 °C/176 °F.
- Check the valve clearances 1 between valve-rocker roller and camshaft with feeler blade 6 (clearance is correct if feeler blade can be inserted into gap with a slight drag).
- If necessary, adjust valve clearance as follows:
 - Loosen locknut 4.
 - Adjust set screw 5 by means of screwdriver 8 and wrench 7 in such a manner that with locknut 5 tightened, the correct valve clearance 1 and camshaft clearance 1 are attained.



- Check the valve clearances at each of the remaining cylinders and adjust if necessary. Settings: see 9.1.
- Refit rocker cover (together with new gasket). Fit the cylinder head cover with a new seal (coat the seal with a few drops of permanently elastic sealant). Insert 6 mm stud bolts to guide the seal, fit the seal and remove the stud bolts.



Connecting piece (rubber nipple), control elements - cylinder head cover, must be fitted correctly in the hole to ensure that the lube oil return line for lubricating the valves functions correctly.

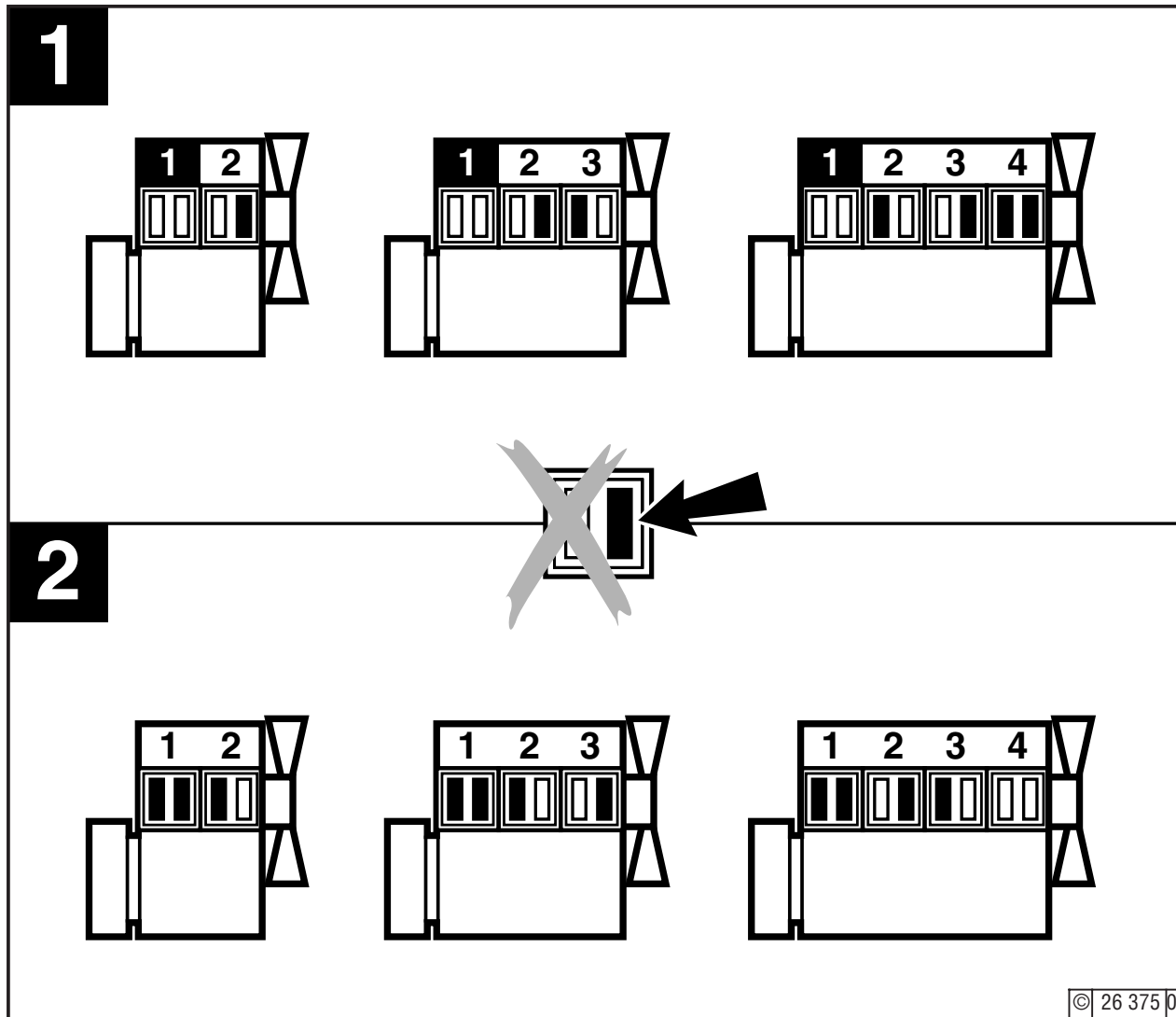
Alternativ Adjustment :

- Remove rocker cover.
- Position crankshaft as per Setting Schematic: see 6.6.1.1.
- Before adjusting valve clearance, allow engine to cool down for at least 30 minutes: oil temperature below 80 °C/176 °F.
- Check valve clearance 1 between pad of rocker arm 2 and valve 3 with feeler blade 8 (clearance is correct if feeler blade can be inserted into gap with a slight drag).
- If necessary, adjust valve clearance as follows:
 - Loosen locknut 4.
 - Adjust set screw 5 by means of screwdriver 8 and wrench 7 in such a manner that with locknut 5 tightened, the correct valve clearance 1 and camshaft clearance 1 are attained.
- Check the valve clearances at each of the remaining cylinders and adjust if necessary. Settings: see 9.1.
- Refit rocker cover (together with new gasket). Fit the cylinder head cover with a new seal (coat the seal with a few drops of permanently elastic sealant). Insert 6 mm stud bolts to guide the seal, fit the seal and remove the stud bolts.



Connecting piece (rubber nipple), control elements - cylinder head cover, must be fitted correctly in the hole to ensure that the lube oil return line for lubricating the valves functions correctly.

6.6.1.1 Setting Schematic for Adjusting Valve Clearances

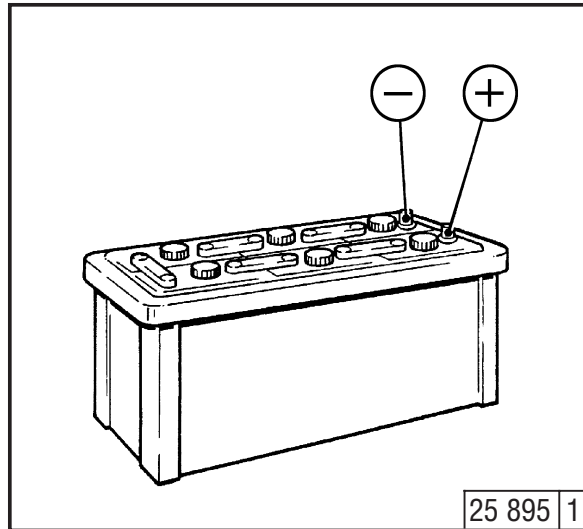


● **Crankshaft Position 1:**
Turn the crankshaft until both valves at cylinder 1 overlap (exhaust valve about to close, inlet valve about to open). Adjust clearances of the valves **marked all-black** in the illustration at left. After setting put a chalk mark on the respective rocker arm to serve as a reminder that it has been done.

● **Crankshaft Position 2:**
Adjust clearances of the valves **marked all-black** in the illustration at left.

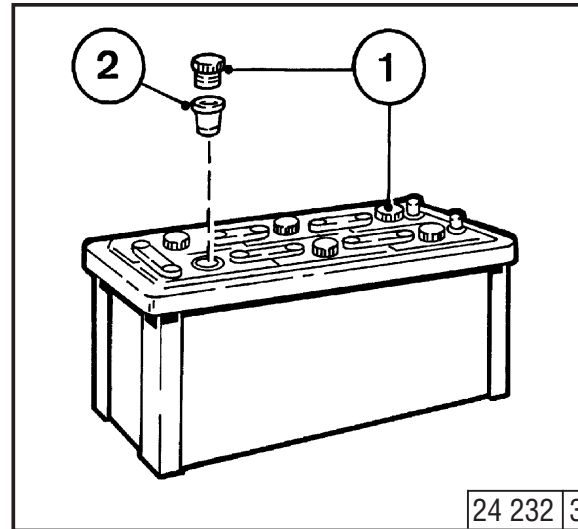
6.7.1 Battery

6.7.1.1 Checking Battery and Lead Connections



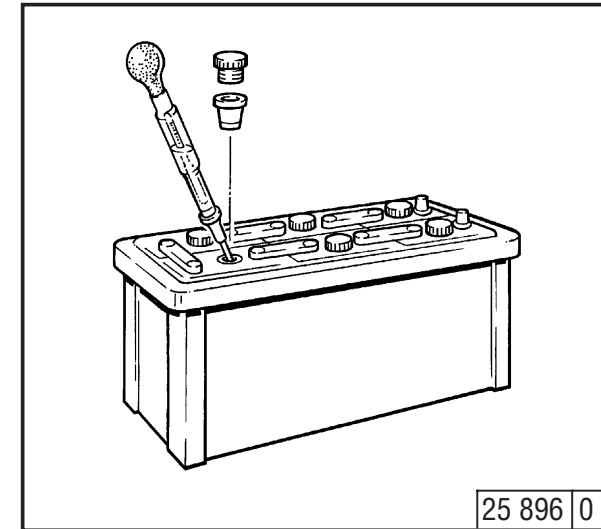
- Keep battery clean and dry.
- Undo soiled terminals.
- Clean battery terminal posts (+ and -) and terminals, and treat with an acid-free and acid-resistant grease.
- When reconnecting, ensure good contact of the terminals. Tighten clamping bolts firmly.

6.7.1.2 Checking Electrolyte Level



- Remove cell caps 1.
- If electrolyte test elements 2 are provided: The level should be high enough to wet the bottom of these.
- If no such elements are provided: Check to make sure that the level is 10-15 mm above the top edge of the plates.
- Top up with distilled water, if necessary.
- .Replace cell caps.

6.7.1.3 Checking Specific Gravity of Electrolyte



- Measure the specific gravity of the individual cells with a commercial hydrometer. The measured values (see adjacent table) indicate the state of charge of the battery.
- During the measurement, the temperature of the electrolyte should, if possible, read 20°C (68°F).

Specific Gravity				
in [kg/ l]		in [°Bé)*		State of Charge
Normal	Tropics	Normal	Tropics	
1,28	1,23	32	27	Fully charged
1,20	1,12	24	16	Half charged: Recharge
1,12	1,08	16	11	Discharged: Charge up immed.

*Measurement of the specific gravity in °Bé (degrees Baumé) is obsolete and rarely used today.



The gases emitted by the battery are explosive! Avoid formation of sparks in vicinity of battery, keep naked lights away!

Do not allow acid to come into contact with the skin or clothing!

Wear protective goggles!

Do not place tools on battery!

6.7.2 Three-Phase Alternator

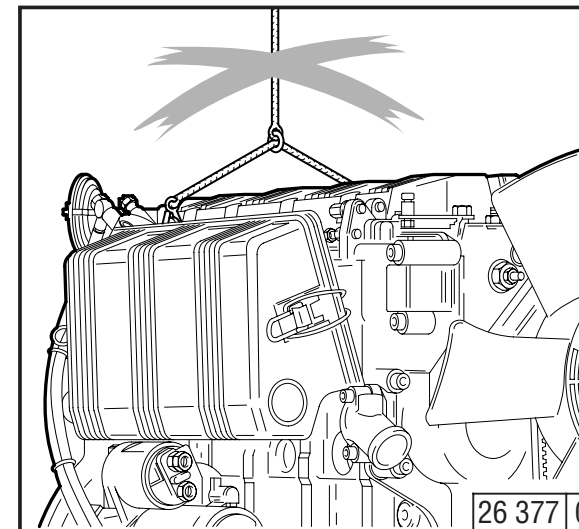
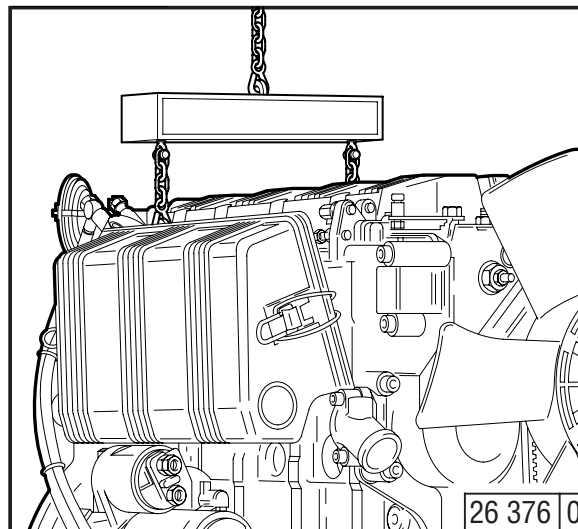
Notes on three-phase system

- When the engine is **running**, never disconnect the leads between battery, alternator and regulator.
- If, however, an engine is to be started and operated without a battery, the regulator/generator connection (B+ and D+) should be disconnected before starting.

Caution: The engine cannot be operated without a battery if the fuel is blocked by a solenoid valve.

- Be sure not to confuse the battery terminals.
- If the bulb of the charging pilot lamp is defective, replace it immediately.
- Engine cleaning: Do not spray with water/steam jet directly against generator! Warm up engine to allow water residues to evaporate. Do not loosen connecting cable between battery and alternator during engine operation.
- Touching a lead against frame for checking whether the lead is live must under no circumstances be applied to a three-phase current system.
- In case of electric welding, connect the earth terminal of the welding unit direct to the part to be welded.

6.7.3 Lifting Tackle



- For transporting the engine, always use the correct lifting tackle.



Always use the correct lifting tackle!

7.1 Diagnosis Chart

Trouble Shooting

7.1 Diagnosis Chart

7

Troubles										Remedial Measure		
Engine fails (or difficult) to start										Check	P	
Engine starts, but runs unevenly or stalls										Adjust	E	
Engine becomes too hot, temperature monitor gives warning										Renew	W	
Engine gives poor performance										Clean	R	
Engine not working on all cylinders										Top up	A	
Engine has little or no oil pressure										Lower level	S	
Engine oil consumption excessive												
Engine smokes - blue												
- white												
- black												
Causes										Section		
●	●		●	●						Air in system / Fuel filter or vent hole of tank clogged	Fuel	P
●	●		●	●						Fuel pump defective		P/W
●	●	●	●				●	●		Injection nozzle or valve of injection pump sticking		P
		●			●				●	Injection nozzle not correctly adjusted		P
		●	●		●	●	●			Plunger leakage		P
					●	●	●			Control rod of injection pump hard-going		P/E
●		●			●					Injection pump speed not correctly se		W
		●		●		●	●			Oil level too high	Lubrication	P
		●			●				●	Oil level too low		P/W
			●		●					Oil pressure-regulating valve sticking		P/R
		●	●		●		●			Oil pump defective		P/R
		●			●		●			Air in oil suction pipe or clogged		P/W
					●		●			Oil pressure sensor or indicator defective		P/W
●	●									Glow plugs or electronic control	Elektrics	P/A
●										Battery discharged		P
										Cable connections wrong or loose		P/W

7.1 Diagnosis Chart

Trouble Shooting

Troubles										Remedial Measure	
Engine fails (or difficult) to start										Check	P
Engine starts, but runs unevenly or stalls										Adjust	E
Engine becomes too hot, temperature monitor gives warning										Renew	W
Engine gives poor performance										Clean	R
Engine not working on all cylinders										Top up	A
Engine has little or no oil pressure										Lower level	S
Engine oil consumption excessive											
Engine smokes - blue											
- white											
- black											
Causes										Section	
●	●		●	●				●	Air cleaner clogged/exhaust turbocharger defective	Maintenance	P
					●			●	Idle speed too high		P/E
								●	Running-in not completed		P
	●	●						●	Engine overloaded/coolant pump defective (coolant fault)		P
●									Injection timed too early/Valves sticking	Adjustments	P/E
								●	Injection timed too late		P/E
●	●								Speed control lever maladjusted		P/E
●	●								Control spring broken or jumped out		P
	●					●		●	Idle speed too low		P/E
		●	●		●	●		●	Piston rings worn out or seized		P/W
		●	●			●		●	Worn cylinders/valve guide		P/W
					●				Main bearings or big-end bearings worn out		P
●	●								Governor linkage hard-going		P/E
●	●								Crankshaft hard-going, seized		P
●		●				●			Cylinder head gasket damaged		P
●									Loose control rod of pump nozzles		P/E
●	●							●	Wrong fuel metering		P/E

8.1 Preserving Engine

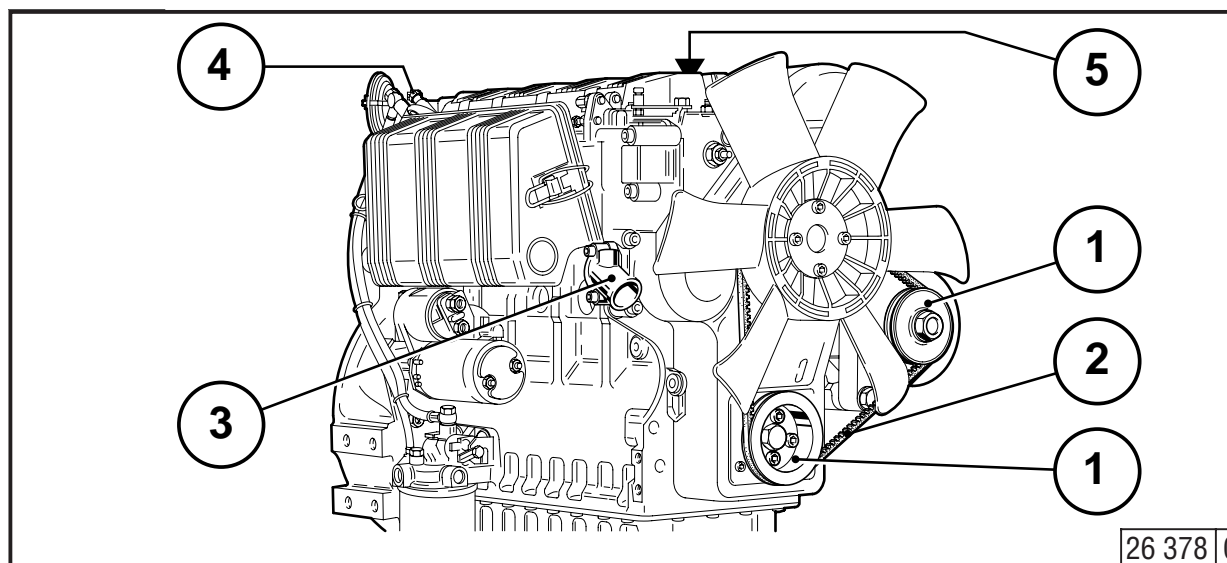
8.1 Preserving Engine

If the engine is to be shut down for an extended period, it is necessary to take preservation measures to prevent rust formation. The preservation measures described here will protect the shut-down engine for a period of up to about 6 months. Before reusing the engine, the preservatives must be removed, except from the oil and fuel.

- Anti-corrosive oils to Specification:
 - MIL-L 21260B
 - TL 9150-037/2
 - Nato Code C 640 / 642
- Recommended cleansing agent for removing preservatives:
 - Benzine (dangerous materials class A3)

Preserving Engine:

- Clean engine (in case of need, cold cleansing agent).
- Cleaning the cooling system: see 6.3.2..
- Run engine until warm and stop.
- Drain engine oil, see 6.1.2, and fill in anti-corrosive oil.
- Drain off engine coolant: see 6.3.3.
- Fill in anti-corrosive agent: see 4.3.3.
- Clean oil bath air cleaner, if provided: see 6.4.3, and fill in anti-corrosive oil.
- Drain fuel out of tank.
- Prepare fuel mixture of 90% diesel fuel and 10% anti-corrosive oil and fill up tank.
- Run engine for about 10 minutes.
- Stop engine.



- Turn engine over several times by hand. When turning engine over with starter, move shutdown lever to stop position.
- Remove V-belt 2 and store in wrapped condition.
- Spray anti-corrosion agent into the grooves of V-belt pulleys 1 and any unpainted parts.
- Close coolant supply line 3 and exhaust opening 4.
- Remove cap 5 and lightly preserve oil filler neck and cap. Replace cap 5.
- Close intake opening 3 and exhaust opening 4.
- Lightly preserve coolant filler neck 5 and refit.
- Drain off anti-corrosive agent: see 6.3.3.

Removing Engine Preservatives:

- Remove anti-corrosive agent from the grooves of the V-belt pulleys 1 and cap 5.
- Fit V-belt 2. Retension if necessary after a short period of operation: see 6.5.
- Remove closures of coolant supply line 3 and exhaust opening 4.
- Fill in coolant: see 6.3.4.
- Start up engine.

- 9.1 Engine Specifications and Settings**
- 9.2 Torque Wrench Settings**
- 9.3 Tools**

Specification Data

9.1 Engine Specifications and Settings

9

Model	F2M 1008	F3M 1008	F4M 1008
Number of cylinders	2	3	4
Cylinder arrangement		vertical, in-line	
Bore [mm]		72	
Stroke [mm]		75	
Cooling system		protective liquid/antifreeze	
Compression ratio [cm ³]	611	916	1222
Total displacement		22.8	
Engine power [kkW]		¹⁾	
Speed [1/min]		¹⁾	
Combustion system		2-stage combustion	
Direction of rotation		counter-clockwise	
Weight, incl. coolg. system as per DIN 70020-A[ca.kg]	65	85	100
Lubrication		forced feed	
Oil temperature in oil pan [°C]		120	
Oil pressure at low idle [bar]		1.1	
Oil capacity (first fill-up) with/ w/o filter[approx. litre]	1.7 / 1,6 ³⁾	2,5 / 2,4 ³⁾	3,4 / 3,2 ³⁾
Diff. oil volume at dipstick min/max [approx. litre]	0.6	1.0	1.3
Valve clearance w/ eng. cold			
Rocker arm/camshaft clearance [mm]		inlet/exhaust valve 0.15	
Gap beetben Rocker arm/tappet contact face and valve stem [mm]		inlet/exhaust valve 0.2	
Opening pressure, injector [bar]		130/140	
Firing order	1-2	1-3-2	1-3-4-2
V-belt tension:		Installation tension	
Rated tension [N]		250 ±20 ²⁾	
Installation tension [N]		400 ±20 ²⁾	

¹⁾ Engine power and speed are stamped on the rating plate (see also 2.1)

²⁾ Retension after running for 15 minutes under load.

³⁾ Approx. value can vary depending on oil sump or radiator design (external cooling system).

The upper oil dipstick marking should always be taken as authoritative.

9.1 Engine Specifications and Settings

Specification Data

Model	F2M 1008	F3M 1008	F4M 1008
Coolant capacity of engine not incl. capacity of radiator and hoses[approx. litre]	0.9	1.3	1.75
Coolant temperature [°C]		max.110	
Thermostat starts opening at [°C]		80° ⁴⁾	
Thermostat fully open from [°C]		95° ⁴⁾	
Coolant preheating		⁵⁾	

⁴⁾ Engines for low-load operation are supplied with thermostats for temperatures 86-101 °C.

⁵⁾ Necessary only for operation in winter: see 3.5.1..

Specification Data

9.1 Engine Specifications and Settings

9

Model		BF4M 1008
Number of cylinders		4
Cylinder arrangement		vertical, in-line
Bore	[mm]	72
Stroke	[mm]	75
Cooling system		protective liquid/antifreeze
Compression ratio	[cm ³]	1222
Total displacement		22.8
Engine power	[KW]	¹⁾
Speed	[1/min]	¹⁾
Combustion system		Turbocharged / 2-stage combustion
Direction of rotation		counter-clockwise
Weight, incl. coolg. system as- per DIN 70020-A(1012)	[ca.Kg]	100
Lubrication		forced feed
Oil temperature in oil pan	[°C]	145
Oil pressure at low idle	[bar]	1.1
Oil capacity (first fill-up) with/ w/o filter	[approx. litre]	3,4 / 3,2 ³⁾
Diff. oil volume at dipstick min/max	[approx. litre]	1.3
Valve clearance w/ eng. cold		
Rocker arm/camshaft clearance	[mm]	inlet/exhaust valve 0.15
Gap beetben Rocker arm/tappet contact face and valve stem	[mm]	inlet/exhaust valve 0.2
Opening pressure, injector	[bar]	130 / 140
Firing order		1-3-4-2
V-belt tension:		Installation tension
Rated tension	[N]	250 ±20 ²⁾
Installation tension	[N]	400 ±20 ²⁾

¹⁾ Engine power and speed are stamped on the rating plate (see also 2.1

²⁾ Retension after running for 15 minutes under load.

³⁾ Approx. value can vary depending on oil sump or radiator design (external cooling system).

The upper oil dipstick marking should always be taken as authoritative.

Model		BF4M 1008
Coolant capacity of engine not incl. capacity of radiator and hoses	[approx. litre]	1.85
Coolant temperature	[°C]	max.110
Thermostat starts opening at	[°C]	80° ⁴⁾
Thermostat fully open from	[°C]	95° ⁴⁾
Coolant preheating		⁵⁾

⁴⁾ Engines for low-load operation are supplied with thermostats for temperatures 86-101 °C.

⁵⁾ Necessary only for operation in winter: see 3.5.1.

Specification Data

9.1 Engine Specifications and Settings

9

Model	F2M 1008 F	F3M 1008 F	F4M 1008 F
Number of cylinders	2	3	4
Cylinder arrangement	vertical, in-line		
Bore [mm]	75		
Stroke [mm]	77,6		
Cooling system	protective liquid/antifreeze		
Compression ratio [cm ³]	686	1028	1372
Total displacement	22,8		
Engine power [kW]	1) ¹⁾		
Speed [1/min]	1) ¹⁾		
Combustion system	2-stage combustion		
Direction of rotation	counter-clockwise		
Weight, incl. coolg. system asper DIN 70020-A[ca.kg]	66	87	98
Lubrication	forced feed		
Oil temperature in oil pan [°C]	120	120	120
Oil pressure at low idle [bar]	1,5		
Oil capacity (first fill-up) with/ w/o filter [approx. litre]	1,8 / 1,6 ³⁾	2,5 / 2,4 ³⁾	3,5 / 3,3 ³⁾
Diff. oil volume at dipstick min/max [approx. litre]	0,6	1,0	1,3
Valve clearance w/ eng. cold	inlet/exhaust valve 0.15		
Rocker arm/camshaft clearance [mm]	inlet/exhaust valve 0.2		
Gap beetben Rocker arm/tappet contact faceand and valve stem [mm]	130/140		
Opening pressure, injector [bar]	1-2		
Firing order	1-2	1-3-2	1-3-4-2
V-belt tension:	Installation tension		
Rated tension [N]	250 ± 20 ²⁾		
Installation tension [N]	400 ± 20 ²⁾		

¹⁾ Engine power and speed are stamped on the rating plate (see also 2.1)

²⁾ Retension after running for 15 minutes under load.

³⁾ Approx. value can vary depending on oil sump or radiator design (external cooling system).

The upper oil dipstick marking should always be taken as authoritative.

9.1 Engine Specifications and Settings

Specification Data

Model	F2M 1008 F	F3M 1008 F	F4M 1008 F
Coolant capacity of engine not incl. capacity of radiator and hoses[approx. litre]	0,9	1,3	1,75
Coolant temperature [°C]		max.110	
Thermostat starts opening at [°C]		80° ⁴⁾	
Thermostat fully open from [°C]		95° ⁴⁾	
Coolant preheating		⁵⁾	

⁴⁾ Engines for low-load operation are supplied with thermostats for temperatures 86-101 °C.

⁵⁾ Necessary only for operation in winter: see 3.5.1.

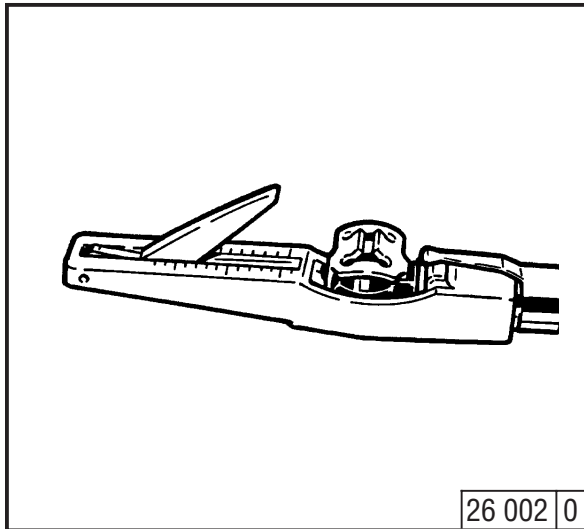
Specification Data

9.2 Torque Wrench Setting

9

Location	Preloading [Nm]	Tightening [°deg.]	Total[Nm]	Note
Rocker cover			8	M 6
Rocker-arm shaft			20	M8
Intake manifold			8,5	M8
Exhaust manifold			24,5	M8
Oil drain plug			40	M12x1,5
Oil pan			10	M 6
Glow plugs			20	M12 x 1,25

V-Belt Tension Gauge



The V-belt tension gauge is obtainable under the Order No. 91 107 from:

FA.WILBÄR
Postfach 14 05 80
D-42826 Remscheid

Note

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.

Notes

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.

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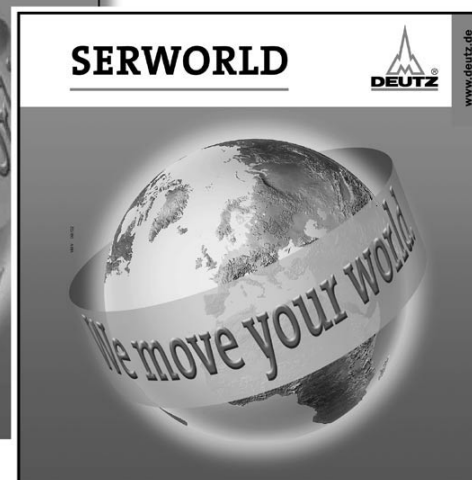
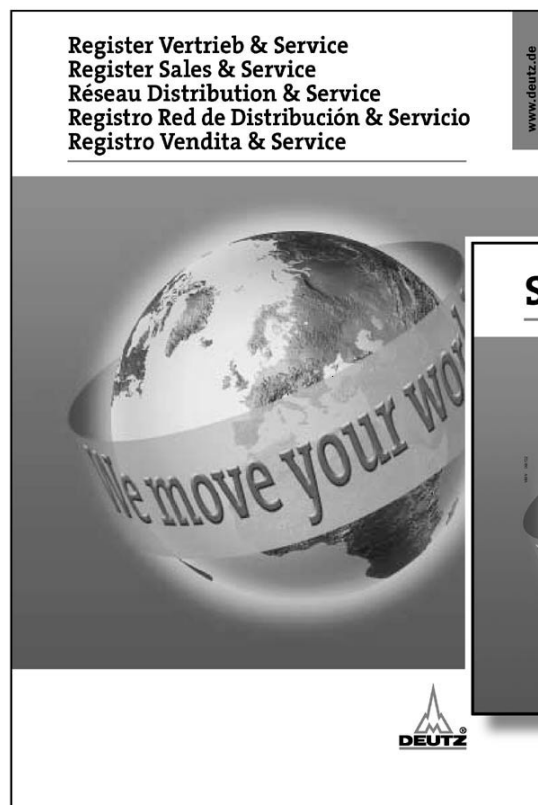
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