Operating Instructions

Diesel Engine

D 2866 E
D 2866 TE
D 2866 LE
D 2866 LXE

Dear Customer

These Operating Instructions are intended to familiarize you with your new MAN Diesel engine and how it operates.
This manual is supplemented by the publication “Fuels, Lubricants and Coolants for MAN Diesel Engines” and the “Service record”.

Note:
All three publications belong to the engine and must always be kept ready to hand near the engine in the engine room.

Please read this Manual and the “Instructions for the installation of MAN Diesel Engines” before you put the new engine into operation.

Comply in full with instructions relating to operation, prevention of accidents and environmental protection.

MAN Diesel engines are developed and manufactured in line with the latest state of the art. However, trouble-free operation and high performance can only be achieved if the specified maintenance intervals are observed and only approved fuels, lubricants and coolants are used.

It is imperative and in your own interest to entrust your MAN Local Service Centre with the removal of any disturbances and with the performance of checking, setting, and repair work.

Yours faithfully,
MAN Nutzfahrzeuge Aktiengesellschaft
Werk Nürnberg

Subject to change to keep abreast with technological progress.

MTDA Technical status: 11.1998 51.99493–8264

Declaration

In accordance with Article 4, paragraph 2, in conjunction with Appendix II, section B, of Directive 89/392/EEC, version 93/44/EEC

MAN Nutzfahrzeuge Aktiengesellschaft,

hereby declares that the engine described below is destined for installation in a machine as defined in the EC directive on machines.

Engine model:

Design: *For data see original declaration*

Engine number: *If required this declaration is enclosed with the delivery note.*

Rating / speed:

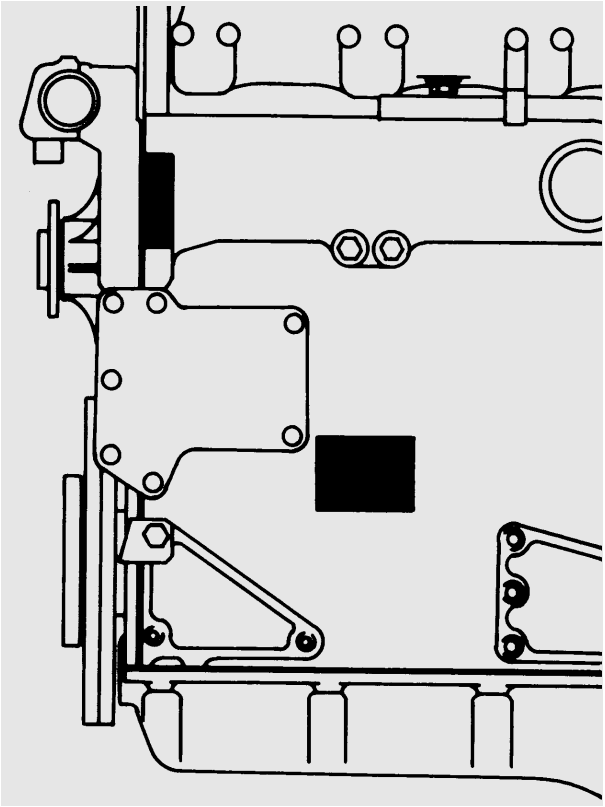
Note:
The manufacturer of the complete ready-to-use machine in which this engine is to be installed must take the further action necessary in the context of indirect safety-related engineering and provision of instructions to ensure that the ready-to-use machine complies with the requirements of the EC directive on machines.

The engine must not be put into operation until the complete machine satisfies the conditions laid down in the EC directive on machines 89/392/EEC, most recently amended by 93/44/EEC, or the latest amendment of said directive.

MAN Nutzfahrzeuge Aktiengesellschaft

Vogelweiherstraße 33

D–90441 Nürnberg



Model

.....

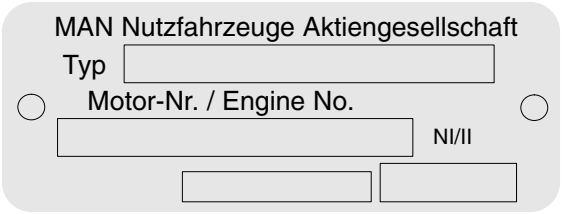
delivered on

.....

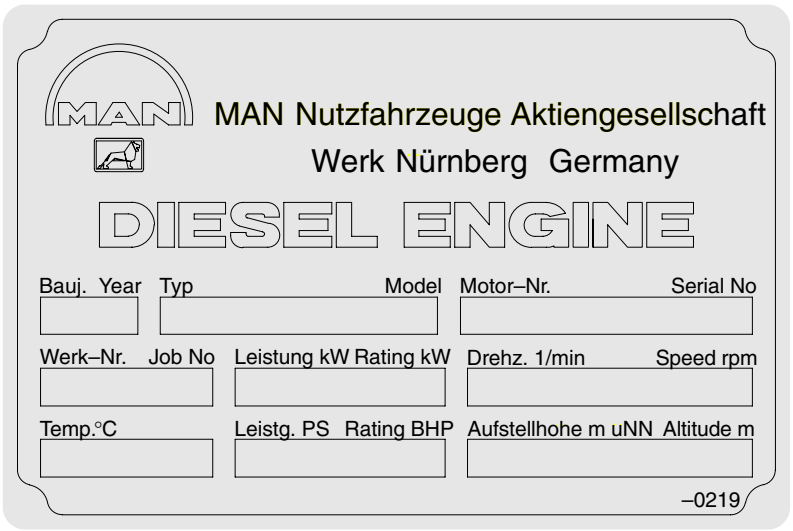
installed on

.....

In all your correspondence please always quote engine model, serial number and job number (Order number).



Enter 14-digit serial number (is used in the spare parts catalog to distinguish between spare parts).



Enter 14-digit engine serial number.

Enter 6-digit job number (Order number).

General notes

Handling diesel engines and the necessary resources is no problem when the personnel commissioned with operation and maintenance are trained accordingly and use their common sense.

This summary is a compilation of the most important regulations. These are broken down into main sections which contain the information necessary for preventing injury to persons, damage to property and pollution. In addition to these regulations those dictated by the type of engine and its site are to be observed also.

Important:
If, despite all precautions, an accident occurs, in particular through contact with caustic acids, fuel penetrating the skin, scalding from hot oil, anti-freeze being splashed in the eyes etc., ***consult a doctor immediately.***

Regulations designed to prevent accidents with injury to persons

During commissioning, starting and operation

- Before putting the engine into operation for the first time, read the operating instructions carefully and familiarize yourself with the “critical” points. If you are unsure, ask your MAN representative.

- For reasons of safety we recommend you attach a notice to the door of the engine room prohibiting the access of unauthorized persons and that you draw the attention of the operating personal to the fact that they are responsible for the safety of persons who enter the engine room.

- The engine must be started and operated only by authorized personnel.
  Ensure that the engine cannot be started by unauthorized persons.

- When the engine is running, do not get too close to the rotating parts. Wear close-fitting clothing.

- Do not touch the engine with bare hands when it is warm from operation – risk of burns.

- Exhaust gases are toxic. Comply with the instructions for the installation of MAN Diesel engines which are to be operated in enclosed spaces. Ensure that there is adequate ventilation and air extraction.

- Keep vicinity of engine, ladders and stairways free of oil and grease.
  Accidents caused by slipping can have serious consequences.

During maintenance and care

- Always carry out maintenance work when the engine is switched off. If the engine has to be maintained while it is running, e.g. changing the elements of change-over filters, remember that there is a risk of scalding. Do not get too close to rotating parts.

- Change the oil when the engines is warm from operation.
  Caution:
  There is a risk of burns and scalding. Do not touch oil drain plugs or oil filters with bare hands.

- Take into account the amount of oil in the sump. Use a vessel of sufficient size to ensure that the oil will not overflow.

- Open the coolant circuit only when the engine has cooled down. If opening while the engine is still warm is unavoidable, comply with the instructions in the chapter entitled “Maintenance and Care”.

- Neither tighten up nor open pipes and hoses (lube oil circuit, coolant circuit and any additional hydraulic oil circuit) during the operation. The fluids which flow out can cause injury.

- Fuel is inflammable. Do not smoke or use naked lights in its vicinity. The tank must be filled only when the engine is switched off.

- When using compressed air, e.g. for cleaning the radiator, wear goggles.

- Keep service products (anti-freeze) only in containers which can not be confused with drinks containers.

- Comply with the manufacturer’s instructions when handling batteries.
  Caution:
  Accumulator acid is toxic and caustic. Battery gases are explosive.

When carrying out checking, setting and repair work

- Checking, setting and repair work must be carried out by authorized personnel only.

- Use only tools which are in satisfactory condition. Worn open-end wrench slip, which could lead to injury.

- When the engine is hanging on a crane, no-one must be allowed to stand or pass under it. Keep lifting gear in good condition.

- When working on parts which contain asbestos, comply with the notes at the end of this chapter.

- When checking injectors do not put your hands under the jet of fuel. Do not inhale atomised fuel.

- When working on the electrical system disconnect the battery earth cable first. Connect it up again last in order to prevent short circuits.

- When welding comply with the “Instructions for welders”.

Regulations designed to prevent damage to engine and premature wear

Do not demand more from the engine than it is able to supply in its intended application. Detailed information on this can be found in the sales literature. The injection pump must not be adjusted without prior written permission of MAN Nürnberg.

If faults occur, find the cause immediately and have it eliminated in order to prevent more serious damage.

Use only genuine MAN spare parts. MAN will accept no responsibility for damage resulting from the installation of other parts which are supposedly “just as good”.

In addition to the above, note the following points:

- Never let the engine run when dry, i.e. without lube oil or coolant.

- When starting do not use any additional starting aids (e.g. injection with starting pilot).

- Use only MAN-approved service products (fuel, engine oil, anti-freeze and anti-corrosion agent). Pay attention to cleanliness. The Diesel fuel must be free of water. See “Maintenance and care”.

- Have the engine maintained at the specified intervals.

- Do not switch off the engine immediately when it is warm, but let it run without load for about 5 minutes so that temperature equalization can take place.

- Never put cold coolant into an overheated engine. See “Maintenance and care”.

- ***Do not add so much engine oil that the oil level rises above the max. marking on the dipstick. Do not exceed the maximum permissible tilt of the engine.***
  Serious damage to the engine may result if these instructions are not adhered to.

- Always ensure that the testing and monitoring equipment (for battery charge, oil pressure, coolant temperature) function satisfactorily.

- Comply with instructions for operation of the alternator. See “Commissioning and operation”.

- Do not let the raw water pump run dry. If there is a risk of frost, drain the pump when the engine is switched off.

Regulations designed to prevent pollution

Engine oil and filter elements / cartridges, fuel/fuel filter

- Take old oil only to an old oil collection point.

- Take strict precautions to ensure that no oil or Diesel fuel gets into the drains or the ground.
  The drinking water supply could be contaminated.

- Filter elements are classed as dangerous waste and must be treated as such.

Coolant

- Treat undiluted anti-corrosion agent and / or antifreeze as dangerous waste.

- When disposing of spent coolant comply with the regulations of the relevant local authorities.

Notes on safety in handling used engine oil *

Prolonged or repeated contact between the skin and any kind of engine oil decreases the skin. Drying, irritation or inflammation of the skin may therefore occur. Used engine oil also contains dangerous substances which have caused skin cancer in animal experiments. If the basic rules of hygiene and health and safety at work are observed, health risks are not to the expected as a result of handling used engine oil.

Health precautions:

- Avoid prolonged or repeated skin contact with used engine oil.
- Protect your skin by means of suitable agents (creams etc.) or wear protective gloves.
- Clean skin which has been in contact with engine oil.
  – Wash thoroughly with soap and water. A nailbrush is an effective aid.
  – Certain products make it easier to clean your hands.
  – Do not use petrol, Diesel fuel, gas oil, thinners or solvents as washing agents.

- After washing apply a fatty skin cream to the skin.
- Change oil-soaked clothing and shoes.
- Do not put oily rags into your pockets.

Ensure that used engine oil is disposed of properly
– Engine oil can endanger the water supply –

For this reason do not let engine oil get into the ground, waterways, the drains or the sewers. Violations are punishable.

Collect and dispose of used engine oil carefully. For information on collection points please contact the seller, the supplier or the local authorities.

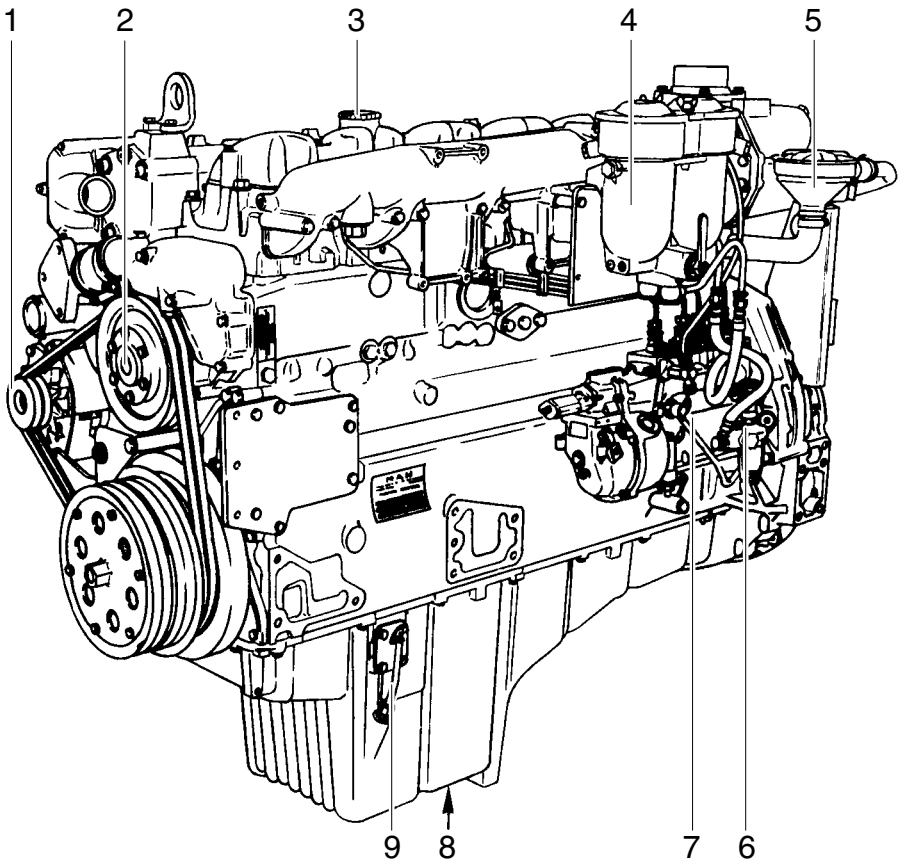
* Adapted from “Notes on handling used engine oil”.

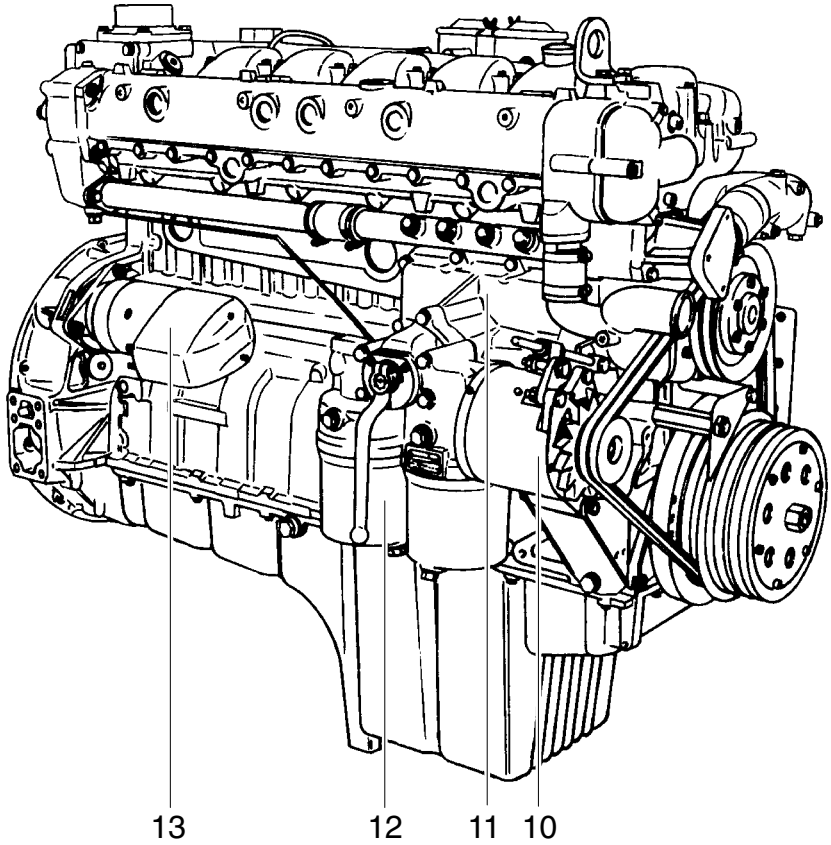
Note on parts containing asbestos

- Certain parts of the engine (gaskets) may contain asbestos. Spare parts and, where necessary, their packaging is marked accordingly (see illustration below).

- When parts that contain asbestos are machined fine asbestos dust may be released. To prevent possible damage to health please take appropriate safety precautions and follow the advice given below:
- Wherever possible work in the open air or in well ventilated rooms.
- If possible use hand-operated or slow-running machines, if necessary with a dust trap. If fast-running machines are used they ought always to have such a device.
- Wet the material before cutting or drilling it.
- Wet the dust, put it into a tightly closing container and have it disposed of as dangerous waste.

Engine views D 2866 E





1 Tensioning pulley

2 Water pump

3 Oil filler neck

4 Tandem fuel filter

5 Oil separator valve for crankcase breather

6 Fuel lift pump with prestrainer

7 Injection pump

8 Oil drain plug

9 Oil dipstick

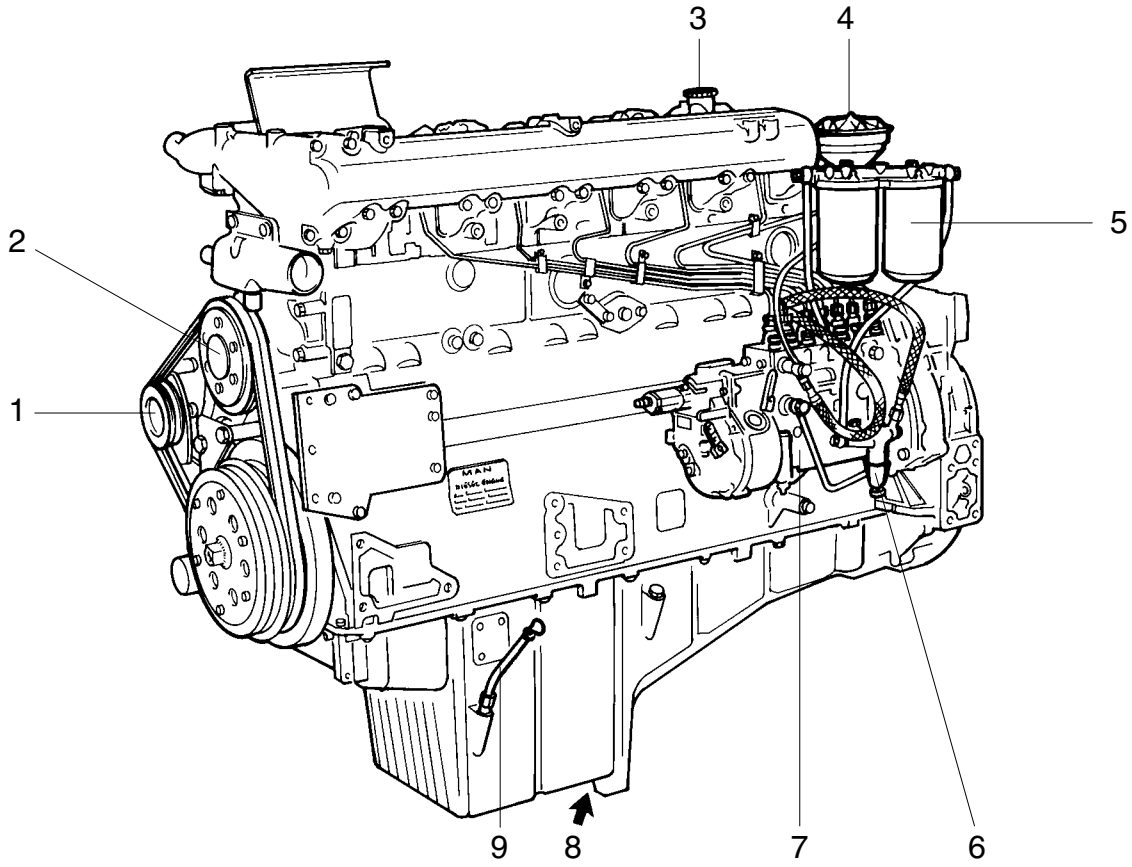
10 Alternator

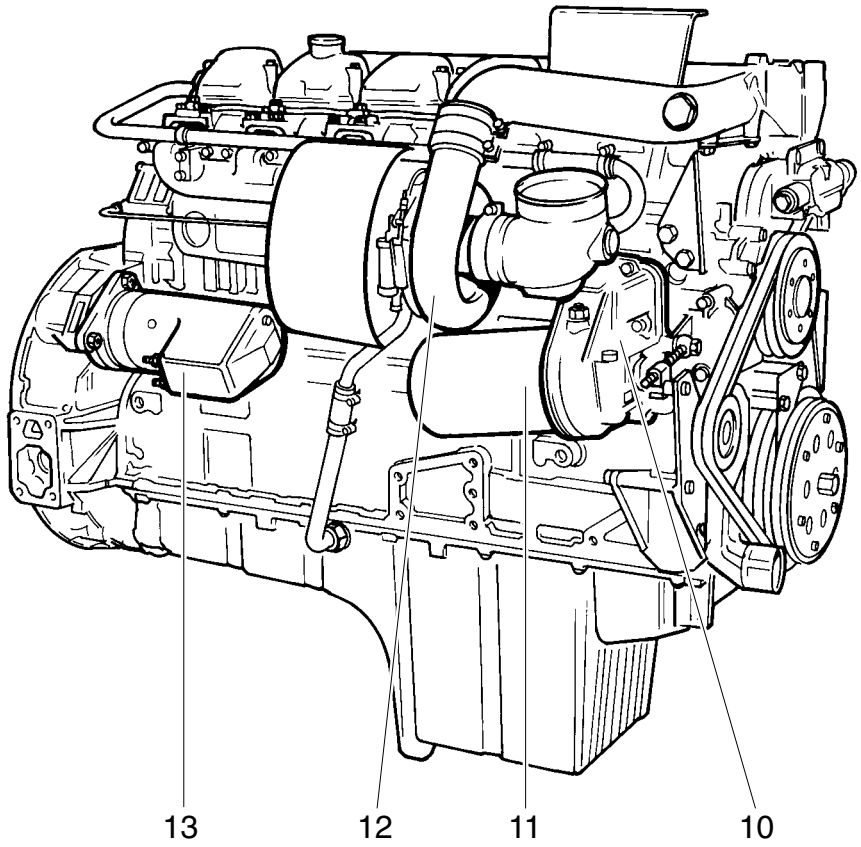
11 Oil cooler

12 Oil filter

13 Starter motor

Engine views D 2866 TE





1 Tensioning pulley

2 Water pump

3 Oil filler neck

4 Oil separator valve for crankcase breather

5 Tandem fuel filter

6 Fuel lift pump with prestrainer

7 Injection pump

8 Oil drain plug

9 Oil dipstick

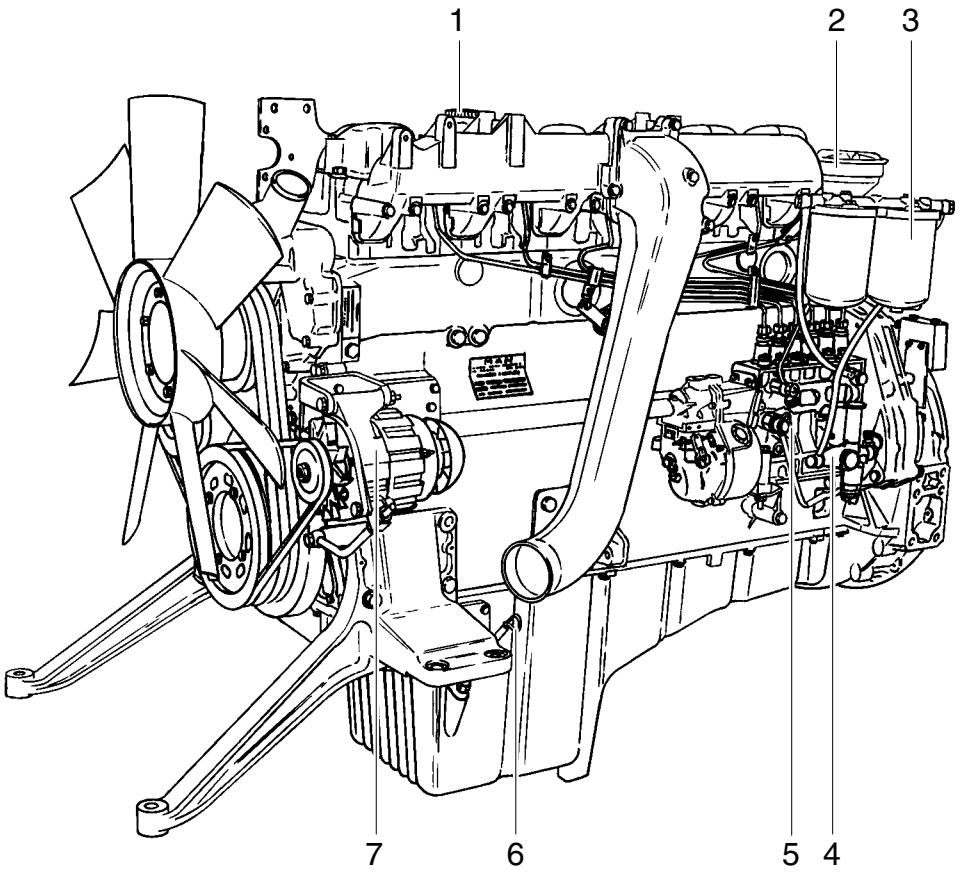
10 Oil cooler

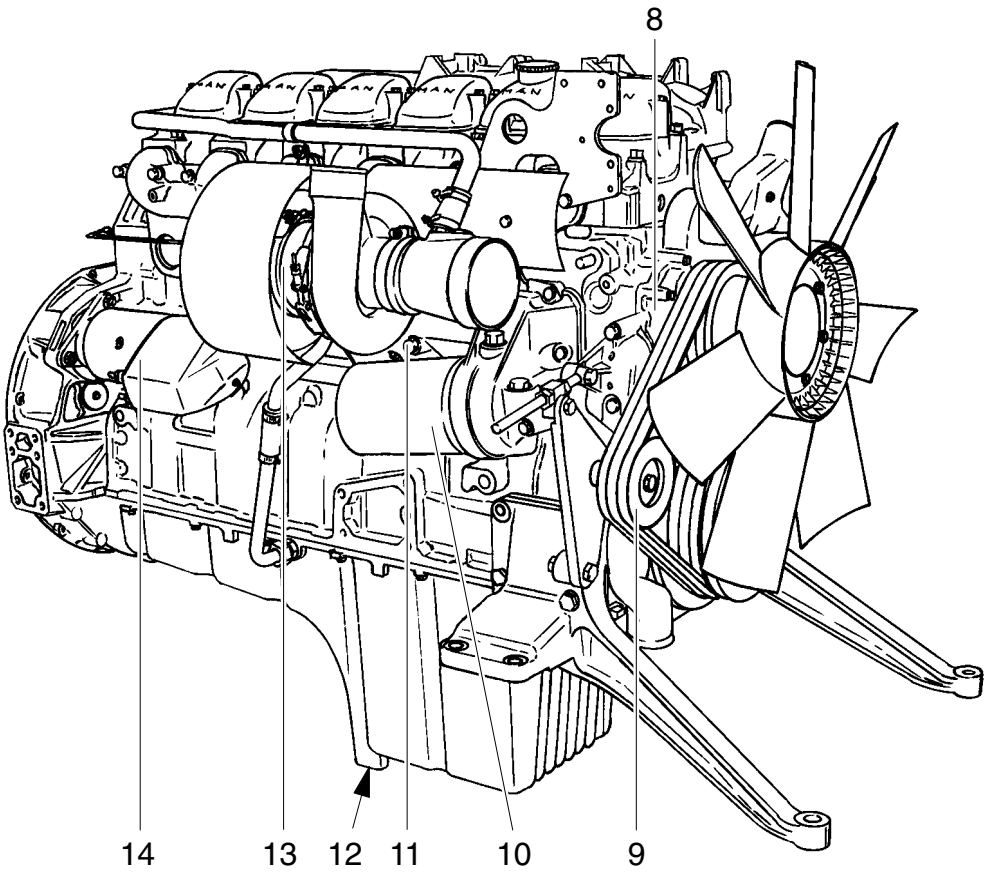
11 Oil filter

12 Turbocharger

13 Starter motor

Engine views D 2866 LE, LXE





1 Oil filler neck

2 Oil separator valve for crankcase breather

3 Tandem fuel filter

4 Fuel lift pump with prestrainer

5 Injection pump

6 Oil dipstick

7 Alternator

8 Water pump

9 Tensioning pulley

10 Oil filter

11 Water drain plug

12 Oil drain plug

13 Turbocharger

14 Starter motor

Engines

The engines D 2866 E / TE / LE / LXE are in-line vertical liquid-cooled 6-cylinder four-stroke Diesel engines with direct injection. D 2866 E is a naturally aspirated engine. D 2866 TE is turbocharged, and D 2866 LE / LXE are turbocharged and intercooled.

Engine block

The cylinder block is a single piece of alloy cast iron. To increase its stiffness, it is extended to a level below the crankshaft centre line. The engine has replaceable wet cylinder liners and individual cylinder heads with shrunk-in valve seat rings and replaceable valve guides.

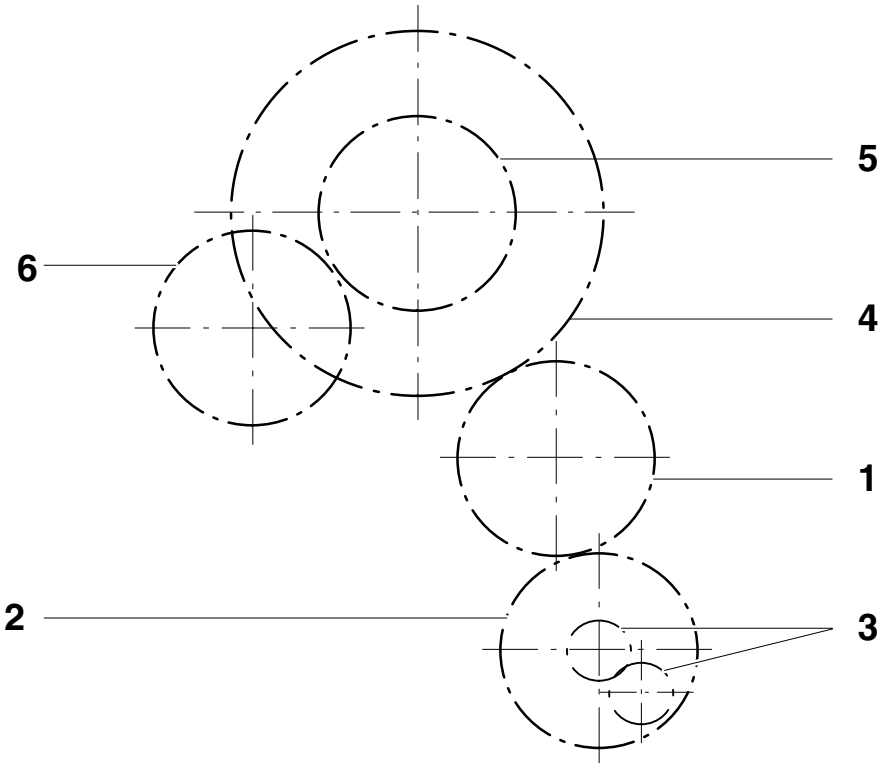
Piston / Conrod / Crank assembly

The forged crankshaft has screwed-on counterweights. Radial seals with replaceable wearing rings on crankshaft and flywheel are provided to seal the crankcase penetrations.

The connecting rods are die-forged, diagonally split and can be removed through the top of the cylinders together with the pistons. Crankshaft and connecting rods run in steel-backed lead bronze ready-to-fit type bearings.

Engine timing

Camshaft, oil pump and injection pump are driven by a gear train arranged at the flywheel end.



1 Crankshaft gear
2 Oil pump drive gear
3 Oil pump impeller gears
4 Camshaft drive gear
5 Idler gear
6 Injection pump drive gear

The crankshaft gear and camshaft gear are match-marked by “1” or “●”.

Valves

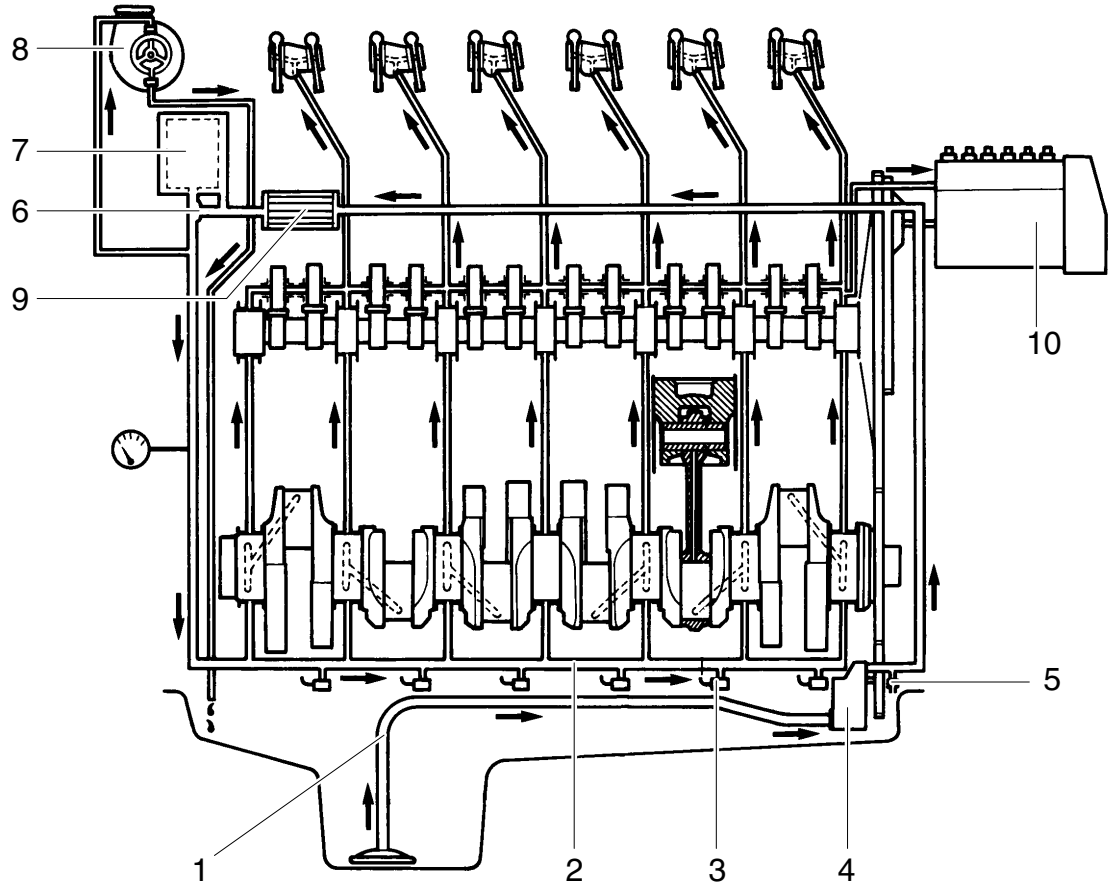
The overhead valves are actuated via chilled cast iron tappets, push rods and rocker arms from the camshaft.

Engine lubrication

The engine is equipped with force-feed lubrication.

The pressure is produced by a gear pump whose drive gear is in direct mesh with the crankshaft gear at the flywheel end.

The oil pump draws the oil from the oil sump and delivers it through the oil cooler and oil filter to the main distributor gallery and from there to the main bearings, big-end bearings and camshaft bearings as well as to the small-end bearings and the rocker arms.



1 Oil suction pipe
2 Main oil galleries
3 Jets for piston cooling and cam lubrication
4 Oil pump
5 Oil relief valve
6 Bypass valve
7 Oil filter
8 Turbocharger
(D 2866 TE / LE / LXE only)
9 Oil cooler
10 Injection pump

The injection pump and the turbocharger are also connected to the engine lubricating system.

The cylinder walls and timing gears are splash-lubricated.

Each cylinder has an oil jet provided for cooling the underside of the pistons.

The lube oil is cleaned in a full-flow oil filter.

Depending on the agreed extent of delivery and the design of the engine, the lube oil circuit can be equipped with oil pressure monitors (advance warning and cut-off function) which shut the engine down in the event of a sudden loss of pressure.

Oil cooler

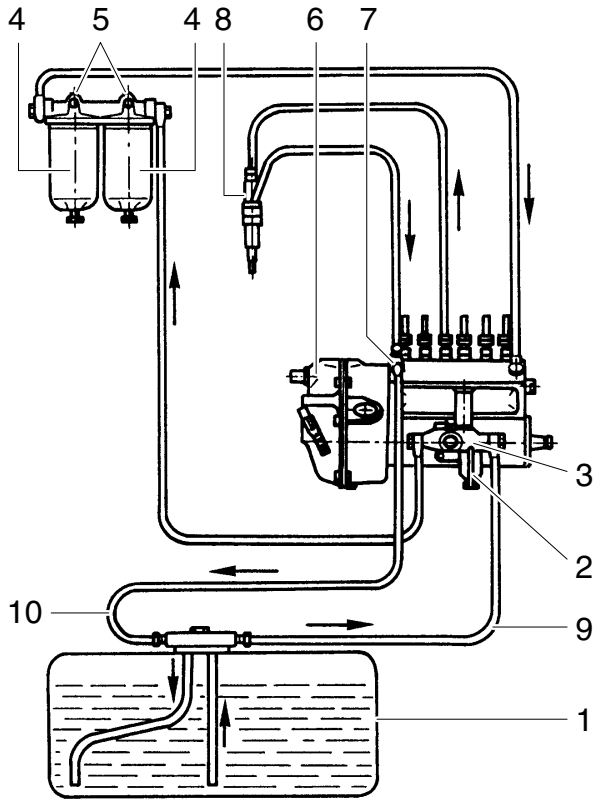
An oil cooler is provided between the oil filter and the crankcase. This cooler is of the flat tube type with turbulence inserts and operated by the coolant.

Fuel system

The fuel is delivered by the fuel lift pump via the fuel filter to the injection pump and from there to the injectors.

The fuel is sprayed into the cylinder through four-hole nozzles fitted in screw-fit injectors in the cylinder heads.

Excessive fuel delivered and leak fuel from the injectors flow through the return pipe back to the tank. A strainer and a hand pump are arranged ahead of the fuel lift pump.



1 Fuel tank
2 Fuel strainer
3 Fuel lift pump
4 Parallel fuel filter
5 Bleeder screw
6 Injection pump
7 Overflow valve
8 Injection nozzles
9 Suction line
10 Return line

Injection pump

The in-line injection pump is driven via gears from the crankshaft. It is connected to the force-feed lubricating system of the engine and consequently maintenance-free.
The centrifugal governor flange-mounted on the pump casing is a variable range governor designed to keep the speed set by the control lever constant under conditions of varying load.

The governor of the turbocharged engines has a full load stop controlled by the charge-air pressure and is designed to decrease the full load fuel quantity in the low speed range from a certain (adjustable) charge-air pressure onwards.

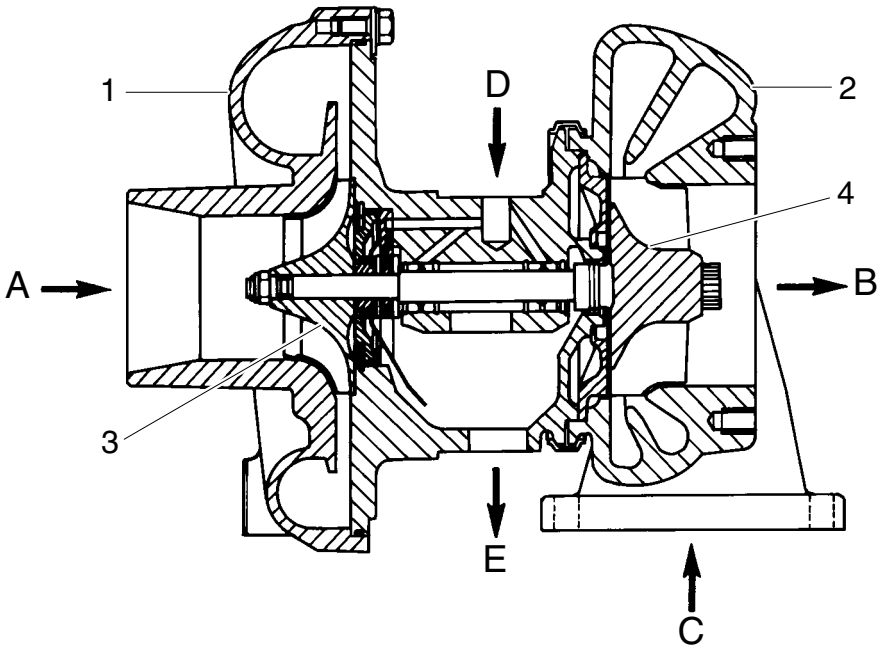
Fuel filters

Before entering the suction chamber of the injection pump, the fuel is cleaned in a two-stage, parallel or changeover filter.

Turbocharger (D 2866 TE, LE, LXE)

The exhaust gases of the engine are passed through the turbine rotor of the turbocharger. Air impeller mounted on the same shaft draws in fresh air and delivers it at a higher pressure to the cylinders.

The turbocharger is air-cooled or liquid-cooled. Lubrication of the main bearing is by oil under pressure from the engine lubricating system.



1 Compressor casing
2 Turbine casing
3 Compressor wheel
4 Turbine rotor

A Air inlet
B Gas outlet
C Gas inlet
D Oil inlet
E Oil return

Intercooler (D 2866 LE, LXE)

Before entering the cylinders the combustion air compressed in the turbocharger is passed through a heat exchanger (intercooler).

Heat removal in the cooler is either by air (air-to-air intercooler) or, in case of the marine application, by means of seawater (air-to-water intercooler) delivered by the raw water pump.

It is important to provide a seawater filter ahead of the air-to-water intercooler.

In the case of extended standstills, cleaned seawater may be left in the intercooler, but dirty water (brackish water) must definitely be discharged.

The seawater-operated intercooler must be regularly cleaned as required in order to maintain its full cooling efficiency. If the engine output is found to drop, the reason may be in a fouled-up intercooler. The intercooler has to be removed from the engine for cleaning.

Cooling

The engine has a liquid-cooling system.

The water pump is a maintenance-free impeller pump driven by V-belts from the crankshaft pulley.

Depending on the agreed extent of delivery and the design of the engine, the coolant circuit can be equipped with temperature and level monitors which, in the event of overheating, will trigger an advance warning system or, in the event of loss of coolant, shut the engine down.

Air cleaner

Air cleaner is mounted on the engine to purify the air for combustion.

The intervals at which the air cleaner requires servicing depend on the specific operating conditions encountered. Clogged air filters may cause black smoke and reduce power.

A check should be made from time to time to see that the fastening elements securing the air cleaner to the intake manifold seal the connection tightly. Any ingress of unfiltered air is liable to cause a high rate of cylinder and piston wear.

Electrical equipment

Alternator

The alternator is fitted with integral silicon rectifiers.

A transistorized regulator mounted on the alternator limits the alternator voltage. The alternator should not be operated except with the regulator and battery connected in circuit to avoid damage to the rectifier and regulator.

The alternator is maintenance-free. Nevertheless, it must be protected against dust and, above all, against moisture.

Operate the alternator according to the instructions given in the chapter “Commissioning and operation”.

Starter motor

The sliding-gear starter motor is flanged to the rear of the flywheel housing on the right-hand side.

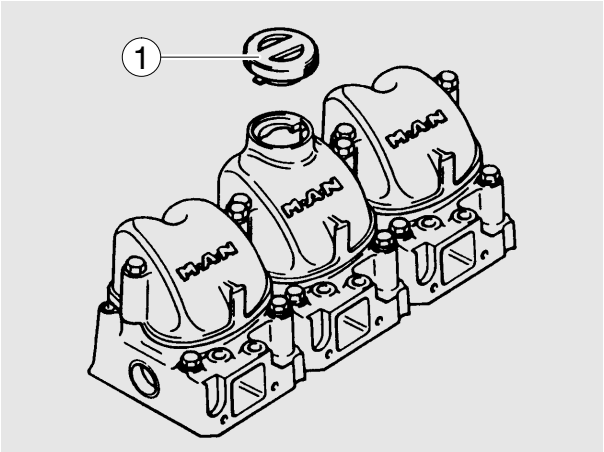
As part of every engine overhaul, the starter pinion and ring gear should be cleaned with a brush dipped in fuel and then a coat of grease should be applied again.

Always protect starter motor against moisture.

Warning:
Always disconnect the battery earth cable before starting work on the electrical system. Connect up the earth cable last, as there is otherwise a risk of short-circuits.

Preparations

At the time of initial commissioning of a new or overhauled engine make sure to have observed the “Technical Information for the installation of MAN Diesel engines”.



1 Oil filler neck on valve cover

Before daily starting the engine, check fuel level, coolant level and engine oil level and replenish, if necessary.

The notches in the dipstick indicate the highest and lowest permissible oil levels.

Marking the dipstick

As a rule oil dipsticks of marine propulsion engines are not marked by the manufacturer since the final installed position is unknown. Therefore, they should be marked after engine installation.

Proceed as follows:

- Fill with minimum oil quantity recommended for the respective engine type. After this initial filling wait about 1/2 hour until the entire oil has collected in the oil sump
- Pull out dipstick and mark minimum oil level visible on dipstick
- Thereafter fill up to maximum oil sump capacity, wait about 1/2 hour and mark maximum oil level visible on dipstick
- After refilling with oil, rotate the engine with the starter and move the shut-down lever to “stop” at the same time until the oil pressure warning light goes out and the oil pressure gauge shows a pressure. Then start the engine and allow it to run at medium speed for a few minutes. Check oil pressure and tightness of system. Then shut down the engine. After about 20 minutes, check the oil level. The oil level should now be at the upper notch of the dipstick, but not higher.
  Add any necessary oil to the upper dipstick mark.

Caution:
Do not add so much engine oil that the oil level rises above the max. marking on the dipstick. Overfilling will result in damage to the engine.

The oil required in the sump is specified in the “Technical Data” at the end of these Instructions.

Note:
The oil required to fill the oil filters and pipes depends upon the engine equipment and use and must be determined individually at the time of initial commissioning (Make a note of the determined quantity).

Ensure outmost cleanliness when handling fuels, lubricants and coolants.

Use only approved fuels, lubricants etc. (see brochure “Fuels, lubricants etc.”). Otherwise the manufacturer’s warranty will become null and void.

Raw water pump

Do not let raw water pump run dry.
Make sure that all valves / cocks in the raw water circuit are open.
If there is a risk of frost, drain the raw water pump.

Starting

Insert key in starting lock.

Press starter button, moving control lever against stop “maximum engine speed”.

Do not operate starter for longer than 10 seconds at a time.

After ignition of the engine, release the starter button and adjust control lever for desired speed.

If engine fails to start, release the key, wait about 30 seconds, then operate starter again.

Avoid running the cold engine for any length of time since in any internal combustion engine this is liable to cause increased wear due to corrosion. Prolonged idling is harmful to the environment.

Note:
On initial start of an overhauled engine or after long periods without use, press shut-down lever in “stop” position and operate starter motor for a few seconds (max. 10) until oil pressure is indicated. Only then the engine should be started in the normal way.

Running in

It is recommended that new or overhauled engines should not be operated at a load higher than about 75% maximum load during the first few hours of operation. Initial run-in should be at varying speeds. After this initial run-in, the engine should be brought up to full output gradually.

During operation

Do not overload the engine. Do not exceed the maximum permissible engine tilt. If faults occur, find their cause immediately and have them eliminated in order to prevent more serious damage!

During operation the oil pressure in the engine lubrication system must be monitored. If the monitoring devices register a drop in the lube oil pressure, switch off the engine immediately.

The coolant temperature should be approx. 80 to 85°C.

The charge warning light of the alternator should go out when the engine is running.

Alternator

In order to avoid damage to the alternator, observe the following instructions:

While the engine is running

- Do not de-energize the main battery switch!
- Do not disconnect the battery or pole terminals or the cables!
- If, durig operation, the battery charge lamp suddenly lights up, stop the engine immediately and remedy the fault in the electrical system!
- Do not run the engine unless the battery charge control is in satisfactory order!
- Do not short-circuit the connections of the alternator with those of the regulator or said connections with ground, not even by briefly bringing the connections into contact!
- Do not operate the alternator without battery connection!

Shutting down

Disengage the gearbox clutch and move the shut-down lever to “stop”. After the engine has been running at a high load level, do not shut it down immediately but allow it to idle about 5 minutes so that temperatures may equalize.

Remove key from starting lock.

Caution:
Ensure that the engine can not be started by unauthorized persons.

Temporary decommissioning of engines

Temporary anti-corrosion protection according to MAN works norm M 3069 is required for engines which are to be put out of service for fairly long periods.

The works standard can be obtained from our After-Sales Service department in Nuremberg.

Engine lubrication

Oil level

Check the oil level in the engine sump daily with a dipstick. The level should be between the two notches cut into the dipstick and should never be allowed to drop below the lower notch.

Caution:
Do not add so much engine oil that the oil level rises above the max. marking on the dipstick. Overfilling will result in damage to the engine.

The oil level should be checked with the engine horizontal and only after it has been shut down for about 20 minutes.

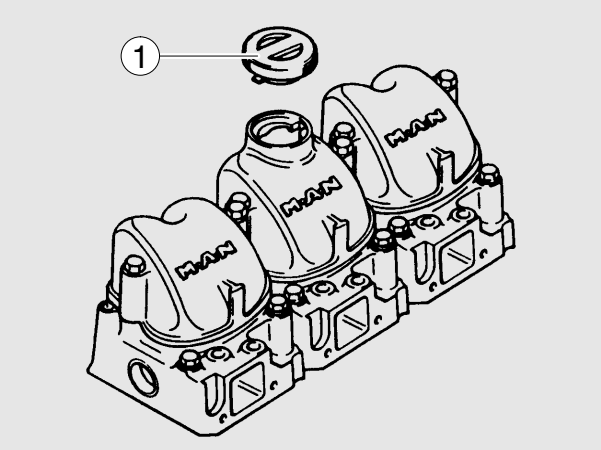
Oil drainage

With the engine at operating temperature, remove the oil drain plugs on the oil sump and the oil filter bowl and allow the old oil to drain off completely. Use a vessel of sufficient size to ensure that the oil does not overflow. Refit the oil drain plugs with new gaskets.

Caution:
The oil is hot- risk of scalding. Do not touch the oil drain plug with bare fingers. Oil is an environmental hazard. Handle it with care!

Refilling with oil

Refill with fresh engine oil at the oil filler neck.



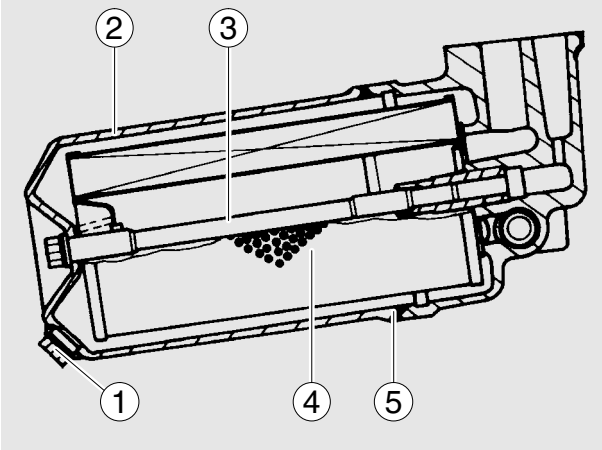
1 Oil filler neck on valve cover

After refilling with oil, rotate the engine with the starter and move the shut-down lever to “stop” at the same time until the oil pressure warning light goes out and the oil pressure gauge shows a pressure. Then start the engine and allow it to run at medium speed for a few minutes. Check oil pressure and tightness of system. Then shut down the engine. After about 20 minutes, check the oil level. The oil level should now be at the upper notch of the dipstick, but not higher.
Add any necessary oil to the upper dipstick mark.

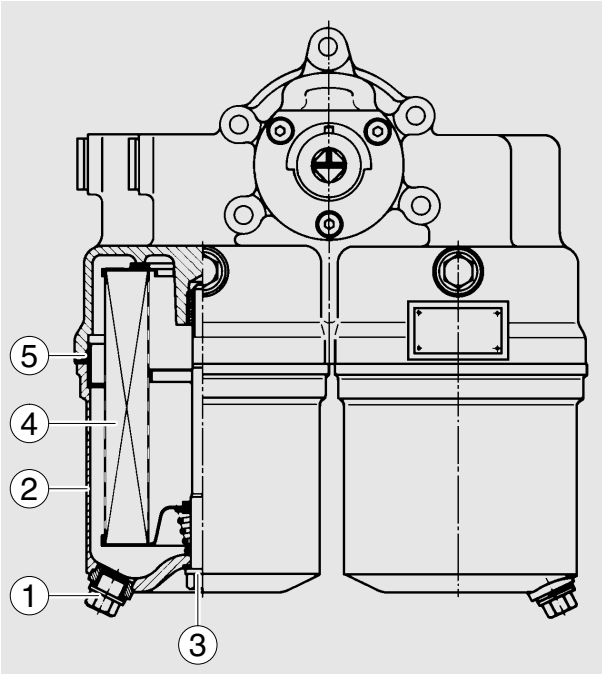
Note:
Refer to maintenance chart for compulsory oil change intervals and oil quality for D 2866 TE engines having higher ratings.

Lubricating oil filter

Cleaning of the lubricating oil is effected in a full-flow oil filter with paper cartridges. A bypass valve ensures continuity of oil supply if the filter elements should be clogged.
After draining off the oil, release tie screw. Remove filter bowl. Renew filter cartridge. Thoroughly clean all other parts in cleaning fluid. Use new gaskets for re-assembly



1 Oil drain plug
2 Oil filter bowl
3 Tie screw
4 Filter cartridge
5 Gasket



1 Oil drain plug
2 Oil filter bowl
3 Tie screw
4 Filter cartridge
5 Gasket

A changeover-type oil filter, the filter elements of which can be replaced even during operation, can be fitted on request. During continuous operation position the selector lever that both filter halves are in operation.

Observe positions of selector lever!

Continuous operation (both filter halves in operation)

Right-hand filter cut out

Left-hand filter cut out

Caution:
Do not leave selector lever in any intermediate position because this would be liable to interfere with oil supply.

Renewal of filter cartridges

- Allow the filter content to run off along drain plugs. Hold a suitable vessel under hole
  Caution:
  Oil is hot and under pressure!
- After releasing the clamping bolts remove filter bowls
- Renew filter cartridges. Thoroughly clean all other parts in cleaning fluid (do not allow cleaning fluid to enter the oil circuit)
- Use new gaskets for reassembly of filter bowls
  Note:
  To prevent the seal from twisting hold the filter bowl firmly when tightening the tensioning screw

Every time an oil change is made, the two oil filter cartridges should be renewed!

Caution:
Used oil filters are classed as dangerous waste and must be disposed of accordingly.

Fuel system

Fuel

If Diesel fuel which contains moisture is used the injection system and the cylinder liners / pistons will be damaged. This can be prevented to same extent by filling the tank as soon as the engine is switched off while the fuel tank is still warm (formation of condensation is prevented). Drain moisture from storage tanks regularly. Installation of a water trap upstream of the fuel filter is also advisable. Do not use any additives to improve flow properties in winter.

Injection pump

No alterations must be made to the injection pump. If the lead seal is damaged the warranty on the engine will become null and avoid.

Faults

We urgently recommend that you have faults in the injection pump rectified only in an authorised specialist workshop.

Bleeding the fuel system

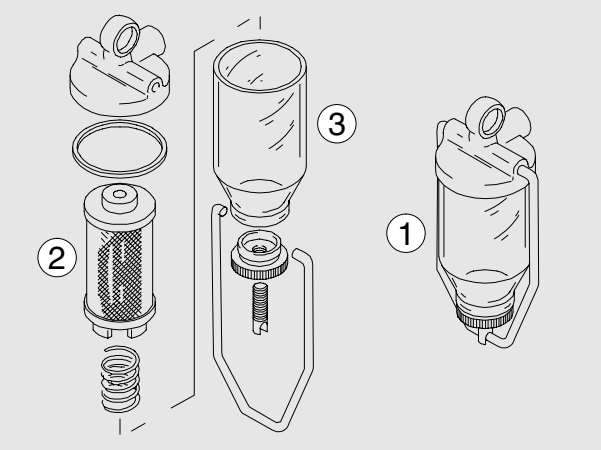
Bleeding the fuel filters is by releasing the bleed screws and operating the manual primer (fit new seals).

The suction chamber of the injection pump is continuously bled via the relief valve during operation. If the suction chamber is completely empty, e.g., when fitting a new pump, filling and bleeding it is by actuating the manual primer.

Fuel lift pump

The fuel lift pump is operated by the injection pump camshaft via the roller tappet.

Strainer



1 Fuel strainer
2 Filtering screen
3 Filter housing

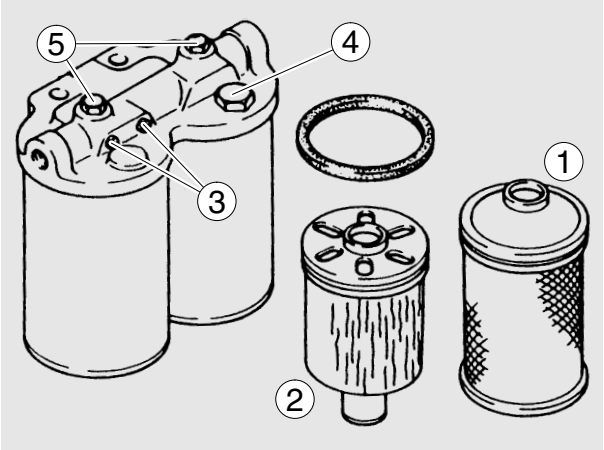
After every 200 hours of operation the fuel strainer connected upstream of the fuel lift pump should be cleaned.

Fuel filter

After every 1000 hours of operation – or earlier if loss of engine power indicates clogging – the filter elements should be renewed.

Two-stage fuel filter
(replaced by parallel fuel filter)

In two filter housings connected in series the fuel first passes through a felt tube element and then through a paper element.



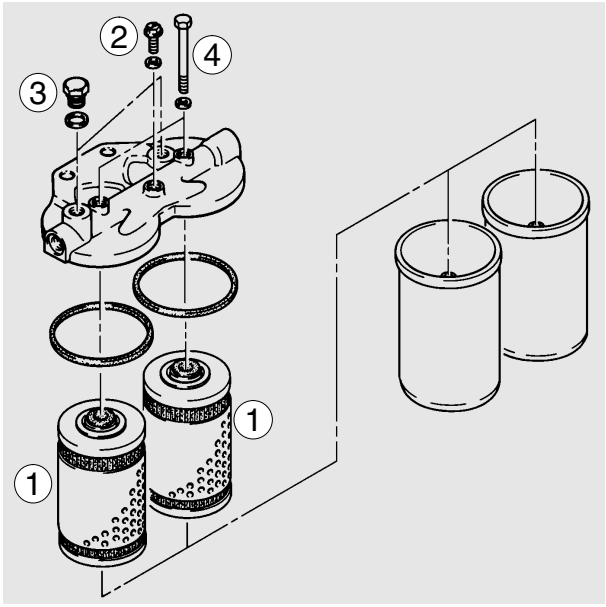
1 Felt tube element (primary filter)
2 Paper element (secondary filter)
3 Vent plugs
4 Filler plug
5 Clamping screws

Replacement of filter elements

- Remove clamping bolts
- Take off filter bowls
- Take out filter elements
- Wash out filter bowls
- Install new filter cartridges
- Refit filter bowls using new gaskets
- Open vent plug for primary filter (felt tube element). Fit new seals
- Operate manual fuel lift pump until fuel is emitted without any bubbles
- Close vent plug on primary filter
- Bleed secondary filter in the same manner

Parallel fuel filter with filter cartridges
(replaced by parallel filter with interchangeable filter)

The fuel passes through two filter elements connected in parallel.



1 Filter elements
2 Vent plugs
3 Filler plug
4 Clamping screws

Replacement of filter elements

- Remove clamping bolts
- Take off filter bowls
- Take out filter elements
- Wash out filter bowls
- Install new filter cartridges
- Refit filter bowls using new gaskets
- Open vent plug (fit new seals)
- Operate manual fuel lift pump until fuel is emitted without any bubbles
- Close vent plug