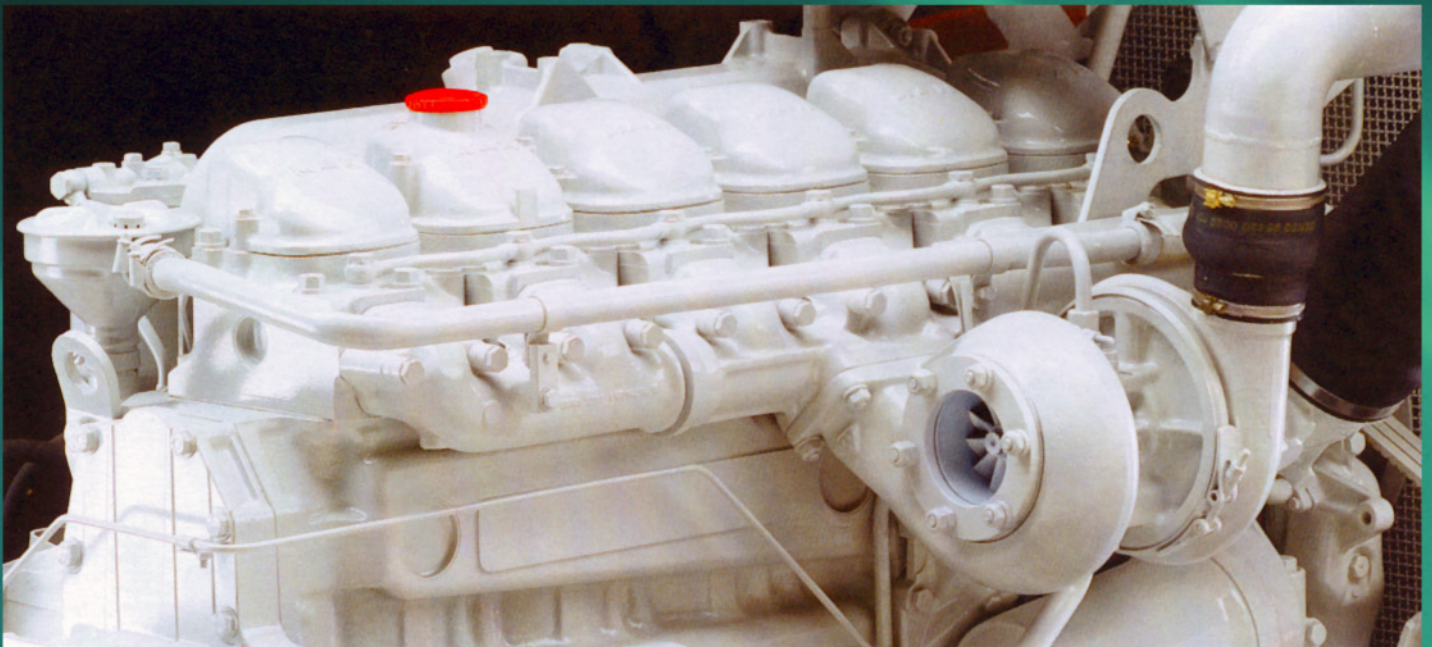


Repair manual



MAN-Industrial Diesel Engines

D 2866 LE 2..



This Repair Manual is designed to facilitate proper repair of the engines listed here.

The pictures and associated descriptions show typical work that may not always be applicable to the engine in hand, which nevertheless does not mean that they are not correct. In such cases, the repair work is to be planned and carried out in a similar way.

It is compulsory that the engine be removed before performing any of the work described in this Repair Manual.

The expert knowledge necessary for handling diesel engines was taken for granted when this publication was compiled.



Note:

Only use fuel, coolants and lubricants in accordance with MAN regulations, otherwise the manufacturer's warranty will not apply!

For basic information on the fuels see the publication "Fuels, Lubricants and Coolants for MAN Diesel Engines".

You can find the approved products on the Internet at:

–<http://www.man-mn.com/> → **Products & Solutions** → **E-Business**–

Any repair of components such as injection pump, alternator etc. ought to be left to our or the manufacturer's service department.

Best regards
MAN Nutzfahrzeuge Aktiengesellschaft
Nuremberg Plant

Since our products are in continuous development, we reserve the right to make technical modifications.

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Important instructions concerning technical safety and personal protection are, as shown below, especially highlighted.

**Danger:**

This refers to working and operating procedures which must be complied with in order to rule out the risk to persons.

**Caution:**

This refers to working and operating procedures which must be complied with in order to prevent damage to or destruction of material.

**Note:**

Explanatory descriptions which help in understanding the relevant work or operating procedure to be carried out.

Fitting flat seals / gaskets

Gaskets are frequently used with sealants or adhesives as an aid to assembly or to achieve a better seal. Above all when parts with different levels of thermal expansion (e.g. aluminium and cast iron) are bonded, this can mean that the gasket is shifted during operation by the so-called stitching or sewing machine effect and leaks occur.

Example: The cap of the front crankshaft seal. If a sealing agent or an adhesive is used here the flat seal will move inwards in the course of time as a result of the different expansion rates of the materials. Oil will be lost, for which the shaft seal may be thought to be responsible.

Perfect assembly of gaskets can only be achieved if the following instructions are adhered to:

- Use only genuine MAN seals / gaskets.
- The sealing faces must be undamaged and clean.
- Do not use any sealing agent or adhesive – as an aid to fitting the seals a little grease can be used if necessary so that the seal will stick to the part to be fitted.
- Tighten bolts evenly to the specified torque.

Assembly of round sealing rings

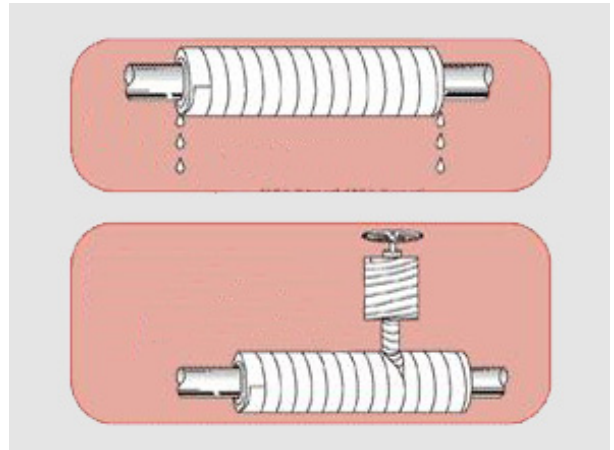
- Use only genuine MAN round sealing rings.
- The sealing faces must be undamaged and clean.
- Always wet round sealing rings with engine oil before fitting them.

Masking of fuel and lube oil pipe connections (for classified engines only)

The unions of pressurised oil and fuel pipes are masked with a protective tape. If this tape is removed during a repair, the unions must be masked with protective tape again afterwards.

The following pipes are affected:

- Oil supply pipe to turbochargers
- Fuel pipes between supply pump, filter and injection pump
- Injection pipes protected against leaks



1

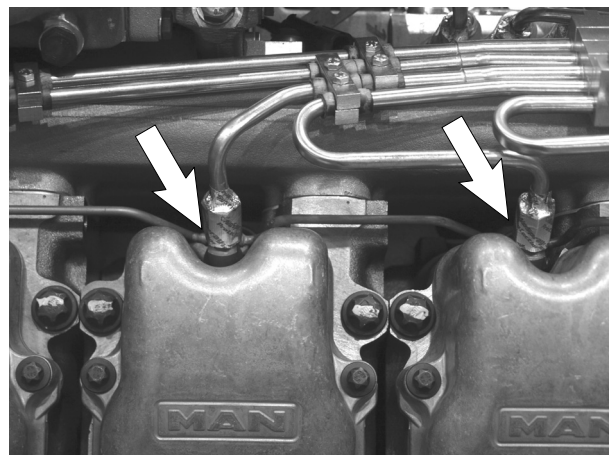
Fig. 1

A protective tape is wound around the unions. Ensure that there is 50 % overlap on every pass.

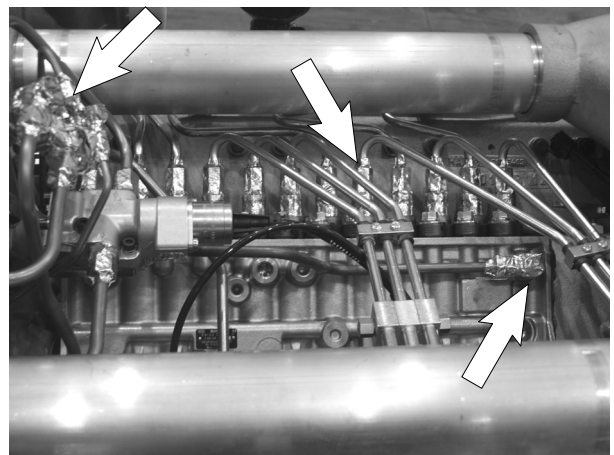
Figs. 2-4

The unions to be masked must be clean and free of oil and grease.

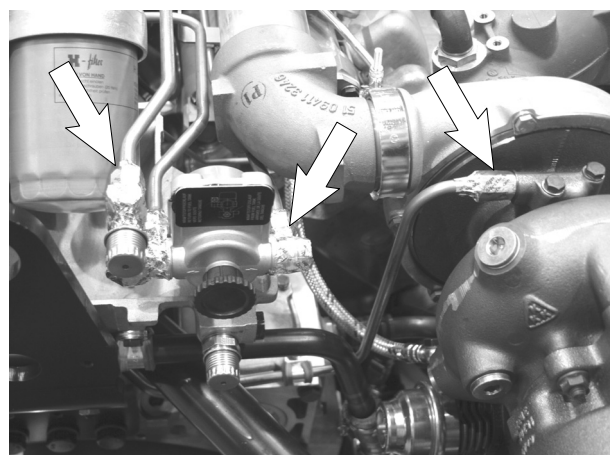
Do not apply the protective tape unless this is the case



2



3



4



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General information

This brief overview summarises important instructions and is structured into areas of main concern in order to impart the knowledge necessary to prevent accidents involving injury to persons, damage to the engine or other property and harm to the environment. Additional notes are included in the operator's manual for the engine.

Important: If despite all safety precautions an accident occurs as a result of contact with caustic acids, penetration of fuel into the skin, scalding with hot oil, anti-freeze splashes into the eyes etc, **consult a doctor immediately!**

1. Instructions for preventing accidents with injury to persons

Checks, setting jobs and repair work must be carried out by authorised skilled personnel only.

- When carrying out maintenance and repair work, ensure that the engine cannot be accidentally started from the bridge by unauthorised persons.
- The engine must be started and operated by authorised personnel only.
- When the engine is running, do not get too close to revolving components. Wear tight-fitting working clothes.
- Do not touch hot engine with bare hands: risk of burning yourself.
- Keep engine vicinity, ladder and steps free of oil and grease. Accidents resulting from slipping may have serious consequences.
- Work only with tools that are in good condition. Worn spanners slip: risk of injuries.
- Persons must not stand under an engine suspended from a crane hook. Keep lifting gear in good order.
- Open coolant circuit only after the engine has cooled down. If opening the coolant circuit while the engine is hot is unavoidable, observe the instructions in the chapter "Maintenance and care" in the Operator's Manual.
- Neither retighten nor open pressurised pipelines and hoses (lube oil circuit, coolant circuit and downstream hydraulic oil circuit if fitted): risk of injuries resulting from emerging fluids.
- When checking the injection nozzles, do not hold your hands in the fuel jet. Do not inhale fuel mist.



- When working on the electrical system, unplug earth cable from battery first and reconnect it last to avoid short-circuits.
- Observe the manufacturer's instructions for handling batteries.
Caution:
Battery acid is toxic and caustic. Battery gases are explosive.
- When carrying out welding work, observe the "Information sheets for welders".



2. Instructions for preventing damage to the engine and premature wear

- **Prior to repairing the engine, clean it thoroughly. Ensure that dirt, sand or foreign matter will not get into the engine during repair work.**
- In the event of operational faults immediately identify the cause and rectify to prevent more serious damage.
- Always use genuine MAN parts only. Installation of "equally" good parts from other suppliers may cause severe damage for which the workshop carrying out the work is responsible.
- Never operate the engine while it is dry, i.e. without lubricant or coolant.
Use a suitable label to mark engines not ready for operation.
- Only use operating materials (fuel, engine oil, antifreeze and anticorrosion agents) approved by MAN. Ensure that everything is kept clean. Diesel fuel must be free of water.
- **Do not fill up with engine oil above the max. notch on the dipstick. Do not exceed the engine's maximum permissible operating inclination.**
Non-compliance with these instructions may cause severe engine damage.
- Control and monitoring devices (charge check, oil pressure, coolant temperature) must work faultlessly.
- Observe the instructions for operating the alternator; see chapter "Commissioning and operation" in the Operator's Manual.

3. Instructions for preventing environmental damage

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

- Take old oil to an old oil disposal point only.
- Ensure without fail that oil and Diesel fuel will not get into the sewerage system or the ground.
Caution:
Danger of contaminating potable water!
- Treat filter elements and cartridges as special waste.

Coolant

- Treat undiluted anticorrosion and/or antifreeze agents as special waste.
- The regulations of the relevant local authorities are to be observed for the disposal of spent coolants.



4. Instructions for handling used engine oil *

Prolonged or repeated contact of any kind of engine oil with the skin causes the skin to degrease, which may result in dryness, irritation or inflammation. Old engine oil also contains hazardous substances which in animal experiments have caused skin cancer. Handling old engine oil does not pose any health hazard if the basic safety and hygiene related regulations are observed.

Health and safety regulations:

- Avoid prolonged, excessive or repeated contact of old engine oil with the skin.
- Use a suitable skin protection agent or wear protective gloves.
- Clean the skin that has been in contact with engine oil.
 - Wash yourself thoroughly with soap and water. A nailbrush is an effective aid.
 - Special hand cleaning agents facilitate cleaning soiled hands.
 - Do not use petrol, Diesel fuel, gas oil, fluxes or solvents as cleaning agents.
- After washing apply moisturising handcream to your skin.
- Change oil-soaked clothes and shoes.
- Do not put any oil-soaked cloths into pockets.

Pay meticulous attention to the proper disposal of old engine oil.

- **Old oil is a water hazard** –

Therefore, do not pour any old oil into the ground, the drains or the sewerage system. Any violation of this rule is punishable.

Collect and dispose of old engine oil properly. For information concerning collection points, contact seller, supplier or the local authorities.

- * Based on the "Merkblatt für den Umgang mit gebrauchtem Motorenöl"
(Notes on how to handle old engine oil).