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Maintenance Manual

MAN Industrial Gas Engines

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Maintenance Manual

MAN Industrial Gas Engines

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1.1 Information about this manual

This manual contains a maintenance schedule, important instructions on maintenance and the maintenance records.

Safe operation of the engine requires adherence to all safety instructions and operating guidelines.

Moreover, the local accident prevention regulations applicable and general provisions on safety for the application area of the engine must be followed.

Maintenance and care work performed in good time and conscientiously at the specifie maintenance intervals will ensure that the car remains roadworthy and operates safely and reliably.

The maintenance schedule provides information about the maintenance intervals and specifie the type of maintenance work to be done. Each maintenance must be acknowledged on the associated maintenance record given in the Appendix of this manual.

Use only original MAN spare parts and accessories or those that have been approved by MAN.

Only original replacement parts and accessories approved by MAN have been specially tested by MAN to ensure their reliability, safety and suitability for use in the engine.

1.2 Publications belonging to the manual

- Service products for MAN industrial gas engines
- Operator's Manual (engine)
- Maintenance record for MAN industrial gas engines

All publications are parts of the product and must be kept near the engine so that they can be reached by the personnel whenever required.

Read the manual carefully before starting any work! This particularly applies to the chapter “General Safety Instructions” and the respective safety instructions in the chapters.

Ignoring this manual and any instructions from suppliers which may be enclosed leads to warranty claims becoming null and void.

1.3 Supplementary publications

For the operator and the maintenance and service personnel

- Spare parts catalogue (included in the scope of supply)

For the service personnel

- Repair manual (engine)

1.4 Limitation on liability

All prevailing standards and regulations, the latest technological standards as well as our long years of know-how and experience have been taken into account when formulating the information and notices in these operating instructions.

MAN does not accept any liability for damage caused by:

- Failure to follow these instructions
- Use that is not in accordance with specification
- Use of untrained personnel
- Unauthorised alterations
- Technical changes
- Use of non-approved spare parts and service products

The actual scope of supply may differ from the explanations and descriptions given in this manual due to custom designs, additional order options requested, or recent technical changes.

The obligations given in the supply agreement and the general terms and conditions of MAN, and the statutory regulations valid at the time of concluding the contract shall be applicable.

1.5 Copyright

Treat the manual confidentially It is intended only for those working with the engine.

It is prohibited to pass on the operator's manual to third parties without the written consent of MAN.

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Tip for users

The information, text, drawings, pictures and other illustrations that it contains are protected by copyright and are subject to industrial property rights.

Any misuse is punishable by law.

1.6 Other applicable documents

Suppliers' components are installed in the engine. The respective suppliers of these components have carried out risk assessments for them.

The compatibility of the design with the European and national regulations applicable has been declared by the respective suppliers of the components.

1.7 Spare parts

Use only original MAN spare parts and accessories or spare parts and accessories that have been approved by MAN.

Only genuine spare parts approved by MAN have been specially tested and thus fulfi the requirements for the stipulated use of the engine.

Spare parts and accessories must be either original MAN parts or those that have been approved by MAN. The reliability, safety and suitability of these parts has been specifie especially for engines. We cannot assess this for other products despite ongoing market observation, and we cannot certify the same.

⚠ WARNING

Risk of injury caused by wrong spare parts

Wrong or defective spare parts impair the safety and lead to damage, malfunction or total failure.

Therefore:

- Only use genuine spare parts from MAN.

Tip for users

For all notification and enquiries, please specify the engine type, engine number and order number.

Order spare parts from the authorised dealer or directly from MAN.

1.8 Disposal

Arrange for disposal in accordance with national regulations.

If no agreements have been made for return or disposal, have the dismantled components recycled:

- Sort metallic parts and scrap them
- Place plastic elements in recycling
- Dispose of remaining components after sorting according to material properties

1.9 Warranty provisions

The obligations given in the supply agreement and the general terms and conditions of MAN, and the statutory regulations valid at the time of concluding the contract shall be applicable.

Ignoring this manual and any operator’s manuals from suppliers which may be enclosed leads to warranty claims becoming null and void.

If you use parts that are not approved, warranty claims shall become null and void.

We recommend that you use original parts even after the expiry of the warranty period in order to ensure consistent performance of the engine.

1.10 Customer service

MAN customer service is at your disposal for technical information.

Tip for users

For all notification and enquiries, please specify the engine type, engine number and order number.

Information on the contact persons in charge can be retrieved whenever required via telephone, fax, e-mail or via the Internet. See "Imprint."

1.11 Explanation of Symbols

Warnings

Warnings in this operator's manual are identifie by symbols. The instructions are introduced by signal words which convey the extent of the hazard.

Follow the instructions to the letter and proceed cautiously to prevent accidents, personal injury and material damage.

⚠ DANGER

Describes an immediate dangerous situation that will lead to severe injuries or death if it is not avoided.

Therefore:

•

⚠ WARNING

Describes a potentially dangerous situation that may lead to severe injuries or death if it is not avoided.

Therefore:

•

⚠ CAUTION

Describes a potentially dangerous situation that may lead to minor or moderate injuries if it is not avoided.

Therefore:

•

NOTE

Describes a potentially dangerous situation that may lead to damage to property if it is not avoided.

Therefore:

•

Tips and Recommendations

Useful Tip

Tips, recommendations and information for efficient trouble-free operation.

ENVIRONMENTAL NOTE

Tips on conduct for environmental protection.

General information

- This sign indicates a list in the firs level.

►This sign indicates an action/sequence of actions.

1 This sign indicates the position of an image in the text.

[1] This sign indicates the position of a special tool in the text.

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2.1 Introduction

Tip for users

The information in this document is subject to changes in accordance with revisions and improvements made to the engines.

This chapter provides information about the residual risks and dangers associated with proper and intended use of the engine.

It contains a list of general safety instructions and those which must be observed to ensure optimal protection of personnel, and safe and fault-free operation of the engine.

Detailed handling or situation-related safety instructions can be found before the corresponding instruction or in the described chapter.

Disregarding the operating guidelines and safety instructions listed in this manual may cause considerable risk.

MAN cannot predict every possible circumstance which may cause a potential hazard. The warnings in this publication do not cover every possible scenario. If a tool, a procedure, a working method, or an operating technique which is not explicitly recommended by MAN is used, you must ensure that it is safe for you and others. You must also ensure that the product does not become damaged. You must also ensure that the safety of the product is not impaired by the procedure employed.

2.2 Intended use

⚠ DANGER

Risk of engine damage due to do improper use

Termination of operating permit.

Therefore:

- Use the engine only for its approved application.
- Use the engine only outside potentially explosive zones.
- Use the engine only with overspeed protection.

The engine is constructed exclusively to drive generators and to couple heat exchangers within the limits of the technical data.

MAN does not assume any liability for damage caused by improper installation. The risk lies exclusively with the operating company. Intended use also includes compliance with the country-specific local environmental regulations.

This in particular concerns the compliance with the applicable legal exhaust emission limits.

Furthermore, the engine operating parameters according to the technical data sheets currently in effect must also be adhered to.

The mixture generating and control system, as well as – if needed – the exhaust gas aftertreatment system must be designed by the manufacturer of the complete machine to meet these criteria.

Intended use also includes compliance with the operating, maintenance and repair work specifie by the manufacturer.

The engine must only be used, maintained and repaired by personnel who are acquainted with it and have been instructed about any potential dangers.

The manufacturer does not assume any liability for damage to property or personal injury resulting from unauthorised modification to the engine.

Similarly, manipulation of the mixture generating and control system may also affect the performance and exhaust gas behaviour of the engine.

This means that compliance with the statutory environmental requirements is no longer assured.

2.3 Content of the manual

Content of the manual

All persons contracted to work on or with the engine must read and understand this manual before starting any work on the engine. This is also applicable if the concerned person has already worked with such an engine or a similar one or has been trained by MAN.

Knowledge of this manual is mandatory.

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2.4 Responsibility of the operator

Responsibility of the operator

The operator of the engine is subject to the statutory obligations in relation to occupational health and safety.

Apart from the instructions on occupational health and safety in this manual, the applicable safety, accident prevention and environmental regulations must be adhered to in the application area of the engine.

The following applies in particular:

- The operator must be aware of the applicable occupational health ad safety provisions and must carry out a risk assessment to determine any additional dangers that may arise based on the special working conditions at the location in which the engine is being used. The operating company must implement these in the form of operational instructions for operating the engine.
- Operators must ensure throughout the entire operating time of the engine that the operating instructions established by them comply with the current status of the relevant regulations and adapt them if necessary.
- The operator must clearly regulate and specify the responsibilities for installation, operation, maintenance and cleaning.
- The operator must ensure that all employees who work on the engine have read and understood this manual.

  The operator must also train the personnel at regular intervals and inform them about the risks involved.
- The operator must provide its staff with the required personal safety equipment.
- The operator must impose access restrictions for the operation room.
- The operator must ensure that the operation room is ventilated.
- This manual must be kept near the engine and must be accessible to those working on the engine at all times.

The operator is responsible for ensuring that the engine is always operated in technically sound and operationally safe condition.

Hence, the following is applicable:

- Carry out maintenance work as they are described in the Maintenance Instructions, completely and at the specifie intervals, or have it carried out by an MAN service workshop / MAN authorised partner.
- The operator must arrange for all safety devices to be checked for functionality and completeness at regular intervals.
- The information in this manual must be followed completely and without exceptions!

2.5 Engine modifications and conversions

To avoid dangers and to safeguard optimal performance, neither modification nor attachments or conversions which have not been expressly approved by MAN should be made on the engine or the exhaust gas aftertreatment system.

If modification are undertaken without the written consent of MAN, any obligation of guarantee or warranty on the part of MAN for damage and defects that are attributable to the unauthorised modificatio becomes null and void. Moreover, MAN does not assume any liability for damage that are caused by modification that have not been approved.

2.6 Personnel requirements

Qualifications

⚠ WARNING

Risk of accidents caused by untrained personnel

Not complying with safety regulations leads to personal injury.

Therefore:

- Carry out all work steps in accordance with the information in this manual.
- Allow the engine to be serviced and repaired solely by trained personnel.
- Make sure that the engine cannot be started by unauthorised persons.
- Regular participation in product- and user training.
- Comply with the safety and accident prevention regulations.
- Ensure orderliness and cleanliness in the working area.

In this operating manual, the following levels of qualificatio are indicated for the various levels of activities:

- A **trained person**

  has been briefed about their assigned duties and informed about potential hazards in the event of improper conduct.

- **Qualified personnel**

  , based on their vocational training, knowledge and experience, and their knowledge of the relevant provisions, are capable of undertaking the tasks assigned to them.

- A **qualified electrician**

  is someone who, based on their technical education, knowledge and experience, and knowledge of the relevant standards and provisions, is in a position to carry out work on electrical systems and to identify potential hazards independently and to avoid them.

  The electrician is trained for the special place of use in which he is engaged and knows the relevant standards and provisions.

Only those persons who can be expected to carry out their work reliably are approved as personnel. Persons whose reflexe are affected, e.g. by drugs, alcohol or medicines, are not approved.

►When choosing the personnel, observe and follow the regulations concerning age and profession applicable at the location where the engine is being used.

Tip for users

MAN Truck & Bus regularly provides product and application training. These training sessions can provide the necessary expertise.

↗ http://www.engines.man.eu/global/de/ueber-man-engines/man-engine-academy/Themen.html

Unauthorised persons

⚠ WARNING

Risk of injury to unauthorised persons

Therefore:

- Keep unauthorised persons away from the working area.
- In case of doubt, talk to the persons and instruct them to leave the working area.
- Halt any work, whilst there are unauthorised persons within the working area.

Instruction

Staff must undergo regular training. Training must be logged to keep better track.

2.7 Personal protective equipment

When carrying out the work, personal protective equipment must be worn in order to keep dangers to health to a minimum.

- Always wear the personal protective equipment required for the kind of work being carried out.
- Comply with the instructions displayed in the working area relating to wearing personal protective equipment.

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Industrial protective clothing

is tight-fittin work clothing with low tear strength, with tight-fittin sleeves and without protruding parts. It is used primarily to protect against injuries, climatic influence and dirt or contamination.

Do not wear any rings, necklaces or other jewellery while working.

Hard hat

For protection against falling or flyin parts.

Safety shoes

To protect against heavy falling parts and to prevent skidding on slippery surfaces.

Safety gloves

To protect the hands from friction, abrasion, pricking, deep wounds, and to prevent contact with hot or corrosive parts or liquids.

Wearing for special work

Special protective equipment is required for special work. Various chapters of this manual refer to special work.

Safety goggles

To protect the eyes from parts flyin around and liquid sprays.

Ear protection

To protect against hearing loss caused by noise.

2.8 Special hazards

Special hazards

Electrical current

⚠ DANGER

Danger to life from electrical voltage

Therefore:

- In the event of damage to the insulation, switch off the power supply immediately and have repairs carried out.
- Have work on the electrical equipment carried out by qualifie electricians only.
- When carrying out any work on the electrical system, switch off the power supply and check that the system is de-energised.
- Shut down the power supply and secure it from being switched on again before completing maintenance, cleaning or repair work.
- Do not bypass or disable any fuses. Use fuses of the correct ampere rating when replacing fuses.
- Keep moisture away from live parts. This may cause short-circuits.

⚠ DANGER

Danger to life from electrical power

Touching the ignition system during operation is life-threatening.

Therefore:

- Do not touch the ignition coils and caps
- Do not touch the cables for the high-voltage and low-voltage circuits.
- Do not touch the plug for the output and input cable.

Inspection and maintenance works

Tip for users

For measuring and testing activities, entering the engine compartment while the engine is running may be permitted as an exception. If necessary, the manufacturer of the complete machine (OEM) must determine under which circumstances entering the engine compartment may be permitted while the engine is running.

⚠ WARNING

Risk of injury from moving components

Rotating parts and/or parts that perform linear movements can cause serious injuries.

Therefore:

- During operation, do not reach into moving components or put your hands in moving components.
- Do not open covers during operation.
- If possible, carry out testing and maintenance work when the engine is at standstill.
- Observe the delay time: Before opening the covers ensure that the parts are no longer moving.
- Wear tight-fittin work clothing in the hazard zone.

⚠ DANGER

Risk of fatal injury caused by engines or engine units

Therefore:

- Wear personal protective equipment.
- Comply with the safety and accident prevention regulations.
- Restrict your stay in the operation room to the absolute minimum time required.
- Position movable guards around engines that are running.
- Only enter the operating room when the engines are running at the lowest possible speed or load.
- Maintenance, service, testing and measuring activities must only be carried out by authorised persons.
- Activities in the immediate hazard zone on the left and right side of the engine must be reduced to an absolute minimum.
- If necessary, the manufacturer of the complete machine (OEM) must prepare work instructions for the measuring and testing activities required as part of the scheduled maintenance according to the maintenance record.

Exhaust gases

⚠ CAUTION

Risk to health from leaking exhaust system

Therefore:

- Shut down engines with leaking exhaust systems immediately.
- Repair the leaking exhaust system.
- Make sure that there is sufficien ventilation.

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Easily inflammable materials - gaseous fuels, oils and greases

⚠ WARNING

Risk of fire from gaseous fuels

Therefore:
- Smoking and handling naked flame are prohibited.
- Comply with the guidelines applicable to gas installations.
- Leaks in the gas supply system create an explosion hazard and must be repaired immediately.

⚠ DANGER

Risk of death from highly inflammable substances

Risk of fir from highly inflammabl substances, liquids and gases.

Therefore:
- Smoking is prohibited in the danger zone.
- Use of open flame or ignition sources in the danger zone is prohibited.
- Keep a fir extinguisher available.
- Immediately report suspicious substances, liquids or gases to the person responsible.
- Stop work immediately in the event of fire Leave the hazard zone until the all-clear is given.

What to do in the event of a gas leak

- Close the stopcock on the gas supply.
- Switch off the main switch for the electrical system.
- Block off risk area.
- Notify the competent bodies immediately and begin repairs.
- Remove any uninvolved persons from the danger zone.

What to do in the event of a fire

- Alert the fir service.
- Provide immediate assistance to anyone in danger, and notify a doctor where appropriate.
- In a pure gas fire do not extinguish the escaping gas flame but instead cool the burning object. (Burning gas is controlled gas)
- Prevent the flame from spreading to the surrounding area.
- If the flame spread to the surrounding area, figh this fir with fir extinguishers.
- Remain calm.

Coolants - antifreeze and anti-corrosion agents

⚠ CAUTION

Risk of injury from service products that are harmful to health

Therefore:
- Wear personal protective equipment.
- If necessary, additionally wear ear protection, protective mask, safety goggles and chemical-resistant protective gloves.
- Avoid contact with eyes and skin.
- Do not eat, drink or smoke at the work place.
- Wash hands thoroughly after work.
- Remove contaminated clothing immediately.
- Avoid spilling any service products.
- Comply with occupational health and safety regulations.
- Please observe the safety data sheets.
- Follow the accident prevention regulations.

Hot service products

⚠ CAUTION

Risk of scalding by hot service products

Therefore:
- Allow service products to cool down.
- Wear personal protective equipment.
- If necessary, additionally wear ear protection, protective mask, safety goggles and chemical-resistant protective gloves.
- In the event of injury, consult a medical practitioner without delay.
- Please observe the safety data sheets.
- Follow the accident prevention regulations.
- Comply with occupational health and safety regulations.

Hot surfaces

⚠ CAUTION

Risk of burn injuries caused by hot surfaces

Components can reach high temperatures during operation and cause scalding if they come into contact with the skin.

Therefore:
- Wear personal protective equipment and wear protective gloves.
- Allow components to cool down to ambient temperature.
- Ensure that protective devices are attached correctly.
- Never remove safety devices from hot components.
- Follow the accident prevention regulations.
- Comply with occupational health and safety regulations.

Noise

⚠ WARNING

Risk of injury caused by noise

Therefore:
- Always wear ear protection when working.
- Comply with occupational health and safety regulations.
- Only stay in the danger zone if necessary.

Sharp edges, pointed corners, dirt or objects lying around

⚠ CAUTION

Risk of injury due to non-compliance with accident prevention regulations

Therefore:
- Follow the accident prevention regulations.
- Comply with occupational health and safety regulations.

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Strong magnetic fields

⚠ DANGER

Risk of fatal injury due to strong magnetic fields

Therefore:
- Persons fitte with pacemakers should not remain in the vicinity of the engine.
- Persons with metallic implants should not remain in the vicinity of the engine.
- Keep ferromagnetic materials and electromagnets away from the magnetic source (minimum distance 3 m).
- Put metallic objects (jewellery, watches, writing instruments, etc.) away before carrying out maintenance work.
- Do not bring any electronic devices near the magnetic source.
- Do not place any storage media, credit cards, etc. near the magnetic source.

2.9 Safety equipment

⚠ WARNING

Risk of death from non-functional safety equipment and devices

Therefore:
- Before starting work, check whether all safety equipment and devices are working and have been installed correctly.
- Before starting the engine, check whether all safety equipment and devices are working and have been installed correctly.

2.10 Conduct in the event of hazards and accidents

Preventive measures

- Always be prepared for accidents and fire
- Keep firs aid equipment (firs aid kit, blankets, etc.) and fir extinguishers close to hand.
- Check the firs aid equipment and fir extinguishers regularly for completeness and functionality.
- Ensure that staff are familiar with the accident reporting process, firs aid and rescue facilities.
- Conduct regular safety training.
- Keep access routes clear for emergency vehicles.

In case of an accident: act correctly

- Remain calm.
- Shut down the engine immediately with the emergency stop button.
- Initiate firs aid measures
- Alert the rescue service and/or fir brigade.
- Rescue persons from the hazard zone.
- Clear access routes for emergency vehicles.
- Inform those in charge.

⚠ CAUTION

Risk of injury

Health hazards caused by accidents.

Therefore:
- consult a doctor immediately in case of:
- Contact with corrosive acid.
- Fuel penetrating the skin.
- Scalding by hot oil or coolant.
- Antifreeze splashing in eyes.

2.11 Signage

The following symbols should be placed in and around the hazard zone.

⚠ WARNING

Risk of injury due to poor signage

Therefore:

- Always keep all safety and warning instructions legible.
- Clean or replace safety, warning and operating notices or instructions.

Do Not Enter

Areas marked in this way should not be entered.

Electrical voltage

Only qualifie electricians may work in the designated work space.

Unauthorised persons should not enter areas marked in this manner.

Hot surfaces

Hot surfaces, such as engines and hot liquids, are not always obvious.

Do not touch them without safety gloves.

Danger to life from suspended loads

During hoisting operations, loads may sway outwards and fall down. This can cause serious injury or death.

Risk of injury

Ignoring the manual poses the risk of injury.

2.12 Environmental protection

ENVIRONMENTAL NOTE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

The following substances harmful to the environment are being used:

Lubricants

Lubricants such as greases and oils contains toxic substances and other substances that are harmful to the environment. They should not reach the environment. They must be disposed of by a specialist disposal company.

Coolant

Coolants may contain toxic and other substances harmful to the environment. They should not reach the environment. They must be disposed of by a specialist disposal company.

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3.1 Engine surroundings

The engine environment is becoming increasingly important for assessing the performance of maintenance work on a modern gas engine.

Especially for turbocharged engines with charge air cooling and a high power density, operational safety largely depends on the proper function of the machine components which have a significan impact on the operating conditions of the engine.

These are:

- Gas system
- Cooling system
- Combustion air system
- Exhaust system
- Exhaust gas aftertreatment

The proper maintenance of these components is just as important as the maintenance of the engine itself. Consequently, the engine must not be seen as an isolated component, but as an interacting part of the entire system. The function of these components and their effect on engine operation must therefore be tested when analysing operational malfunctions.

NOTE

Risk of engine damage due to improper maintenance

Therefore:
- Before carrying out maintenance work, read the maintenance instructions carefully.
- Carry out all maintenance work in accordance with the information in the corresponding documentation.
- Comply with service intervals.
- Include all peripheral components of the engine in the maintenance.
- Make sure that the engine cannot be started by unauthorised persons.
- Before starting work, ensure sufficien space for mounting.
- Ensure orderliness and cleanliness in the working area.

3.2 Maintenance on components of the complete machine

This manual can only provide a generic description of the maintenance work on machine components.

It can only serve to provide framework guidelines which are absolutely essential for operational safety of the engine.

These guidelines are listed in the chapter “Maintenance work”.

A detailed description of the maintenance work must be provided by the respective suppliers or by the system manufacturer.

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4.1 Maintenance record

Maintenance and care

NOTE

Risk of engine damage due to improper maintenance

Therefore:

- Before carrying out maintenance work, read the maintenance instructions carefully.
- Carry out all maintenance work in accordance with the information in the corresponding documentation.
- Comply with service intervals.
- Include all peripheral components of the engine in the maintenance.
- Make sure that the engine cannot be started by unauthorised persons.
- Before starting work, ensure sufficien space for mounting.
- Ensure orderliness and cleanliness in the working area.

Maintenance record

A maintenance record is available in addition to this maintenance manual.

Engine start-up, regular maintenance work, and any revisions must be entered in the maintenance record.

4.2 Repair manual

The repair manual contains a detailed description of all assembly and adjustment work on the engine. This work should only be carried out by specialists who have been trained in repair work.

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5.1.1 General safety instructions

Tip for users

Before starting the work, read and follow the general safety instructions and the safety instructions given in this chapter.

Follow the instructions to the letter and proceed cautiously to prevent accidents, personal injury and material damage.

Personal protective equipment

The following protective equipment must be worn:

- Industrial protective clothing
- Safety shoes
- Safety gloves

Safety instructions

Personnel

- Only trained specialists should carry out the maintenance work described in the Maintenance Instructions.

Basic rules

NOTE

Risk of engine damage due to improper maintenance

Therefore:
- Before carrying out maintenance work, read the maintenance instructions carefully.
- Carry out all maintenance work in accordance with the information in the corresponding documentation.
- Comply with service intervals.
- Include all peripheral components of the engine in the maintenance.
- Make sure that the engine cannot be started by unauthorised persons.
- Before starting work, ensure sufficien space for mounting.
- Ensure orderliness and cleanliness in the working area.

⚠ WARNING

Risk of injury from uncontrolled engine start

Therefore:
- Make sure that the engine cannot be started by unauthorised persons.
- Switch off the main battery switch.
- Remove the ignition key.

⚠ WARNING

Risk of injury caused by wrong spare parts

Wrong or defective spare parts impair the safety and lead to damage, malfunction or total failure.

Therefore:
- Only use MAN Genuine Spare Parts.

Maintenance work

Tip for users

Expiry of liability for defects due to non-approved service products

When using unapproved service products, the liability for defects becomes null and void.

- Use only approved service products (see the publication “Service products for MAN industrial and marine diesel engines”).

Tip for users

If spare parts are required for this product, MAN recommends using MAN spare parts or parts which meet the corresponding specifications e.g. concerning dimensions, type, strength, and material.

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ENVIRONMENTAL NOTICE

Risk of contaminating bodies of water and soil

Therefore:

- Collect service products using appropriate and sufficientl large containers.
- Submit used oil for used oil recycling.
- Undiluted antifreeze must be treated as hazardous waste.

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

Therefore:

- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

ENVIRONMENTAL NOTICE

Risk of environmental damage due to batteries

Therefore:

- Dispose of batteries appropriately.
- Observe the legislations regarding batteries.
- Observe national regulations.

5.2.1 Engine cleaning

NOTE

Risk of engine damage from the ingress of water

Reduced functionality due to improper cleaning.

Therefore:

- Do not use high-pressure cleaners.
- The maximum air pressure of 205 kPa (30 psi) must not be exceeded.
- The maximum water pressure of 275 kPa (40 psi) must not be exceeded.
- Minimum clearance of the jet nozzle must be at least 30 cm.

⚠ WARNING

Risk of injury from easily inflammable substances

Plant debris, leaves and other dirt on the surface of the engine will catch fire

Therefore:

- Clean the engine regularly with compressed air.

NOTE

Risk of component damage due to excessive pressures

Reduced functionality of exhaust gas aftertreatment system and engine.

Therefore:

- The maximum air pressure of 205 kPa (30 psi) must not be exceeded.
- The maximum water pressure of 275 kPa (40 psi) must not be exceeded.
- The water jet must not be aimed directly at seals, connecting pieces and electronic components.
- Use protective devices if necessary.

ENVIRONMENTAL NOTICE

Risk of environmental pollution due to waste water containing oil

- When cleaning the engine, drain waste water using an oil separator.

►Switch off the engine and allow to cool down for 15 minutes.

►Check the engine for leaks before the washing process and repair them immediately after cleaning.

Dirt tends to collect in areas where operating media are leaking out, which leads to the engine requiring repeated cleaning within a short time.

►Use a concentrated jet of tap water or a steam jet for cleaning. Do not use high-pressure cleaners.

►Rinse plant debris, leaves and other contamination off the crankcase using a jet of water. When doing so, keep a distance of at least 30 cm between the outlet opening of the jet nozzle and the engine

►Do not aim the water jet directly at shaft seals (behind the vibration damper), tension pulleys, external sealing joints and hose connections.

►In case of persistent dirt, use cleaning flui “Henkel P3-grato 12” (MAN item no.: 09.21002-0308). Mix cleaning flui at a ratio of 1:10 with water and spray the engine with the solution.

Then rinse the engine with tap water.

5.2.2 Checking the coolant concentration

Coolant concentration check

NOTE

Risk of component damage due to incorrect concentration of additive

Increased antifreeze content leads to a temperature increase in the coolant.

Therefore:

- Check the concentration by means of a sealing spindle or refractometer.
- Never allow the antifreeze concentration to fall below 40 % by volume.
- A concentration of more than 50 % by volume must be avoided.
- Always supplement coolant shortfalls with a mixture of water and min. 40-50 % by volume (- 37°) antifreeze.

The mixing ratio of the coolant concentration in the cooling system must be checked regularly.

For a description of the process and information on coolant concentration, see the publication “Service products for MAN industrial gas engines.”

Literature reference

For information on radiator frost protection, see the MAN service product database.
↗ https://ws-public.man-mn.com/portal/irj/asp

5.2.3 Checking the coolant hoses

Checking the coolant hoses

Especially at locations where coolant hoses build an elastic connection between engine and vehicle:

Inspection of the external condition of the coolant hoses as well as fir installation.

►Check all coolant hoses for:

- Leaks
- Firm seat of the hose clamps
- Contamination and oil pollution
- damage
- Porosity

►Replace leaking, aged or oily coolant hoses with hose clamps.

5.2.4 Checking the cooling system for leaks

Checking the cooling system for leaks

NOTE

Risk of engine damage due to lack of pressure in the cooling system

Therefore:
- Check the cooling system for leaks by pressurizing
- Replace leaking seals or defective working valves.

The cooling system is not included in the scope of supply from MAN.

5.2.5 Replacing the air filter

Replacing the air filter

NOTE

Risk of material damage due to dust on the clean-air side

Engine damage and reduced engine performance

Therefore:
- Open the air filte box only after the intake vacuum indicator has triggered.
- Do not use compressed air to clean the air filte box inside.
- Do not allow any dust to enter the clean-air side.
- Prior to replacing the security element, use a moist cloth to wipe out the air filte box inside.
- Do not operate the engine without main air filte cartridge.
- Replace the safety cartridge and the main air filte cartridge.
  Do not clean and do not reuse.
- Observe the manufacturer's instructions.

The air filte is not included in the scope of supply from MAN.

►Prior to replacing the air filte element, clean the air filte box inside.
►Prior to replacing the security element, use a moist cloth to wipe out the air filte box inside.

5.2.6 Checking and adjusting the ignition timing

Checking the ignition timing

Tip for users

Before starting the work, read and follow the general safety instructions and the safety instructions given in this chapter.

Follow the instructions to the letter and proceed cautiously to prevent accidents, personal injury and material damage.

Personal protective equipment

- Industrial protective clothing
- Hard hat
- Safety shoes
- Safety gloves
- Safety goggles
- Ear protection

Safety instructions

Personnel

- Checking and adjusting the ignition timing may only be carried out by authorised and trained specialists.

Safety instructions

⚠ DANGER

Risk of fatal injury caused by engines or engine units

Therefore:
- Wear personal protective equipment.
- Comply with the safety and accident prevention regulations.
- Restrict your stay in the operation room to the absolute minimum time required.
- Position movable guards around engines that are running.
- Only enter the operating room when the engines are running at the lowest possible speed or load.
- Maintenance, service, testing and measuring activities must only be carried out by authorised persons.
- Activities in the immediate hazard zone on the left and right side of the engine must be reduced to an absolute minimum.
- If necessary, the manufacturer of the complete machine (OEM) must prepare work instructions for the measuring and testing activities required as part of the scheduled maintenance according to the maintenance record.

⚠ DANGER

Risk of death from non-functional safety equipment and devices

Therefore:
- Before starting work, check whether all safety equipment and devices are working and have been installed correctly.
- Before starting the engine, check whether all safety equipment and devices are working and have been installed correctly.
- Never disable safety equipment during operation.

⚠ WARNING

Risk of injury from rotating engine parts

Therefore:
- Equip rotating parts with suitable contact protection.
- Never remove safety guards from rotating parts.

Adjusting or checking of ignition timing using a stroboscopic light can only be carried out while the engine is running.

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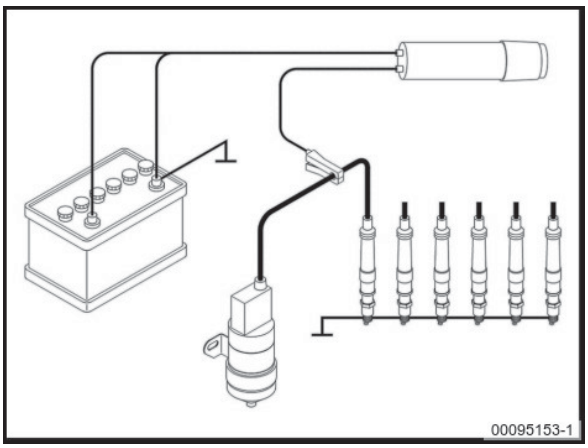
Connecting the stroboscopic light

►Connect the connection cable to the battery

Red clip to positive terminal

Black clip to negative terminal

►The inductive clamp sensor is clipped onto the ignition cable to the 1st cylinder (counter flywhee side)



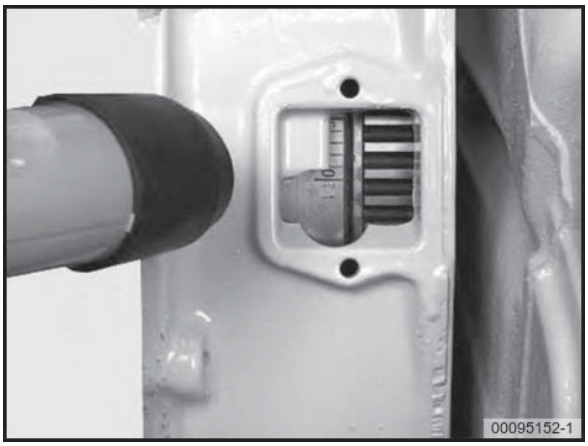
Checking the ignition timing

Before the firs cylinder reaches its top dead centre, a graduated scale will become visible on the flywhee or at the hub for vibration dampers on counter flywhee side, starting with 40° crank angle before TDC down to 0°. A reference edge on the flywhee housing or on the crankshaft end cover at the counter flywhee side serves as a counter mark.

Checking or adjusting the ignition timing is carried out while the engine is running using a stroboscopic lamp directed against the marks, lighting up at the moment of ignition.

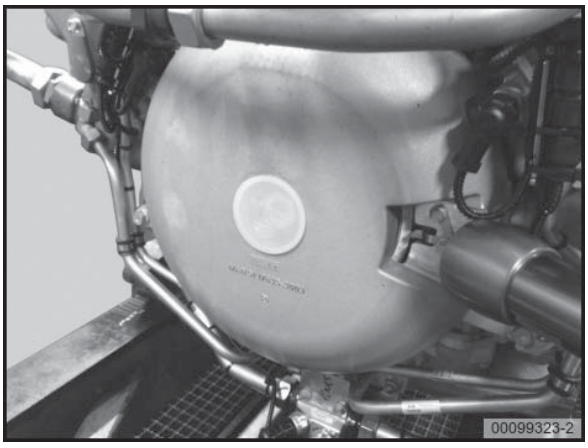
On the flywhee housing

►Connecting the stroboscopic light
►Removing the cover at the flywhee housing
►Starting the engine
►Operate the engine with the lowest possible speed or load
►Direct the stroboscopic light to the graduated scale on the flywhee and to the counter mark to check the ignition timing



Counter flywhee side

►Connecting the stroboscopic light
►Starting the engine
►Operate the engine with the lowest possible speed or load
►Direct the stroboscopic light to the graduated scale on the hub for vibration dampers and to the counter mark to check the ignition timing



The flas triggers with correct timing simultaneously with the ignition spark of the 1st cylinder. The inductive clamp sensor is clipped onto the ignition cable. The inductive clamp sensor picks up the ignition pulses and transmits them to the stroboscopic lamp.

Adjusting the ignition timing

The adjustment of the ignition timing is carried out at the control unit (accessories).

Checking or adjusting the ignition timing is carried out while the engine is running using a stroboscopic lamp directed against the marks, lighting up at the moment of ignition.

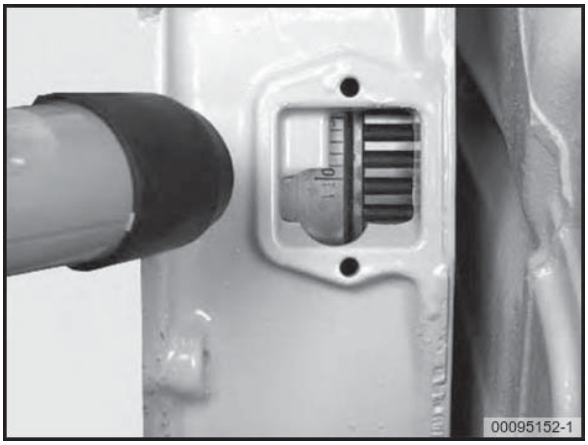
On the flywhee housing

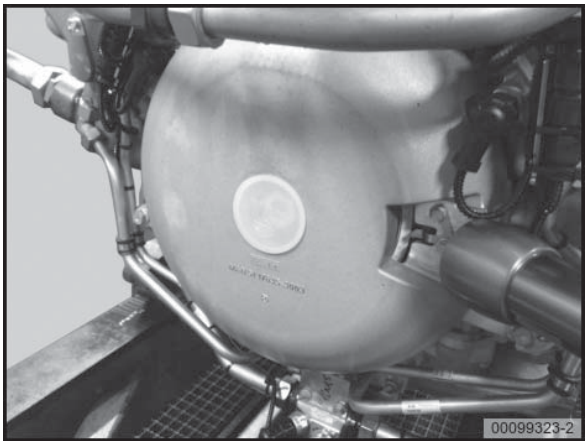
- ►Connecting the stroboscopic light
- ►Removing the cover at the flywhee housing
- ►Starting the engine
- ►Operate the engine with the lowest possible speed or load
- ►Direct the stroboscopic light to the graduated scale on the flywhee and to the counter mark to check the ignition timing

Counter flywhee side

- ►Connecting the stroboscopic light
- ►Starting the engine
- ►Operate the engine with the lowest possible speed or load
- ►Direct the stroboscopic light to the graduated scale on the hub for vibration dampers and to the counter mark to check the ignition timing

If the value on the control unit does not correspond to the actual value on the flywheel the value must be varied via the ignition control unit or the engine control until the desired ignition time is flashed





Tip for users

The engine control unit and ignition control unit are not included in the scope of supply from MAN.

For a description of how to set and vary the ignition timing, see the instructions of the manufacturer of the engine control unit and the ignition control unit.

5.2.7 Checking cable harness, cable connections and plugs

Checking the cable harness

- ►Check whether the routing of the cable harness has been caried without tension, kinks or abrasions
- ►Check the cable harness for damage, replace if necessary
- ►Check the cable harness fastenings for damage, replace if necessary
- ►Replace missing cable harness fastenings (cable ties, etc.)

Checking the cable connections and plugs

Tip for users

Do not open plug connectors for inspection!

- ►Check all plug connectors and cable connections of the cable harness for damage, replace if necessary
- ►Check all plug connectors and cable connections of the cable harness for tight fi

5.2.8 Measuring the compression pressure

Measurement conditions

At the time of carrying out the compression pressure test, the following conditions must be met:

- The valve clearance must be checked and adjusted if necessary.

- Ignition cables must be connected to ground.
- Maximum permitted values for intake vacuum (- 15 mbar) and exhaust gas back pressure (+ 40 mbar) must be observed.

Measuring the compression pressure

Tip for users

Before starting the work, read and follow the general safety instructions and the safety instructions given in this chapter.

Follow the instructions to the letter and proceed cautiously to prevent accidents, personal injury and material damage.

Personal protective equipment

- Industrial protective clothing
- Safety shoes
- Safety gloves

Personnel

- Checking and adjusting the ignition timing may only be carried out by authorised and trained specialists.

Special tools

1

Compression pressure recorder 80.99605-0164
Quantity 1
Measuring the compression pressure in conjunction with:
- Diesel register sheets replacement, scale 0-40 bar 80.99605-0165
- Extension M14, 105 mm: 80.99605-0301
- Extension M18:

2

Extension 80.99605-0301
Quantity 1
Measuring the compression pressure in conjunction with:
- Diesel register sheets replacement, scale 0-40 bar 80.99605-0165
- Compression pressure recorder: 80.99605-0164

Special tool M18 spark plug

Extension M18

Special tool **Extension M18** is currently not available at MAN.

Measuring the compression pressure **(M18)** in conjunction with:

- Compression pressure recorder: 80.99605-0164
- Diesel register sheets replacement, scale 0-40 bar 80.99605-0165
- Extension M18

Work steps:

►After the test run, shut off the engine at operating temperature (engine temperature > 50 °C)
►Pull off the spark plug connector
►Remove the spark plugs of all cylinders, see chapter "Removing/installing the spark plugs" of the respective series
►Screw extension M14 or M18 into cylinder 1
►Screw a straight adapter on the extension and connect it with the compression pressure recorder [1]

►Note engine type and number on the register sheet
►Place the register sheet into the compression pressure recorder
►Start the engine without accelerating and with an open throttle valve. Only let the starter turn until a constant speed is reached (approx. 4 seconds, engine speed >140 rpm)
►Unscrew the spark plug adapter with extension [2] and screw it into cylinder 2
►Switch the register sheet to cylinder 2
►Let the starter turn again
►Repeat these work steps for all cylinders (for V12 engines, one register sheet per cylinder bank)
►Screw in all spark plugs with the required torque according to the manufacturer's specifications see chapter Removing/installing the spark plugs of the respective series

Note down the measuring results in the maintenance record E3 of the document "Maintenance record for MAN industrial gas engines".

5.2.9 Compression pressures

Tip for users

The details about compression pressures and permissible deviations are empiric values, which initially give little information about the cause of damage and its consequences.

The compression pressure is only a criterion for determining whether the engine can remain in operation or not.

If the values lie within the permissible limits, further inspections in the area of the valve drive, valve seat, pairing liner, the piston, and piston rings are not necessary.

If the limit values fall below the specifie values, this must be taken as an indication to plan supplementary / follow-up inspections. However, the specialist on-site is responsible, if or which measures must be taken (e.g. further inspection, endoscopy, immediate repair, further operation until the next scheduled service).

In case of doubt, we will gladly provide the necessary support by offering advice or sending a representative if required.

		Compression pressures [bar]			Pressure difference [bar] between the individual cylinders		
Type	Compression	good	permissible	in need of repair	good	permissible	in need of repair
E0834 E302	13:1	> 16	12-16	<12	<3	3	> 3
E0836 E302	13:1	> 16	12-16	<12	<3	3	> 3
E0834 LE302/312/322	11:1	> 16	12-16	<12	<3	3	> 3
E0836 LE302	11:1	> 16	12-16	<12	<3	3	> 3
E2676 E302	12:1	> 19	15-19	<15	<2	2-3	> 3
E2676 LE202	12.6:1	> 19	15-19	<15	<2	2-3	> 3
E2676 LE212	14:1	> 20	16-20	<16	<2	2-3	> 3
E2876 E302/312	12:1	> 16	13-16	<13	<3	3	> 3
E2876 TE302	12:1	> 16	13-16	<13	<3	3	> 3
E2876 LE302	11:1	> 16	13-16	<13	<3	3	> 3
E2876 LE202	14:1	> 16	13-16	<13	<3	3	> 3
E2876 LE212	13:1	> 16	13-16	<13	<3	3	> 3
E2848 LE202/322/332	12:1	> 16	13-16	<13	<3	3-5	> 5
E2842 E302/312	12.5:1	> 16	13-16	<13	<3	3-5	> 5
E2842 LE302	10:1	> 16	13-16	<13	<3	3-5	> 5
E2842 LE312	11:1	> 16	13-16	<13	<3	3-5	> 5
E2842 LE202/322/332	12:1	> 16	13-16	<13	<3	3-5	> 5
E3268 LE212	12:1	> 19	15-19	<15	<2	2-3	> 3

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E3268 LE222	13.6:1	> 20	16-20	<16	<2	2-3	> 3
E3268 LE232	12:1	> 19	15-19	<15	<2	2-3	> 3
E3262 E302	12:1	> 19	15-19	<15	<2	2-3	> 3
E3262 LE232	12:1	> 19	15-19	<15	<2	2-3	> 3
E3262 LE242	12:1	> 19	15-19	<15	<2	2-3	> 3
E3262 LE202	12:1	> 19	15-19	<15	<2	2-3	> 3
E3262 LE212	13.6:1	> 20	16-20	<16	<2	2-3	> 3

5.2.10 Measuring the crankcase pressure

Tip for users

Before starting the work, read and follow the general safety instructions and the safety instructions given in this chapter.

Follow the instructions to the letter and proceed cautiously to prevent accidents, personal injury and material damage.

Personal protective equipment

- Industrial protective clothing
- Hard hat
- Safety shoes
- Safety gloves
- Safety goggles
- Ear protection

Safety instructions

Personnel

- Measuring of the crankcase pressure may only be carried out by authorised and trained specialists.

Basic rules

⚠ DANGER

Risk of fatal injury caused by engines or engine units

Therefore:
- Wear personal protective equipment.
- Comply with the safety and accident prevention regulations.
- Restrict your stay in the operation room to the absolute minimum time required.
- Position movable guards around engines that are running.
- Only enter the operating room when the engines are running at the lowest possible speed or load.
- Maintenance, service, testing and measuring activities must only be carried out by authorised persons.
- Activities in the immediate hazard zone on the left and right side of the engine must be reduced to an absolute minimum.
- If necessary, the manufacturer of the complete machine (OEM) must prepare work instructions for the measuring and testing activities required as part of the scheduled maintenance according to the maintenance record.

⚠ DANGER

Risk of death from non-functional safety equipment and devices

Therefore:
- Before starting work, check whether all safety equipment and devices are working and have been installed correctly.
- Before starting the engine, check whether all safety equipment and devices are working and have been installed correctly.
- Never disable safety equipment during operation.

⚠ WARNING

Risk of injury from rotating engine parts

Therefore:
- Equip rotating parts with suitable contact protection.
- Never remove safety guards from rotating parts.

At the time of carrying out the crankcase pressure test, the following conditions must be met:

- Maximum permitted values for intake vacuum (- 15 mbar) and exhaust gas back pressure (+ 40 mbar) must be observed.

Special tool

Differential pressure tester

To measure the crankcase pressure, use a differential pressure tester (e.g. Testo 512) or similar.

Measuring the crankcase pressure in conjunction with:

- Silicone hose (length as required)
- Hose clamps

Measuring the crankcase pressure

►Setting down the engine
►Pulling out the oil dipstick

Tip for users

Ensure the silicon hose is long enough so that it is possible to leave the hazard zone of the engine while testing.

►Attach pressure tester with silicone hose and hose clamp pliers on the oil dipstick guide tube
►Do not stay next to the engine during measuring
►Starting the engine
►Operate the engine at constant load and 50% of the rated power
►Operate the engine at constant load and 100% of the rated power

Enter the results of the measurement in the maintenance record E2 and E3 of the document "Maintenance record for MAN industrial gas engines".

5.2.11 Oil specifications

NOTE

Risk of engine damage caused by wrong service products

Therefore:
- Only use engine oil as per the approved specification
- Contact MAN in case of damage.
- For further information about service products, refer to the MAN service product database.

For approved engine oils for the service products used (natural gas/special gas), see the following table:

Service product	Natural gas	Special gas
Engine oil (oil specification	M 3271-2	M 3271-4

Tip for users

Only use service products in accordance with MAN regulations, as failure to do so will cause the liability for defects to lapse.

For basic information on the service products, refer to the publication “Service products for MAN gas engines”.

↗ https://ws-public.man-mn.com/portal/irj/asp

https://truckmanualshub.com/

Literature reference

For information on engine oil see the MAN service product database.

↗ https://ws-public.man-mn.com/portal/irj/asp

5.2.12 Replacing the steel mesh hoses

All steel mesh hoses installed on the engine must be replaced no later than 6 years from the date of manufacture. The date of manufacture can be found on the fitting directly on the hose, see photo. The date of manufacture consists of year and month (YY/mm).

This is why the date of manufacture of the steel mesh hoses must be verifie and recorded during commissioning. For engines already in service, the date of manufacture must be checked during the next scheduled maintenance.

An extension of the period of use is only possible if the test criteria specifie in the trade association guideline, info sheet no. 15, tables 1-8, are checked and evaluated at regular intervals.

Tip for users

In case of claims during the warranty period, the maintenance records E2/E3 must be submitted as well, see “Maintenance record for MAN industrial gas engines.”

5.2.13 Instructions for installation

Instructions for installation

Fitting nuts and bolts.

- Lightly lubricate nuts and bolts on the threading and the contact surface of the bolt head.
- Refer to the reference values in company standard M 3059 for bolted connections without specially prescribed tightening torques

Assembly of connecting pieces, banjo screws and screw plugs

- For tightening torques see table “Tightening torques for connecting pieces, hollow screws and screw plugs.”

Installation of micro-encapsulated bolts

- Comply with the application guidelines in company standard MAN 222 when using micro-encapsulated bolts.

Reuse of bolts and nuts

- Check bolt heads, threads and nuts for wear and ease of movement, replace if necessary
- Only reuse bolts and nuts if they are not worn!

Installing piping

Piping assemblies must not be deformed during assembly work – risk of fracture!

Installing flat seals

- Only use genuine MAN seals
- The sealing surfaces must be free of damage and clean.
- Do not use adhesive agent or sealing agents. If necessary, to facilitate installation, use a little grease to stick the seal to the part to be mounted.
- Tighten bolts evenly to prescribed tightening torque.

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Installing O-rings

- Only use genuine MAN O-rings.
- The sealing surfaces must be free of damage and clean.

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5.3.1 engine oil change

Engine oil change E08

Technical data
Tightening torques

Oil filte on the oil filte head ..... 25 Nm

Screw plug in oil sump ..... M18x1.5 ..... 60 Nm

Test and setting values

Engine oil refill quantity (with filter change)

E0834 ..... 14 litres

E0836 ..... 35 litres

Consumables

Engine oil ..... see oil specification

⚠ WARNING

Risk of injury from hot service products

Therefore:
- Wear personal protective equipment.
- Only touch the oil drain plugs using chemical-resistant safety gloves.
- Follow the accident prevention regulations.
- Comply with occupational health and safety regulations.

Tip for users

Drain the engine oil when the engine is at operating temperature.

Tip for users

The oil filte insert must be replaced during every engine oil change.

Tip for users

When changing the oil, use a container with adequate capacity to avoid any oil overflow

Tip for users

Only use service products in accordance with MAN regulations, as failure to do so will cause the liability for defects to lapse.

For basic information on the service products, refer to the publication “Service products for MAN industrial gas engines”.

You can fin approved products on the Internet at:

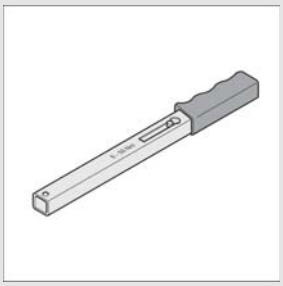
https://ws-public.man-mn.com/portal/irj/asp

Literature reference

For information on engine oil see the MAN service product database.

↗ https://ws-public.man-mn.com/portal/irj/asp

Special tools

1		**Torque wrench** Quantity 1	08.06450-0006

2		**Ratchet** Quantity 1	08.06455-0002

Draining the engine oil

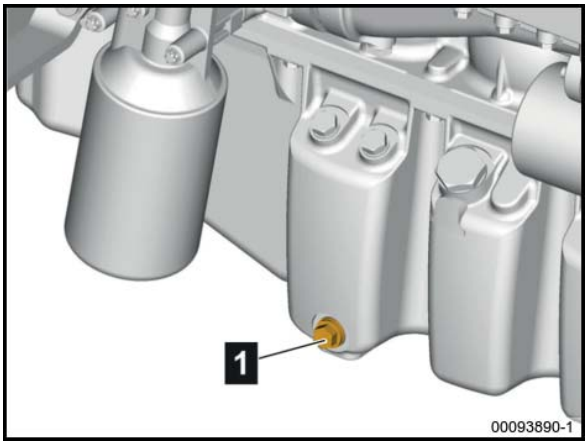
Tip for users

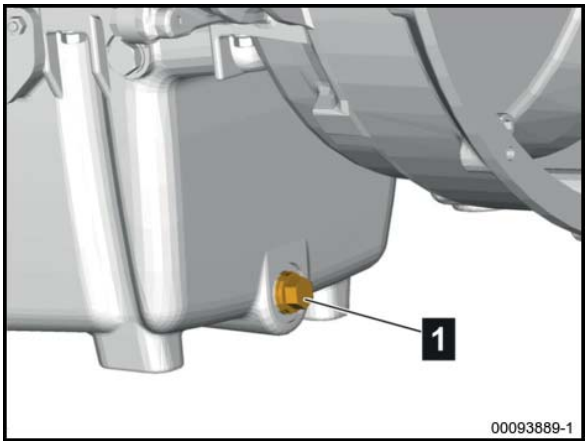
Attachments of the manufacturer of the overall plant (automatic refill lines, etc.) may have an impact on the draining process. Corresponding descriptions must be provided by the manufacturer of the overall plant.

Depending on the version of the oil sump, there are several options to drain the oil.

- ►Place a suitable container under the oil drain plug **1**
- ►Unscrew the oil drain plug **1** from the oil sump and allow the engine oil to drain off completely
- ►Screw in the oil drain plug **1** with a new seal
- ►Tighten the oil drain plug **1** using torque wrench [1], ratchet [2] and suitable socket wrench insert

Tightening torque..... ..... 60 Nm





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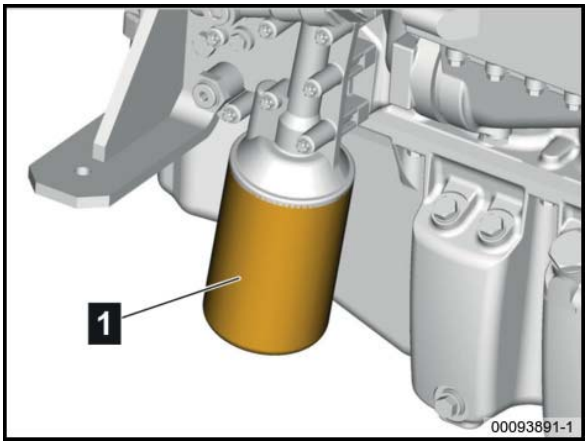
Changing the oil filter



►Unscrew the filte cartridge **1** using a strap wrench
►Thinly apply clean engine oil on the seal of the new filte cartridge **1**
►Screw on the new filte cartridge **1** by hand until the seal makes contact
►Screw the filte cartridge **1** by hand for approx. 3/4 turn further

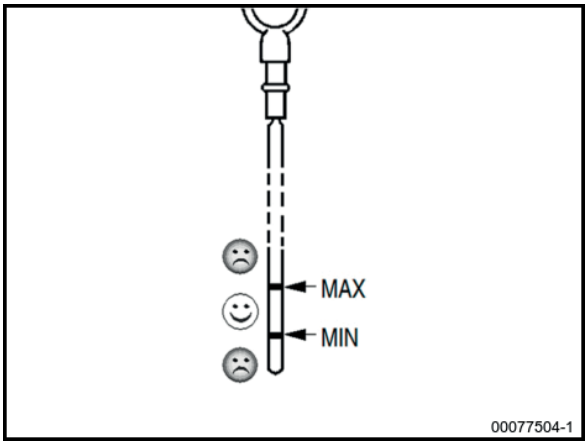
The process corresponds to a torque of approx. 25 Nm.

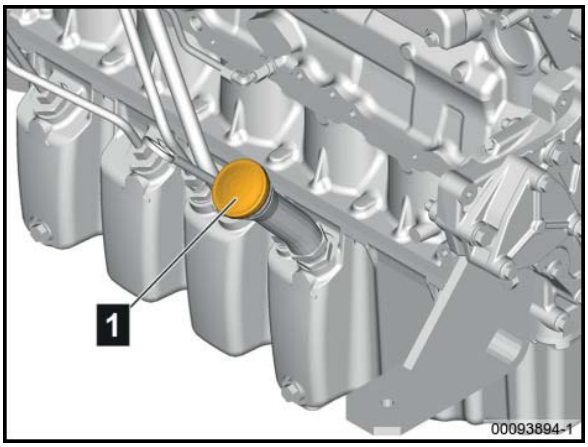
Pouring in engine oil

NOTE

Risk of engine damage due to incorrect oil level

Therefore:
- Never fil more than the indicated oil quantity.
- Observe the Min/Max marks on the oil dipstick.
- Check the oil level and correct it if necessary.





►Open the cover **1**
►Slowly fil in engine oil using the fille neck

Oil fill amount for E0834

Engine oil refil quantity (with filte ..... 14 litres change).....

Oil fill amount for E0836

Engine oil refil quantity (with filte ..... 35 litres change).....

►Screw the cover **1** back on
►Start the engine and let it run at low speed for a few minutes

NOTE

Risk of engine damage due to lack of oil pressure

Therefore:
- Observe the oil pressure gauge.
- Check the oil pressure and check for leaks
- If no oil pressure builds up after approx. 10 seconds of operation, immediately shut down the engine.
- Identify and rectify the cause.

►Setting down the engine

►Check the filte cartridge for leaks, re-tighten if necessary
►Checking the engine oil level

5.3.2 Checking the engine oil level

Checking the engine oil level E08

NOTE

Risk of engine damage due to incorrect oil level

Therefore:
- Never fil more than the indicated oil quantity.
- Observe the Min/Max marks on the oil dipstick.
- Check the oil level and correct it if necessary.

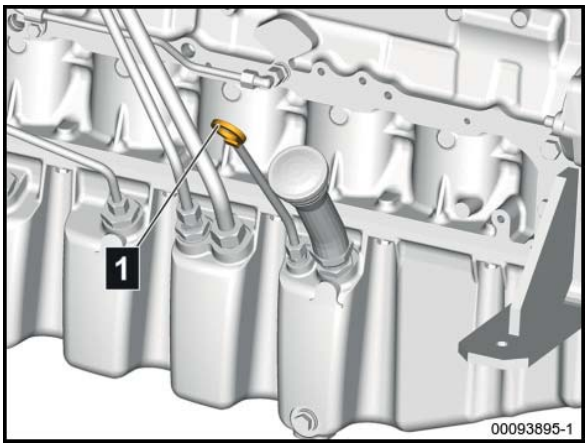
Tip for users

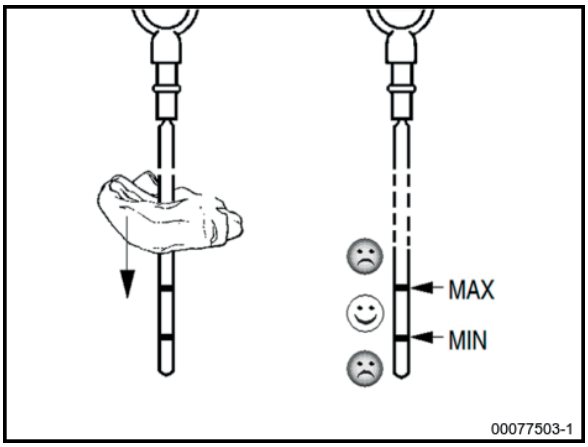
Check the oil level with the engine in horizontal position, and at the earliest approx. 5 minutes after the engine has been switched off.

►Pull out the oil dipstick 1
►Wipe off the oil dipstick 1 using a lint-free, clean cloth
►Insert the oil dipstick 1 up to the stop
►Pull out the oil dipstick 1 again and check the oil level

The oil level must be between the MIN and MAX marks (notches) on the oil dipstick.

►Insert the oil dipstick 1 up to the stop
►If necessary, top up engine oil or drain in case of overfil
►Check the oil level again





5.3.3 Changing the coolant

Changing the coolant E08

Technical data
Tightening torques

Screw plug in oil module	M18x1.5		30 Nm

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Test and setting values

Total filling amount of engine coolant

E0834 E..... 12 l
E0834 LE..... 13 l
E0836 E..... 16 l
E0836 LE..... 16 l

⚠ WARNING

Risk of injury from hot fluids

The coolant reaches high temperatures during operation and causes scalding if it comes into contact.

Therefore:

- Allow the engine to cool down.
- Handle the coolant drain plug with safety gloves only.

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

Therefore:

- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

ENVIRONMENTAL NOTICE

Risk of contaminating bodies of water and soil

Therefore:

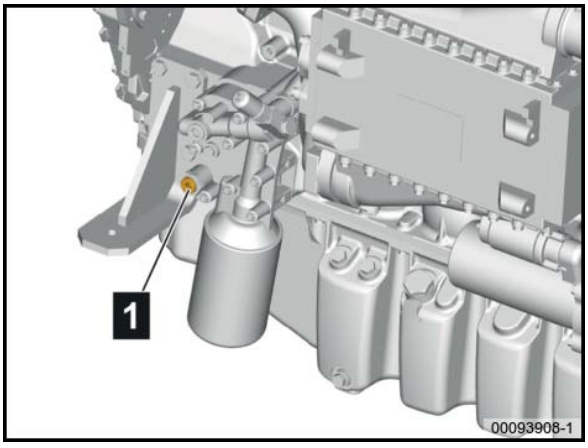
- Collect service products using appropriate and sufficientl large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.
- Undiluted antifreeze must be treated as hazardous waste.

Drain coolant

Tip for users

The cooling system is installed by the manufacturer of the overall plant, therefore, only the procedure at the engine is described here. A detailed description is delivered by the manufacturer of the overall plant.

On the engine



►Unscrew the drain plug **1** on the oil cooler housing
►Collect emerging coolant in a suitable container.
►Allow the coolant to drain completely
►Screw in the drain plug **1** with a new seal and tighten

Tightening torque..... 30 Nm

►Draining the coolant from the cooling system and the heat exchanger (if installed), see corresponding instructions.

Topping up coolant

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

Therefore:

- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

NOTE

Risk of engine damage due to temperature differences

Therefore:

- Do not add cold coolant to a hot engine.

Tip for users

The cooling system is installed by the manufacturer of the overall plant. A detailed description is delivered by the manufacturer of the overall plant.

Fill the cooling system of the engine with a mixture consisting of tap water and antifreeze based on ethylene glycol or anti-corrosion agent.

See the publication "Service products for MAN industrial gas engines".

The cooling system must be fille with coolant in accordance with the fillin instructions provided by the manufacturer of the overall system.

The proper mixing ratio of water and antifreeze must be restored.

Cooling system with membrane expansion tank

Tip for users

The cooling system is installed by the manufacturer of the overall plant. A detailed description is delivered by the manufacturer of the overall plant.

►After fillin the cooling system, let the electric coolant pump run for approx. 15 minutes and vent the cooling system.

►Observe the cooling system pressure and check the coolant level.

5.3.4 Removing/installing the spark plug

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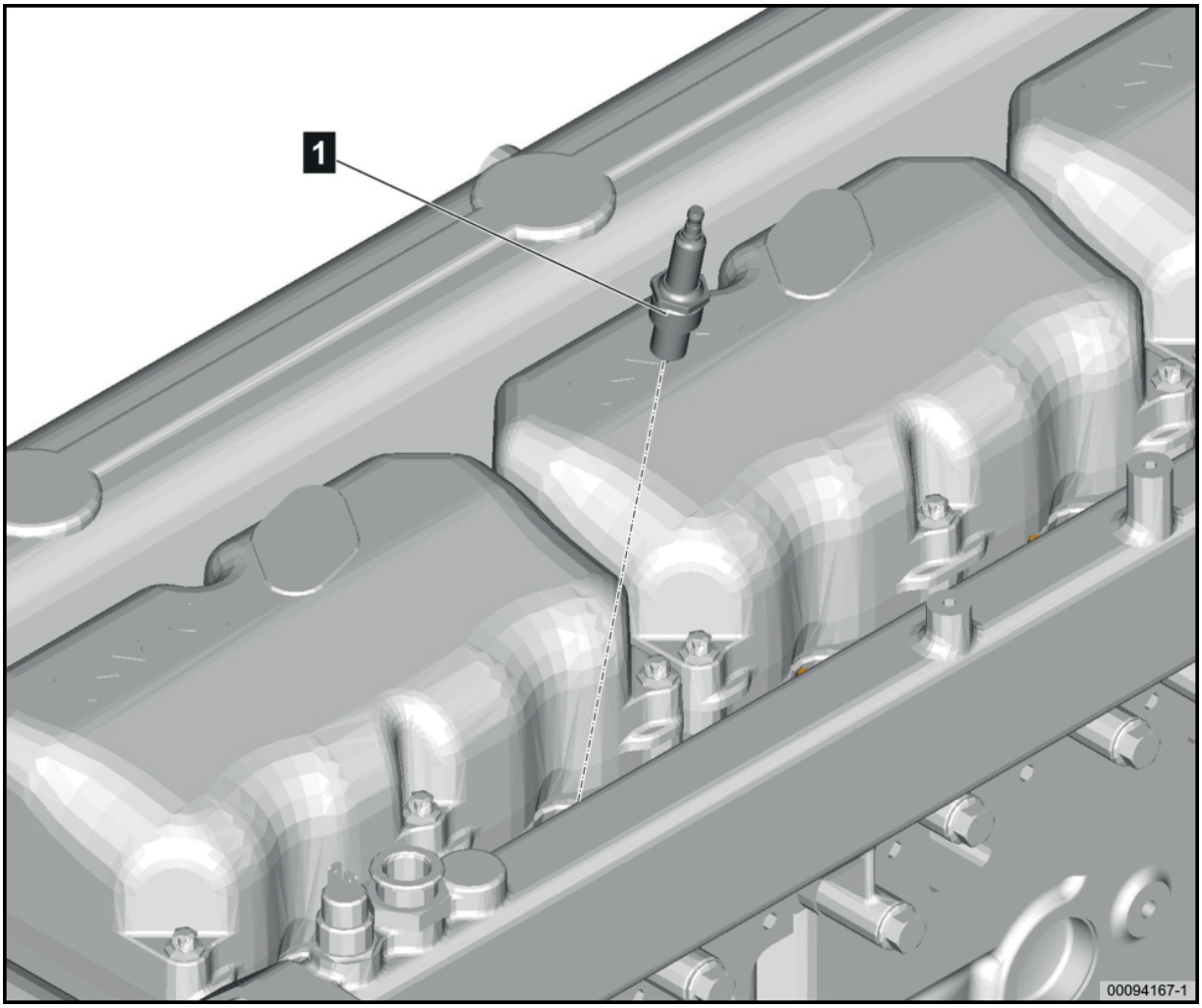


key

1 Spark plug

Technical data

Tightening torques

Original equipment E0834/36 E (size 16)			
Spark plug (dry thread)	M14x1.25		30 Nm
Original equipment E0834/36 LE (size 21)			
Spark plug (dry thread)	M14x1.25-6e		40 Nm
Third-party manufacturer			
Spark plug, third-party manufacturer	M14x1.25		See manufacturer's instructions

Test and setting values

Original equipment E0834/36 E (size 16)		
Electrode distance in the spark plug		0.28 ± 0.05 Nm
Original equipment E0834/36 LE (size 21)		
Electrode distance in the spark plug		0.2 ± 0.05 Nm

Important information

NOTE

Risk of component damage due to incorrect tightening torque

The tightening torque should correspond to the structure of MAN spark plug.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

Tip for users

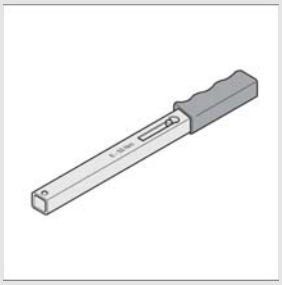
Do not reinstall damaged or dropped spark plugs!

Special tools

1

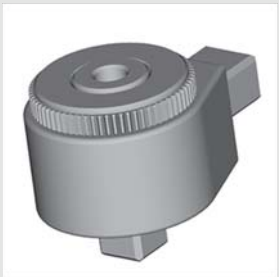
Handle 08.06460-0001
Quantity 1
Handle 9 x 12 x 400 mm
Removing spark plugs in conjunction with:
- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs 51.97710-0005

2



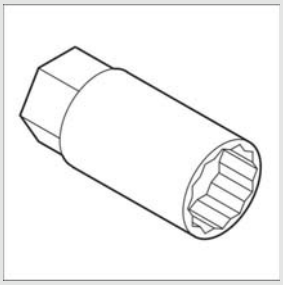
Torque wrench 08.06450-0006
Quantity 1
Torque wrench, 6 - 50 Nm / 9 x 12 x 333 mm, 3/8" square drive
Installing the spark plugs in conjunction with:
- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs 51.97710-0005

3



Ratchet 08.06455-0001
Quantity 1
3/8” square ratchet 10 - 9 x 12
Removing spark plugs in conjunction with:
- Handle 08.06460-0001
- Socket wrench insert for spark plugs 51.97710-0005

Installing the spark plugs in conjunction with:
- Torque wrench 08.06450-0006
- Socket wrench insert for spark plugs 51.97710-0005

4		**Socket for spark plugs** Quantity 1 Removing the spark plugs in conjunction with: • Handle 08.06460-0001 • Ratchet 08.06455-0001 Installing the spark plugs in conjunction with: Torque wrench 08.06450-0006 • Ratchet 08.06455-0001	51.97710-0005

Removing spark plugs

Removing spark plugs

⚠ DANGER

Danger to life from electrical power

Touching the ignition system during operation is life-threatening.

Therefore:

- Never disconnect the spark plug connector while the engine is running.

►Pull off the spark plug connector

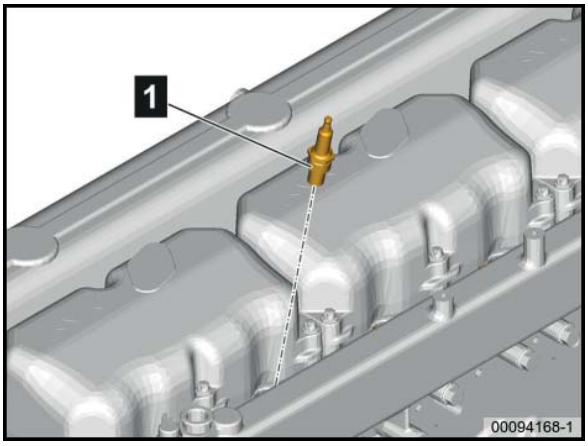
Tip for users

Prior to dismounting, use compressed air to remove any fouling and contamination from the installation bay.

►Use compressed air to clean the installation bay

►Assemble the special tool consisting of handle [1], ratchet [3], extension and socket wrench insert for spark plugs [4]

►Loosen and unscrew the spark plugs **1** using the special tool



Installing spark plugs

Screwing in the spark plugs

Tip for users

Do not reinstall damaged or dropped spark plugs!

NOTE

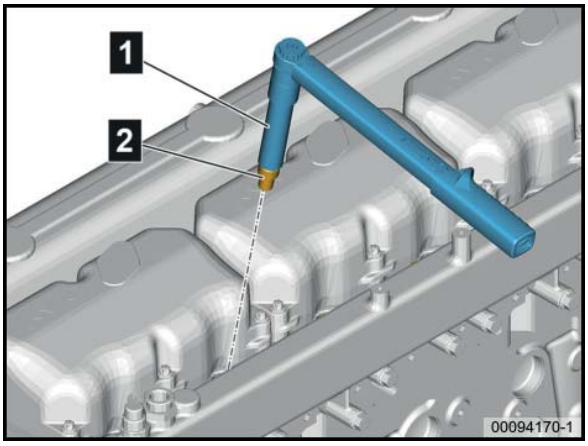
Risk of component damage due to incorrect tightening torque

The tightening torque should correspond to the structure of MAN spark plug.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

►Screw in the spark plug **2** by hand using the socket wrench insert for spark plugs [4]



► Assemble the special tool **1** consisting of torque wrench [2], ratchet [3], extension and socket wrench insert for spark plugs [4]

► Tighten the spark plugs **2** using the special tool **1**

Tightening values Original equipment E0834/36 E (size 16)

Tightening torque (dry thread)..... ..... 30 Nm

Tightening values Original equipment E0834/36 LE (size 21)

Tightening torque (dry thread)..... ..... 40 Nm

Tightening torque values third-party manufacturer

Tightening torque..... ..... See manufacturer's instructions

► Position the spark plug connectors and let it lock into place

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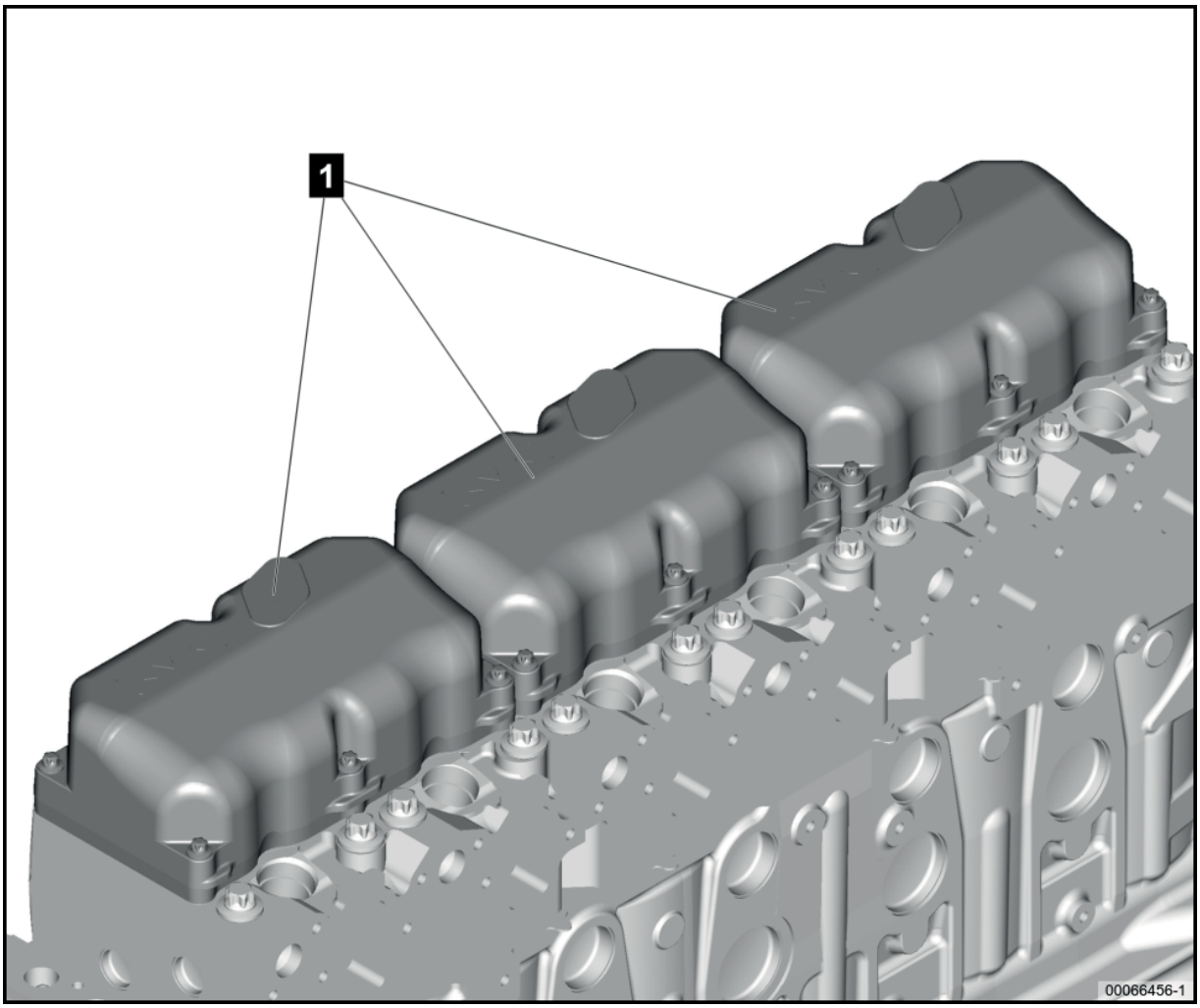
5.3.1 Checking and adjusting E0834/E0836 valve clearance

5.3.1.1 Removing/installing the cylinder head cover



key

1 Cylinder head cover

Important information

NOTE

Risk of material damage from improperly tightened bolted connections

Components will get damaged.

Therefore:

- Only use an impact screwdriver for preliminary tightening to max. 50 % of fina tightening torque.
- Final tightening must always be applied manually using a torque wrench

NOTE

Risk of damage to component by contaminants

Therefore:

- Clean components and sealing surfaces before the assembly with suitable means
- Protect cleaned surfaces from re-contamination

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

ENVIRONMENTAL NOTICE

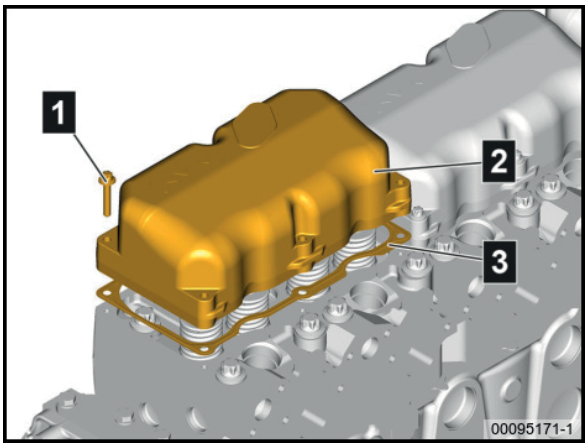
Risk of contaminating bodies of water and soil

Therefore:

- Collect service products using appropriate and sufficientl large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.
-

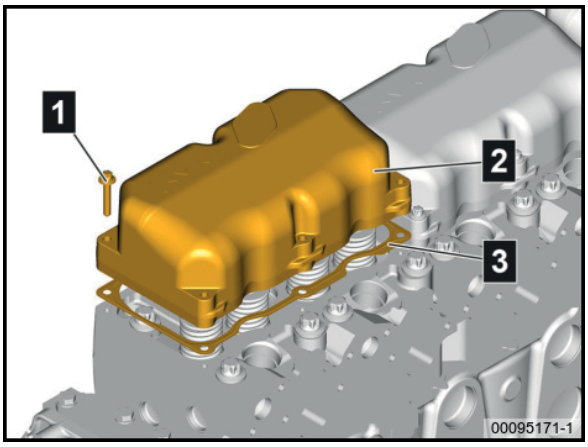
Removing the cylinder head cover

Removing the cylinder head cover



►Unscrew the mounting bolts 1
►Remove the cylinder head cover 2 with seal 3 from the cylinder head
►Clean the areas to be sealed

Mounting the cylinder head cover



►Fit the cylinder head cover 2 with a new seal 3
►Screw in mounting bolts 1 and tighten crosswise

5.3.1.2 Check & adjust valve/s

Additional measures

►Removing/installing the cylinder head cover, Page 46

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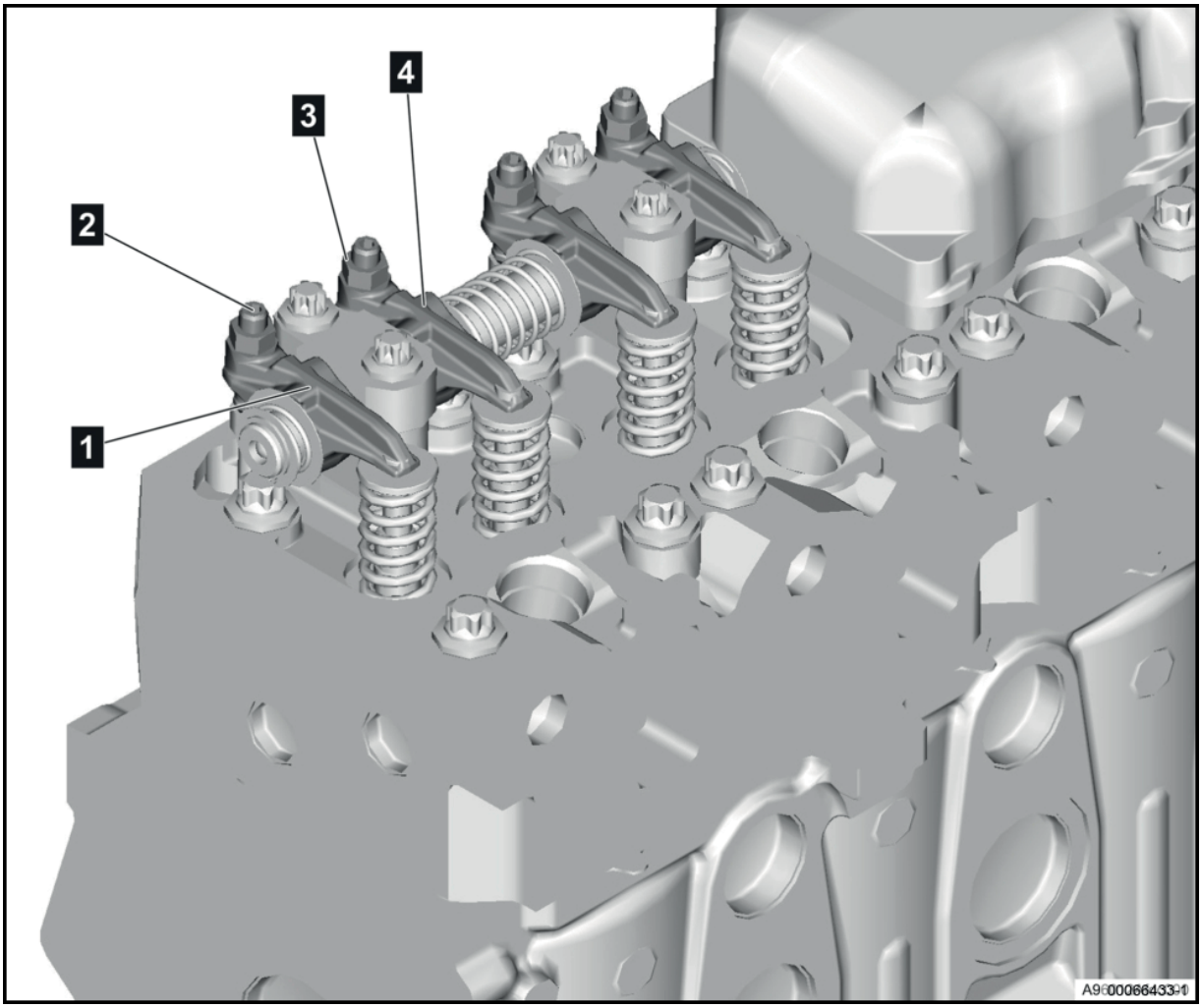


key

1 Exhaust valve rocker arm	3 Lock nut
2 Adjusting screw	4 Intake valve rocker arm

Technical data

Tightening torques

Lock nuts of inlet- and outlet valve.....M10X1..... ..... 40 Nm

Test and setting values

Intake valve clearance..... 0.50 mm

Exhaust valve clearance..... ..... 0.50 mm

Important information

NOTE

Risk of engine damage due to incorrect valve clearance

Therefore:

- Only set the valve clearance whilst the engine is cold

NOTE

Risk of component damage due to incorrectly tightened bolted connections

Therefore:

- Only use an impact screwdriver for preliminary tightening to max. 50 % of fina tightening torque.
- Final tightening must always be applied manually using a torque wrench

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

ENVIRONMENTAL NOTICE

Risk of contaminating bodies of water and soil

Therefore:

- Collect service products using appropriate and sufficientl large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.

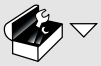
Special tools

1

Feeler gauge, 7-leaf version 08.75310-3309
Quantity 0
Replacement for 08.75300-0000 , 80.99607-0173 , 0174 , 0175 , 0176 , 0177 , 0178 , 0179 check valve clearance and adjust if necessary

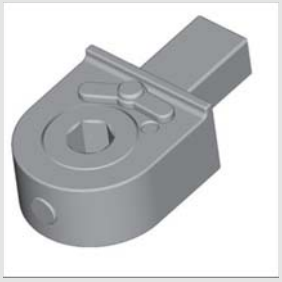
2

Valve adjusting wrench, wrench width 14 80.99603-6031
Quantity 1
Wrench width 14 adjusting the valve clearance in conjunction with: 08.06460-0003



Valve adjusting wrench insert 80.99603-0337
Quantity 1

3



Ratchet 08.06410-9072
Quantity 1
Ratchet for 5/16" - 9 x 12 bits

4

Handle 08.06460-0003
Quantity 1
Detachable handle 9 X 12 - 150 mm adjust the valve clearance

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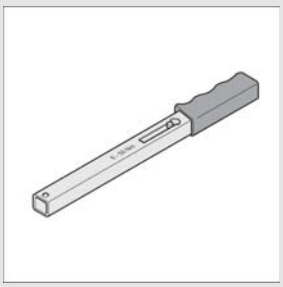
5



Torque wrench 08.06450-0006
Quantity 1
Torque wrench 6-50 Nm square drive 3/8" square for insertion tool 9x12 adjust to valve clearance, tighten the lock nut of the adjusting screw

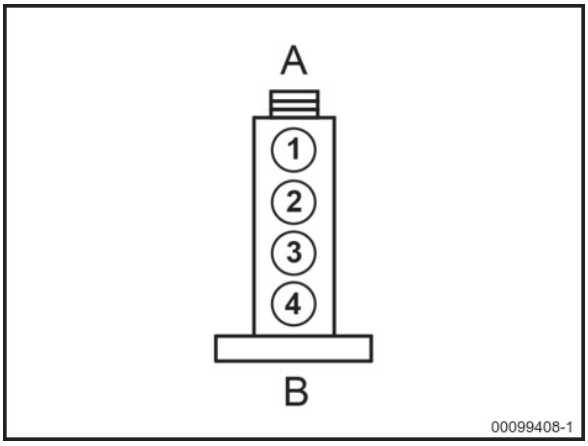
Checking and adjusting valve clearance

Cylinder allocation E0834

Cylinder allocation for valve adjustment E0834

A = Vibration damper side

B = Flywheel side



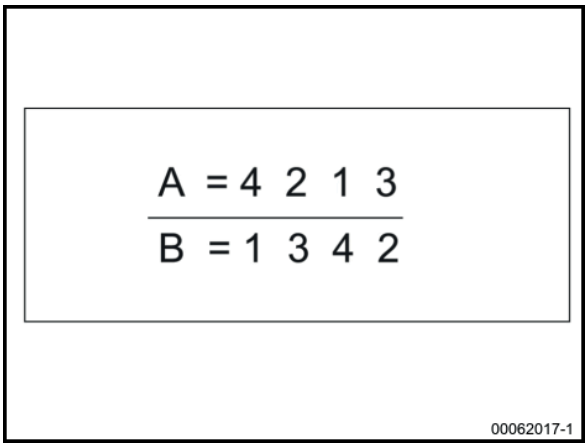
Bring the engine to the adjusting position (E0834)

A = Rocker arms overlap

B = Rocker arms free for valve clearance setting

►Crank the engine in its running direction using the engine cranking unit and gear ratchet until the rocker arms are in overlap

►Check or adjust free rocker arm according to the table

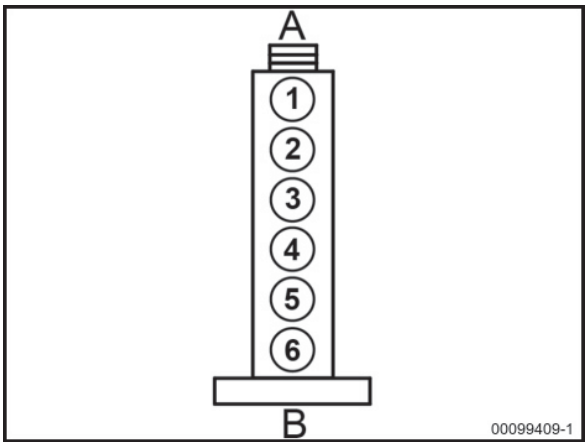


Cylinder allocation E0836

Cylinder allocation for valve adjustment E0836

A = Vibration damper side

B = Flywheel side

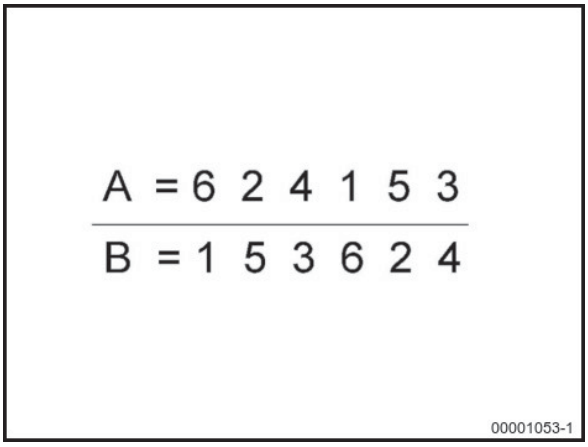


Bring the engine to the adjusting position (E0836)

A = Rocker arms overlap

B = Rocker arms free for valve clearance setting

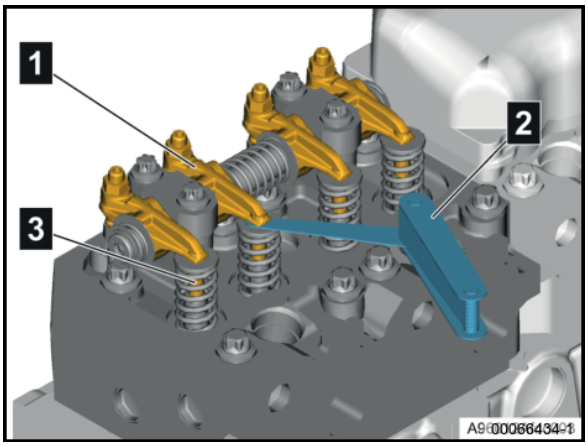
- ►Crank the engine in its running direction using the engine cranking unit and gear ratchet until the rocker arms are in overlap
- ►Check or adjust free rocker arm according to the table



Checking the intake valve clearance

- ►Insert the feeler gauge 0.5 mm leaf [1] 2 between the rocker arm 1 and the valve 3

The valve clearance must be adjusted if it is not 0.5 mm.

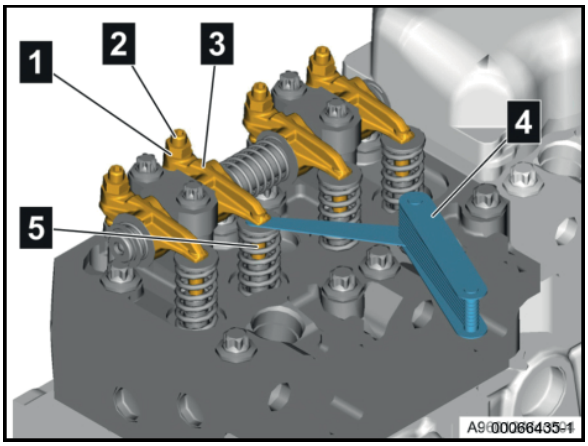


Adjusting the intake valve clearance

- ►Set valve adjusting wrench SW 14 [2] and grab handle [4] to lock nut 1 and attach ratchet socket [3] and grab handle [4] to valve adjusting wrench SW 14 [2]
- ►Undo the lock nut 1 and adjusting screw 2
- ►Insert the 0.5 mm feeler gauge [1] 4 between the rocker arm 3 and the valve 5
- ►Screw in the adjusting screw 2 until the 0.5 mm leaf of the feeler gauge [3] 5 can be moved between the rocker arm 3 and the valve 5 with little resistance
- ►Brace the adjuster screw 2 with the valve adjusting wrench size 14 [2], ratchet insert [3] and grip [4] and tighten the lock nut 1 using the torque wrench [5]

Tightening torque..... ..... 40 Nm

- ►Check valve clearance and repeat adjustment process, as required



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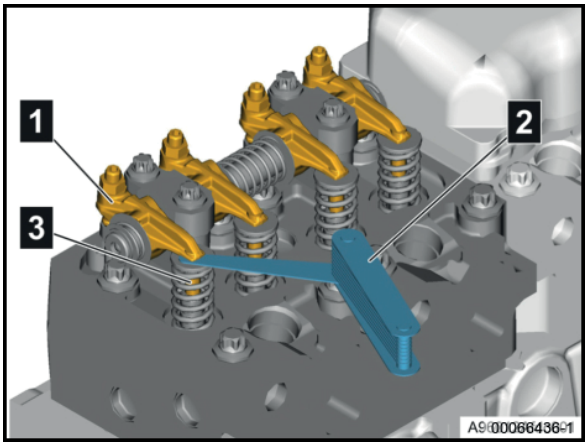
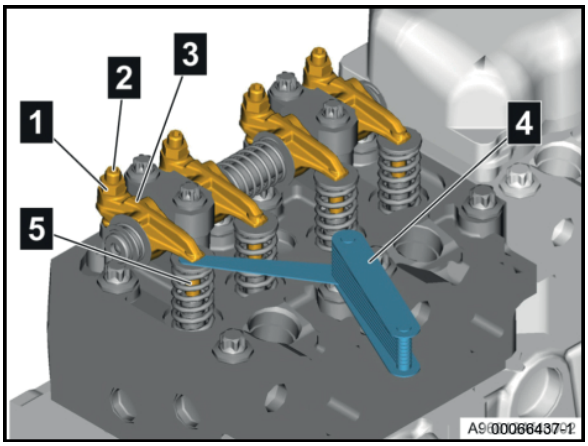
Checking the exhaust valve clearance



►Insert the feeler gauge 0.5 mm leaf [1] **2** between the rocker arm **1** and the valve **2**

The valve clearance must be adjusted if it is not 0.5 mm.

Adjusting the exhaust valve clearance



►Set valve adjusting wrench SW 14 [2] and grab handle [4] to lock nut **1** and attach ratchet socket [3] and grab handle [4] to valve adjusting wrench SW 14 [2]
►Undo the lock nut **2** and adjusting screw **1**
►Insert the 0.5 mm feeler gauge [1] **4** between the rocker arm **3** and the valve **5**
►Screw in the adjusting screw **1** until the 0.5 mm leaf of the feeler gauge [3] **4** can be moved between the rocker arm **3** and the valve **5** with little resistance
►Brace the adjuster screw **2** with the valve adjusting wrench size 14 [2], ratchet insert [3] and grip [4] and tighten the lock nut **1** using the torque wrench [5]

Tightening torque..... ..... 40 Nm

►Check valve clearance and repeat adjustment process, as required

5.4.1 engine oil change

Engine oil change E26

Technical data
Tightening torques

Oil filte lid on oil module		40 + 10 Nm
Screw plug in oil sump	M18x1.5	80 Nm

Test and setting values
Engine oil refill quantity (with filter change)

Standard oil sump	72 litres

Consumables

Engine oil	see oil specification

⚠ WARNING

Risk of injury from hot service products

Therefore:
- Wear personal protective equipment.
- Only touch the oil drain plugs using chemical-resistant safety gloves.
- Follow the accident prevention regulations.
- Comply with occupational health and safety regulations.

NOTE

Hazard of component damage from using incorrect tools

The frequency of the impact screwdriver causes dirt particles to fall out of the filte element.

Therefore:
- Do not use an impact screwdriver to loosen or tighten the cover.

Tip for users

Drain the engine oil when the engine is at operating temperature.

Tip for users

The oil filte insert must be replaced during every engine oil change.

Tip for users

When changing the oil, use a container with adequate capacity to avoid any oil overflow

Tip for users

Only use service products in accordance with MAN regulations, as failure to do so will cause the liability for defects to lapse.

For basic information on the service products, refer to the publication “Service products for MAN gas engines”.

You can fin approved products on the Internet at:

https://ws-public.man-mn.com/portal/irj/asp

Literature reference

For information on engine oil see the MAN service product database.

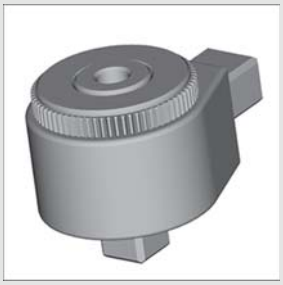
↗ https://ws-public.man-mn.com/portal/irj/asp

https://truckmanualshub.com/

Special tools

1

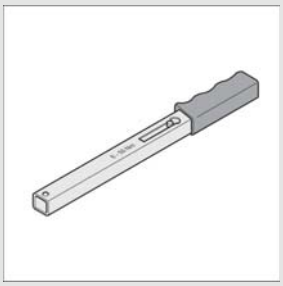
Socket wrench insert 80.99603-0325
Quantity 1
Size 36
Unscrewing the oil filte lid
Tightening the oil filte lid in conjunction with 08.06455-0001 and 08.06450-0006

2 

Ratchet 08.06455-0001
Quantity 1
Tightening the oil filte lid

3

Handle 08.06460-0001
Quantity 1
Loosening the oil filte lid in conjunction with 08.06455-0001

4 

Torque wrench 08.06450-0006
Quantity 1
Tightening the oil filte lid in conjunction with 08.06455-0001

5

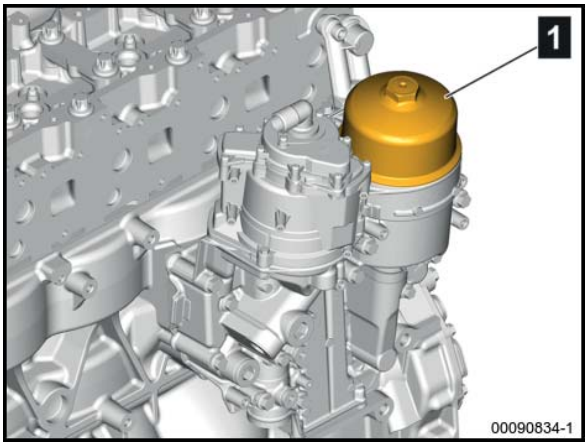
Ratchet 08.06455-0002
Quantity 1
Tightening the oil drain plug in conjunction with 08.06450-0002

Draining the engine oil

Tip for users

Attachments of the manufacturer of the overall plant (automatic refill lines, etc.) may have an impact on the draining process. Corresponding descriptions must be provided by the manufacturer of the overall plant.

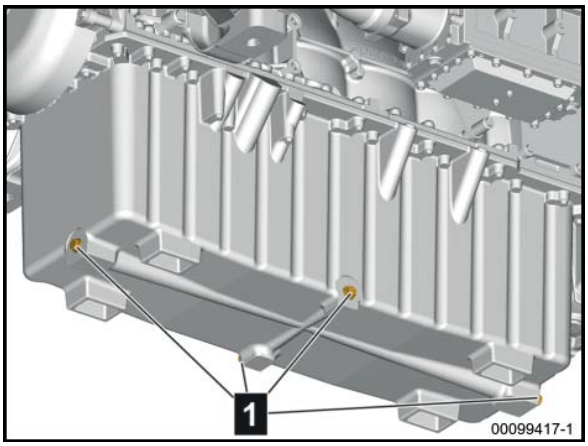
►Unscrew the oil filte lid **1** using the handle [3], undo the ratchet adapter [3] and size 36 socket [1] and unscrew by 2-3 turns.
►Wait until the oil has completely drained from the engine oil module to the oil sump



Draining the engine oil

►Place a suitable container under the oil drain plug **1**
►Unscrew the oil drain plug **1** from the oil sump and allow the engine oil to drain off completely
►Screw in the oil drain plug **1** with a new seal
►Tighten the oil drain plug **1** using torque wrench [4], ratchet [2] and suitable socket wrench insert

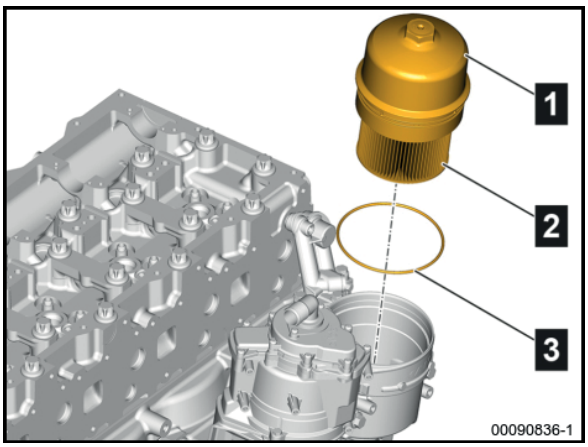
Tightening torque..... ..... 80 Nm



Changing oil filter insert

►Unscrew the oil filte lid **1** from oil module using the handle [3], ratchet [3] and size 36 socket wrench insert [1]
►Unscrew the oil filte lid **1** from the oil module and remove the O-ring **3**
►Remove the oil filte insert **2** from the oil module
►Clean the oil filte lid **1**
►Clean the oil filte housing with a lint-free, clean cloth
►Fit a new O-ring **3** onto the oil filte lid **1**
►Insert the new oil filte insert **2** into the oil filte lid **1**.
►Screw oil filte lid **1** into the oil module
►Tighten oil filte lid **1** with the torque wrench, ratchet and socket wrench insert

Tightening torque..... .... 40 + 10 Nm

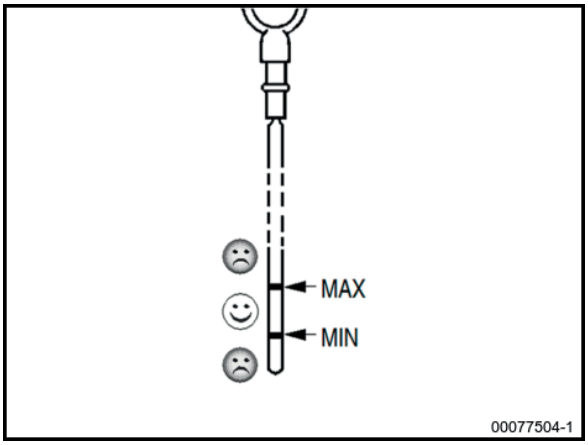


Pouring in engine oil

NOTE

Risk of engine damage due to incorrect oil level

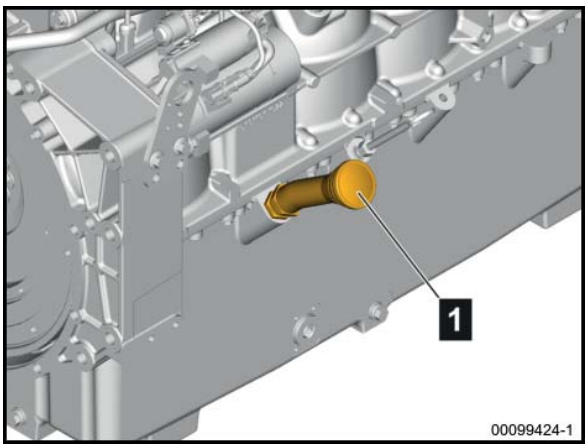
Therefore:
- Never fil more than the indicated oil quantity.
- Never fil more than the indicated oil quantity.
- Never fil more than the indicated oil quantity.



►Open the cover **1**
►Slowly fil in engine oil using the fille neck

Standard oil sump

Engine oil refil quantity (with filte ..... 72 litres change).....



►Screw the cover **1** back on
►Start the engine and let it run at low speed for a few minutes

NOTE

Risk of engine damage due to lack of oil pressure

Therefore:
- Observe the oil pressure gauge.
- Check the oil pressure and check for leaks
- If no oil pressure builds up after approx. 10 seconds of operation, immediately shut down the engine.
- Identify and rectify the cause.

►Setting down the engine
►Checking the engine oil level

5.4.2 Checking the engine oil level

Checking the engine oil level E26

NOTE

Risk of engine damage due to incorrect oil level

Therefore:
- Never fil more than the indicated oil quantity.
- Observe the Min/Max marks on the oil dipstick.
- Check the oil level and correct it if necessary.

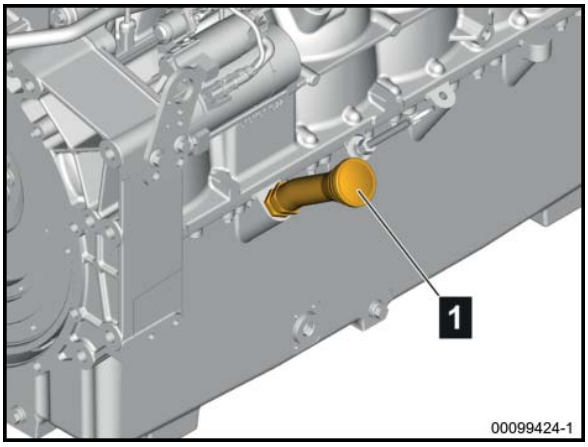
Tip for users

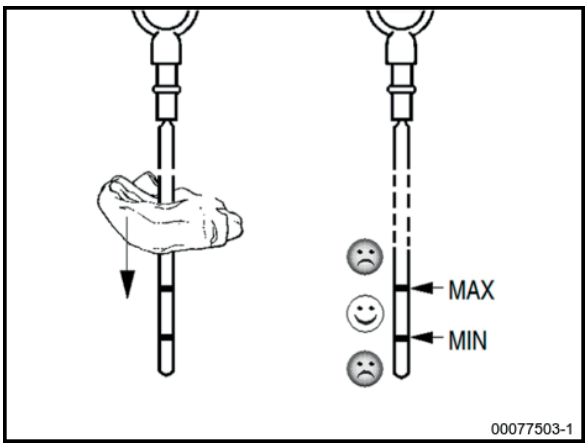
Check the oil level with the engine in horizontal position, and at the earliest approx. 5 minutes after the engine has been switched off.

►Pull out the oil dipstick **1**.
►Wipe the oil dipstick **1** off with a clean, lint-free cloth.
►Insert the oil dipstick **1** again until it reaches the stop.
►Pull out the oil dipstick **1** again and check the oil level
►Insert the oil dipstick **1** again until it reaches the stop.

The oil level must be between the MIN and MAX marks (notches) on the oil dipstick **1**.

►Insert the oil dipstick **1** up to the stop.
►If necessary, top up engine oil or drain in case of overfil
►Check the oil level again





5.4.3 Replacing the oil separator diaphragm

Technical data
Tightening torques

Mounting bolts, union on valve cover	5.2 ± 1.7 Nm
Mounting bolts, valve cover on oil separator cover	6 ± 1 Nm

NOTE

Risk of component damage due to incorrectly tightened bolted connections

Therefore:
- In preliminary tightening, use an impact screwdriver with max. 50% of the prescribed fina tightening torque.
- Final tightening must always be applied manually using a torque wrench.

NOTE

Risk of damage to component by contaminants

Therefore:
- Clean components and sealing surfaces before the assembly with suitable means.
- Protect cleaned surfaces from re-contamination.

NOTE

Risk of component damage due to reutilised bolts

Therefore:
- Replace any mounting bolts that were unscrewed.

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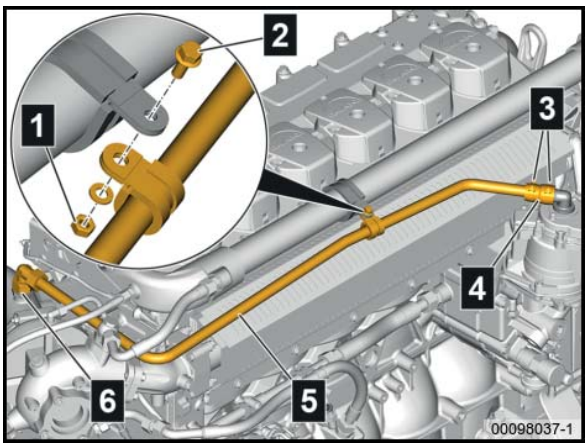
Special tools

1		**Hose clamp pliers** Quantity 1 Hose clamp pliers, angled version Removing / installing the spring band clamps	80.99625-0073
2		**Torque screwdriver** Quantity 1 Torque screwdriver 320 - 1600 cNm with interchangeable blade insert Tightening the mounting bolts	08.06510-9029
3		**Interchangeable blade 8 mm with ¼" square drive length 80 mm** Quantity 1	08.06559-0002

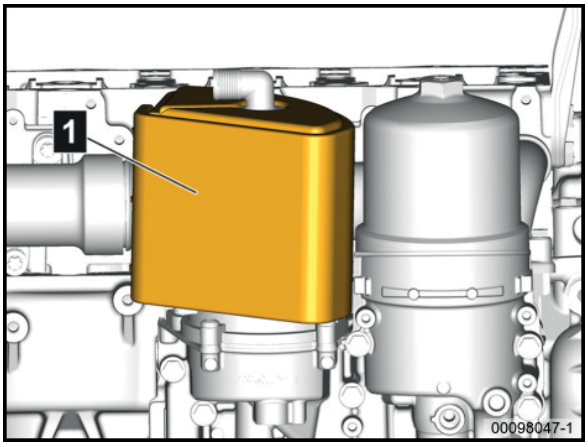
Removing the diaphragm

Dismounting the bleed line

- ►Undo the spring band clamps **3** using the hose clamp pliers [1] and push onto the bleed line **5**
- ►Push the moulded hose **4** onto the bleed line
- ►Unscrew the union nut **6**
- ►Unscrew the mounting nut **1** and remove with the mounting bolt **2** and the washer
- ►Remove the bleed line **5**

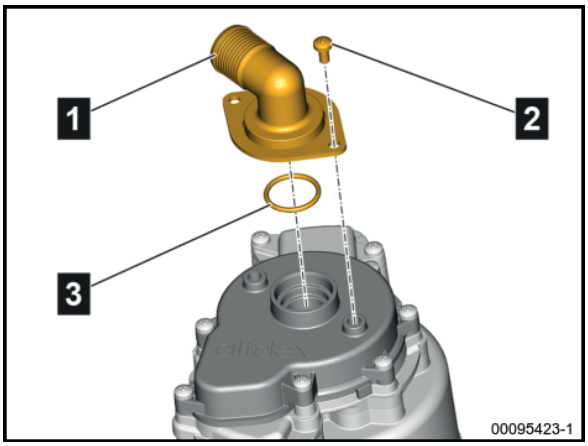


Removing the insulating mat



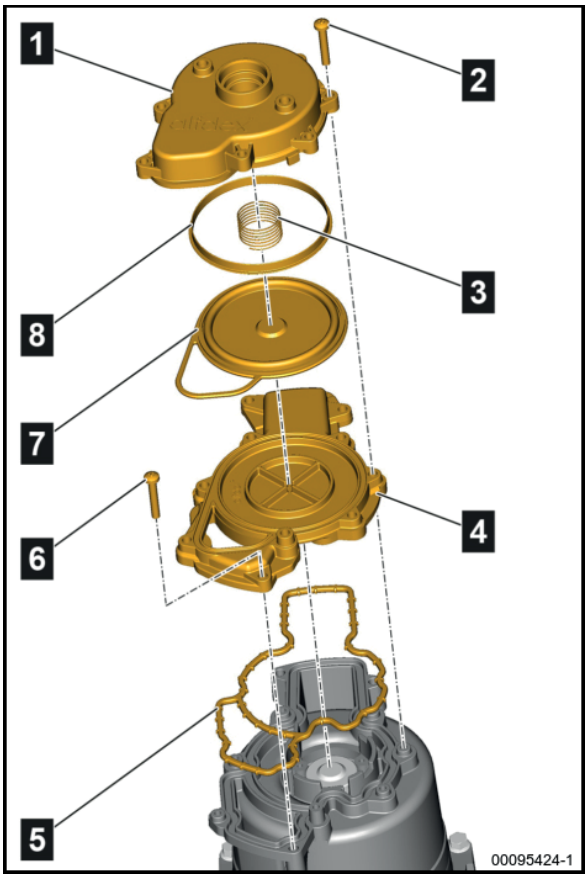
- ►Mark the insulating position of the insulating mat **1**.
- ►Remove the insulating mat **1** from the disk separator

Remove the union



- ►Mark the installation position of the union **1**
- ►Unscrew and remove the mounting bolts **2**
- ►Remove the union **1**
- ►Remove O-ring **3**
- ►Clean the areas to be sealed

Removing the diaphragm



- ►Unscrew and remove the mounting bolts **2**
- ►Remove the valve cover **1** with spring **3**
- ►Remove the seal **8** and diaphragm **7** from the oil cooler housing cover **4**
- ►Unscrew and remove the mounting bolts **6**
- ►Remove the oil cooler housing cover **4**
- ►Pull the profil seal **5** out of the oil cooler housing
- ►Clean the areas to be sealed

Installing the diaphragm

Installing the diaphragm

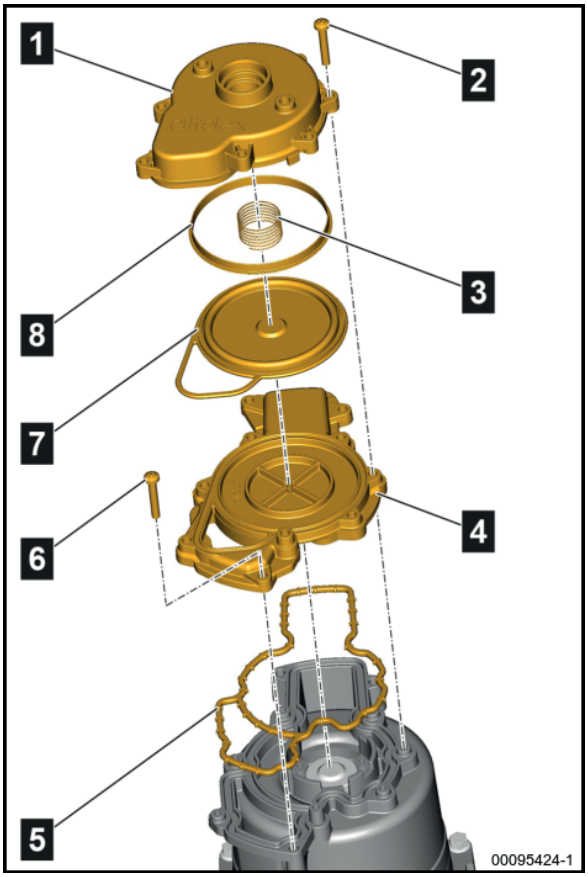
NOTE

Risk of component damage due to reutilised bolts

Therefore:
- Replace any mounting bolts that were unscrewed.

- ►Clean the areas to be sealed
- ►Fit a new profil seal 5 in the oil cooler housing
- ►Attach the oil cooler housing cover 4 and check the profil seal 5 for correct fi
- ►Screw in the new mounting bolts 6 and tighten by hand
- ►Insert the new diaphragm 7 with a new seal 8 into the oil cooler housing cover 4
- ►Attach the valve cover 1 with spring 3
- ►Check the diaphragm 7 and seal 8 for correct fi
- ►Screw in the new mounting bolts 2 and tighten by hand
- ►Check the correct fi of the spring 3
- ►Tighten the mounting bolts 2 and 6 crosswise

Tightening torque..... .... 6 ± 1 Nm



Attaching the union

- ►Clean the areas to be sealed
- ►Attach union 1 with new O-ring 3 as marked

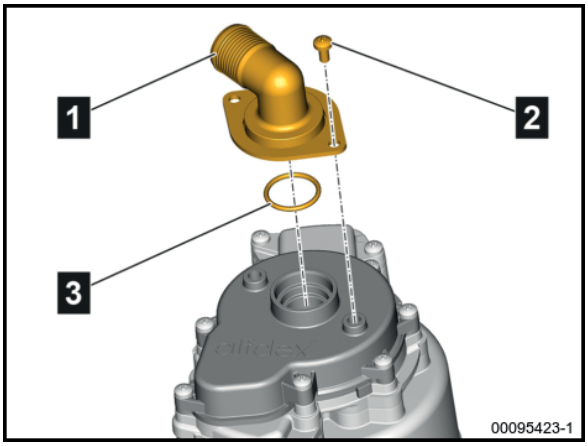
NOTE

Risk of component damage due to reutilised bolts

Therefore:
- Replace any mounting bolts that were unscrewed.

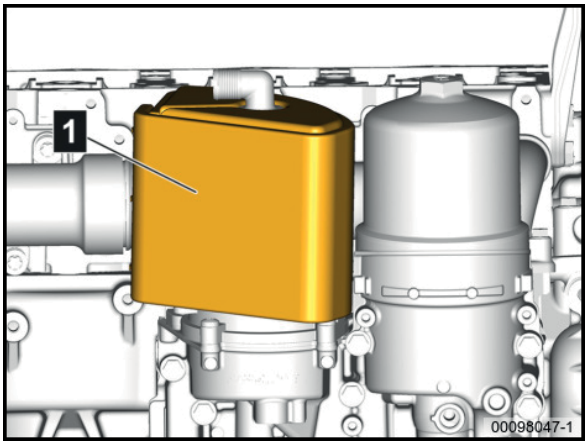
- ►Screw in and tighten the new mounting bolts 2

Tightening torque..... .... 5.2 ± 1.7 Nm

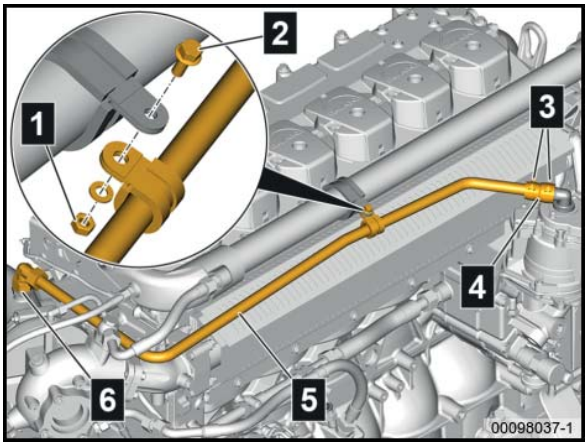


Attaching the insulating mat

- ►Check the insulating mat 1 for damage; replace if necessary
- ►Attach the insulating mat 1 to the disk separator as marked



Mounting the bleed line



►Position the bleed line 5
►Push the moulded hose 4 onto the union
►Screw on and tighten the union nut 6

NOTE

Danger of property damage due to leaks in the hose connections

Therefore:
- Mount hose and spring band clamps as close as possible to the bead.
- Observe the specifie tightening torques according to specifie standard.

►Mount the spring band clamps 3 in the installation position using the hose clamp pliers [1]
►Insert the mounting bolt 2, and then screw on the mounting nut 1 with washer and tighten it

5.4.4 Changing the coolant

Changing the coolant E26

Technical data
Tightening torques
Total fillin amount of engine coolant..... 30 l

Consumables
Coolant ..... For more information see the MAN service product database.

⚠ WARNING

Risk of injury from hot fluids

The coolant reaches high temperatures during operation and causes scalding if it comes into contact.
Therefore:
- Allow the engine to cool down.
- Handle the coolant drain plug with safety gloves only.

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.
Therefore:
- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

ENVIRONMENTAL NOTICE

Risk of contaminating bodies of water and soil

Therefore:
- Collect service products using appropriate and sufficientl large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.
- Undiluted antifreeze must be treated as hazardous waste.

Tip for users

Only use service products in accordance with MAN regulations, as failure to do so will cause the liability for defects to lapse.

↗ https://ws-public.man-mn.com/portal/irj/asp

Literature reference

For information on radiator frost protection, see the MAN service product database.

↗ https://ws-public.man-mn.com/portal/irj/asp

Drain coolant

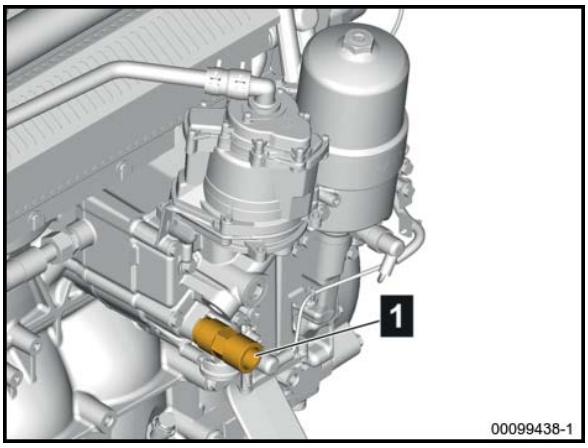
Tip for users

The cooling system is installed by the manufacturer of the overall plant, therefore, only the procedure at the engine is described here. A detailed description is delivered by the manufacturer of the overall plant.

Draining the coolant from the engine

► Drain the coolant at the oil module nozzle **1**
► Collect emerging coolant in a suitable container
► Allow the coolant to drain completely

► Draining the coolant from the cooling system and the heat exchanger (if installed), see corresponding instructions.



Topping up the coolant

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

Therefore:

- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

NOTE

Risk of engine damage due to temperature differences

Therefore:

- Do not add cold coolant to a hot engine.

Tip for users

The cooling system is installed by the manufacturer of the overall plant. A detailed description is delivered by the manufacturer of the overall plant.

Fill the cooling system of the engine with a mixture consisting of tap water and antifreeze based on ethylene glycol or anti-corrosion agent.

See the publication "Service products for MAN industrial gas engines".

The cooling system must be fille with coolant in accordance with the fillin instructions provided by the manufacturer of the overall system.

The proper mixing ratio of water and antifreeze must be restored.

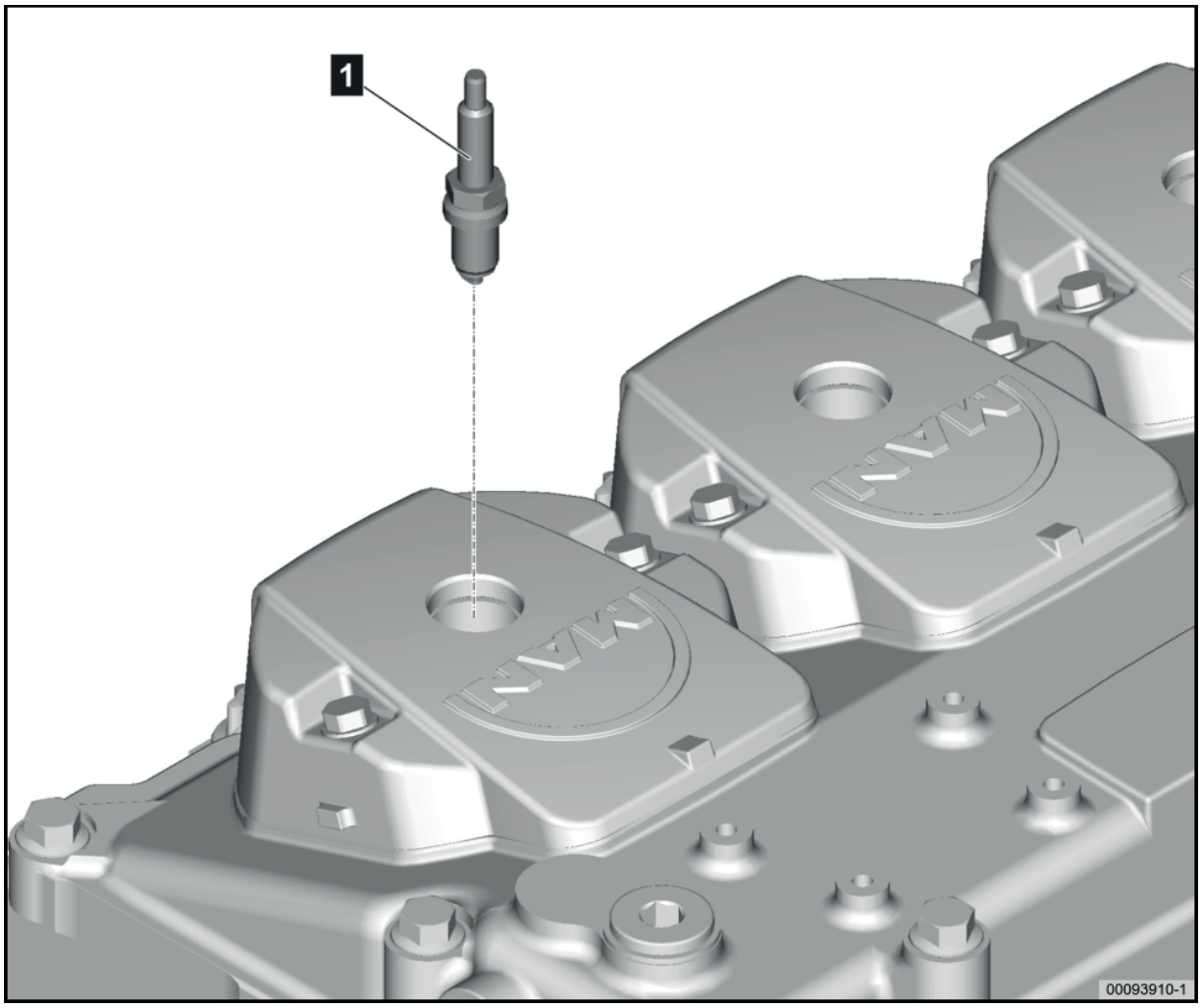
Cooling system with membrane expansion tank

Tip for users

The cooling system is installed by the manufacturer of the overall plant. A detailed description is delivered by the manufacturer of the overall plant.

►After fillin the cooling system, let the electric coolant pump run for approx. 15 minutes and vent the cooling system.
►Observe the cooling system pressure and check the coolant level.

5.4.5 Removing/installing the spark plug



key

1 Spark plug

Technical data
Tightening torques

Original equipment			
Spark plug (dry thread)	M14x1.25		40 Nm
Third-party manufacturer			
Spark plug, third-party manufacturer	M14x1.25		See manufacturer's instructions

Test and setting values

Original equipment			
Electrode distance in the spark plug			0.28 ± 0.05 mm

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Important information

NOTE

Risk of component damage due to incorrect tightening torque

The tightening torque refers to the spark plug installed by MAN.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

Tip for users

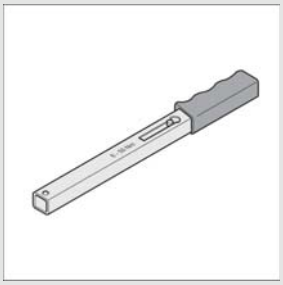
Do not reinstall damaged or dropped spark plugs!

Special tools

1

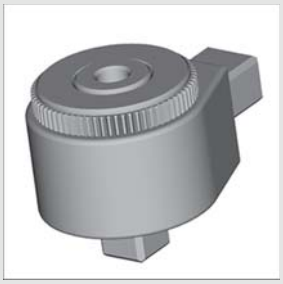
Handle 08.06460-0001
Quantity 1
Handle 9 x 12 x 400 mm
Removing spark plugs in conjunction with:
- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs 51.97710-0005

2



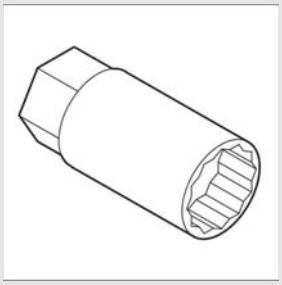
Torque wrench 08.06450-0006
Quantity 1
Torque wrench, 6 - 50 Nm / 9 x 12 x 333 mm, 3/8" square drive
Installing the spark plugs in conjunction with:
- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs 51.97710-0005

3



Ratchet 08.06455-0001
Quantity 1
3/8” square ratchet 10 - 9 x 12
Removing spark plugs in conjunction with:
- Handle 08.06460-0001
- Socket wrench insert for spark plugs 51.97710-0005

Installing the spark plugs in conjunction with:
- Torque wrench 08.06450-0006
- Socket wrench insert for spark plugs 51.97710-0005

4		**Socket for spark plugs** Quantity 1 Removing the spark plugs in conjunction with: • Handle 08.06460-0001 • Ratchet 08.06455-0001 Installing the spark plugs in conjunction with: Torque wrench 08.06450-0006 • Ratchet 08.06455-0001	51.97710-0005

Removing spark plugs

Unscrewing the spark plugs

⚠ DANGER

Danger to life from electrical power

Touching the ignition system during operation is life-threatening.

Therefore:

- Never disconnect the spark plug connector while the engine is running.

►Pull off the spark plug connector

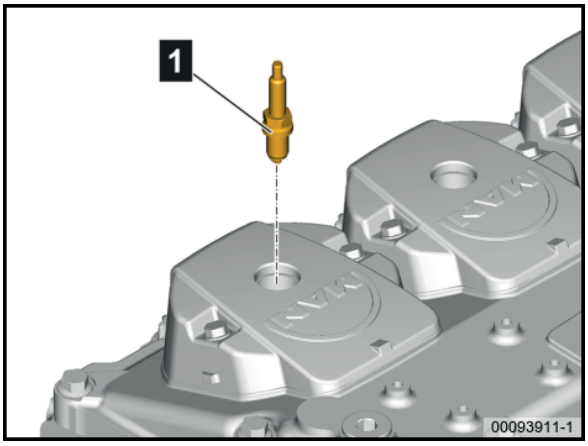
Tip for users

Prior to dismounting, use compressed air to remove any fouling and contamination from the installation bay.

►Use compressed air to clean the installation bay

►Assemble the special tool consisting of handle [1], ratchet [3], extension and socket wrench insert for spark plugs [4]

►Loosen and unscrew the spark plugs **1** using the special tool



Installing spark plugs

Screwing in the spark plugs

Tip for users

Do not reinstall damaged or dropped spark plugs!

NOTE

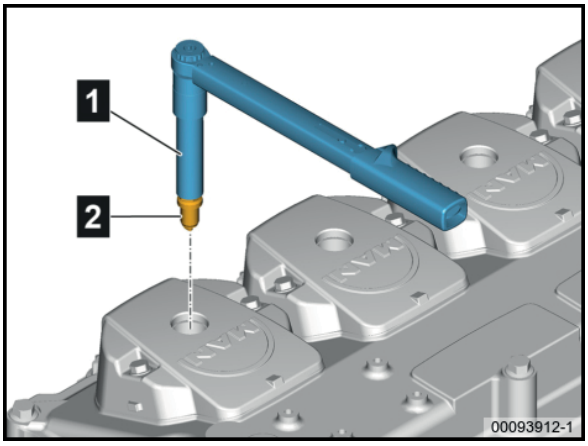
Risk of component damage due to incorrect tightening torque

The tightening torque should correspond to the structure of MAN spark plug.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

►Screw in the spark plug **2** by hand using the socket wrench insert for spark plugs [4]



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► Assemble the special tool consisting of torque wrench [2], ratchet [3], extension and socket wrench insert for spark plugs [4]
► Tighten the spark plugs **2** using the special tool **1**

Tightening torque values of original equipment

Tightening torque (dry thread)..... ..... 40 Nm

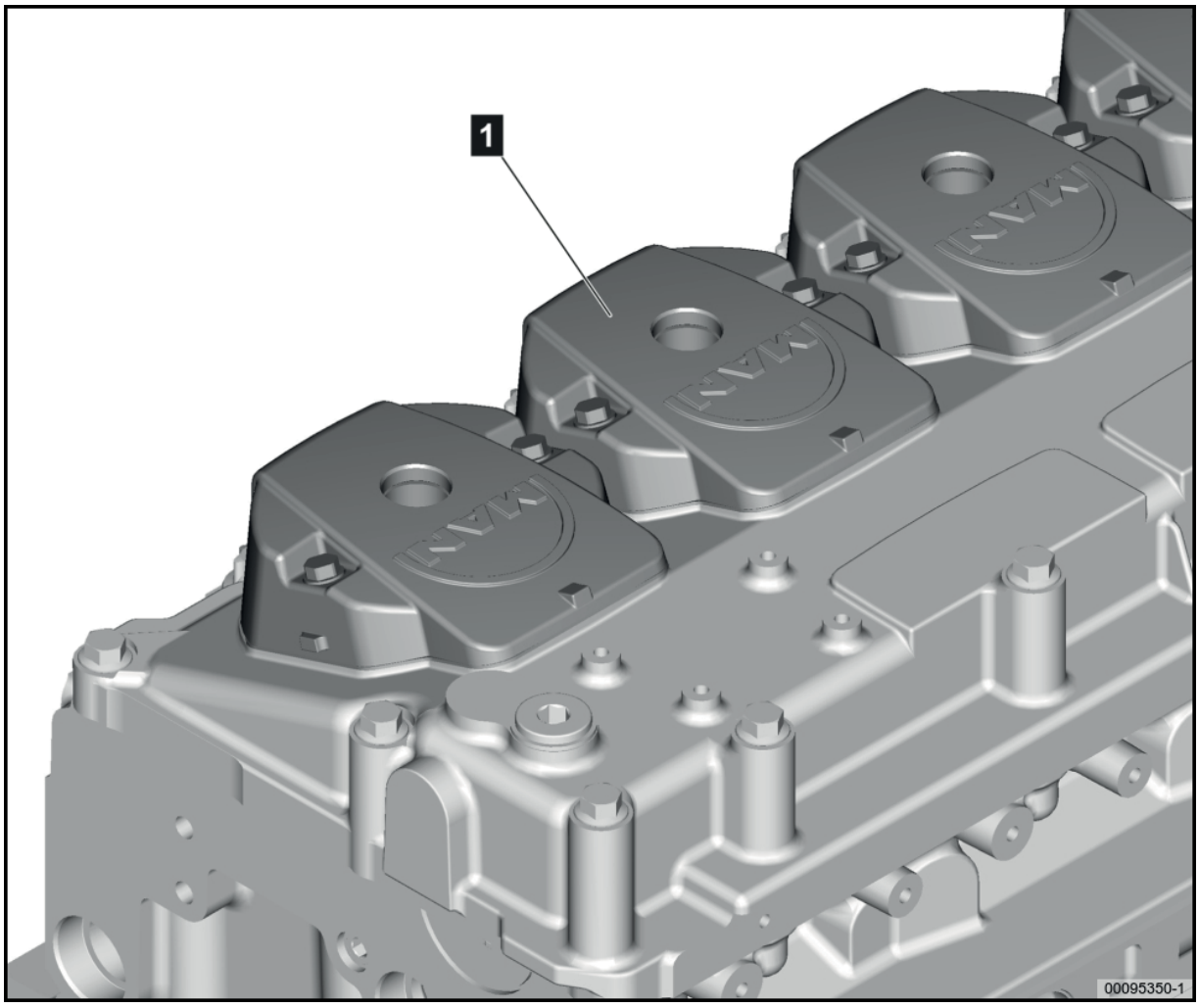
Tightening torque values third-party manufacturer

Tightening torque..... ..... See manufacturer's instructions

► Position the spark plug connectors and let it lock into place

5.4.1 Checking and adjusting E2676 valve clearance

5.4.1.1 Removing/installing the cylinder head cover (small)



key

1 Cylinder head cover

Technical data

Tightening torques

Mounting bolts of cylinder head cover on cylinder head..... ..... 22 Nm

Consumables

Assembly lubricant P-80 ..... 09.15014-0031

Important information

NOTE

Risk of component damage due to incorrectly tightened bolted connections

Therefore:

- Only use an impact screwdriver to tighten to max. 50% of the specifie fina tightening torque.
- Final tightening must always be applied manually using a torque wrench.

NOTE

Risk of damage to component by contaminants

Therefore:

- Clean components and sealing surfaces before the assembly with suitable means.
- Protect cleaned surfaces from re-contamination.

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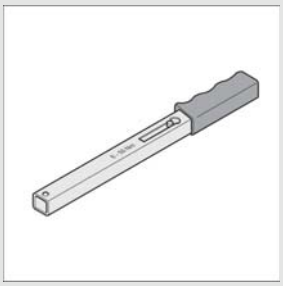
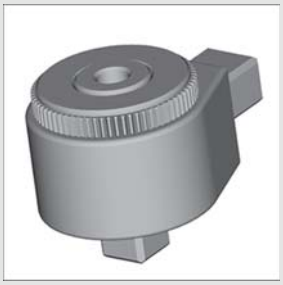
Tip for users

The repair manual describes the repair method of an engine variant as an example. Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions. In cases such as these, plan and execute the repair instructions accordingly.

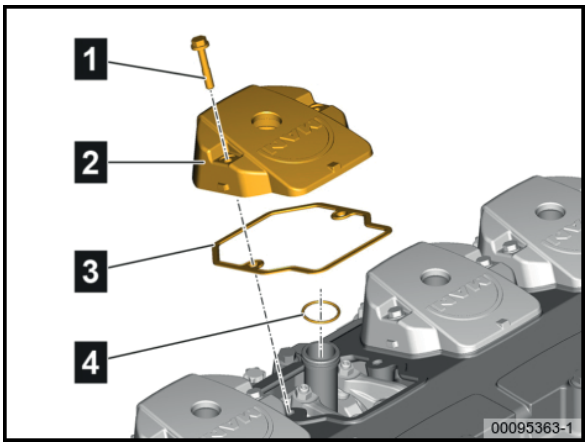
Special tools

1		**Torque wrench** Quantity 1	08.06450-0006
2		**Ratchet** Quantity 1	08.06455-0001
3		**Angle extension** Quantity 1	08.06139-9025

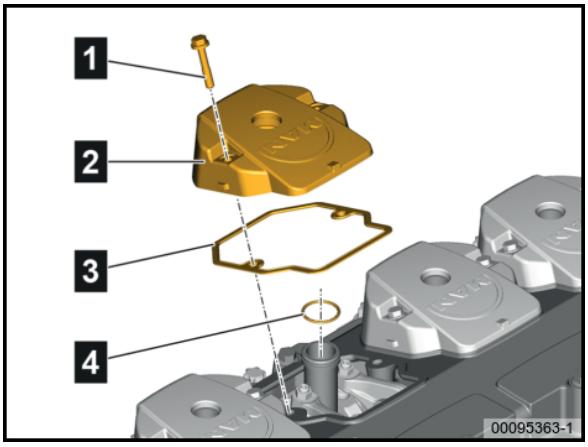
Removing the cylinder head cover (small)

Removing the cylinder head cover

- ►Unscrew the mounting bolts **1**
- ►Remove the cylinder head cover **2** with seal **3**
- ►Remove O-ring **4**
- ►Clean the areas to be sealed
- ►Repeat the same procedure for all cylinder head covers



Attaching the cylinder head cover (small)



- ►Clean the areas to be sealed
- ►Apply a thin layer of installation lubricant P-80 on the new O-ring 4
- ►Fit the new O-ring 4 onto the spark plug guide tube
- ►Check the seal 3 for damages, renew if necessary
- ►Position the cylinder head cover 2 with seal 3
- ►Screw in the mounting bolts 1
- ►Tighten the mounting bolts 1 with torque wrench [1], ratchet [2] and angle extension [3]

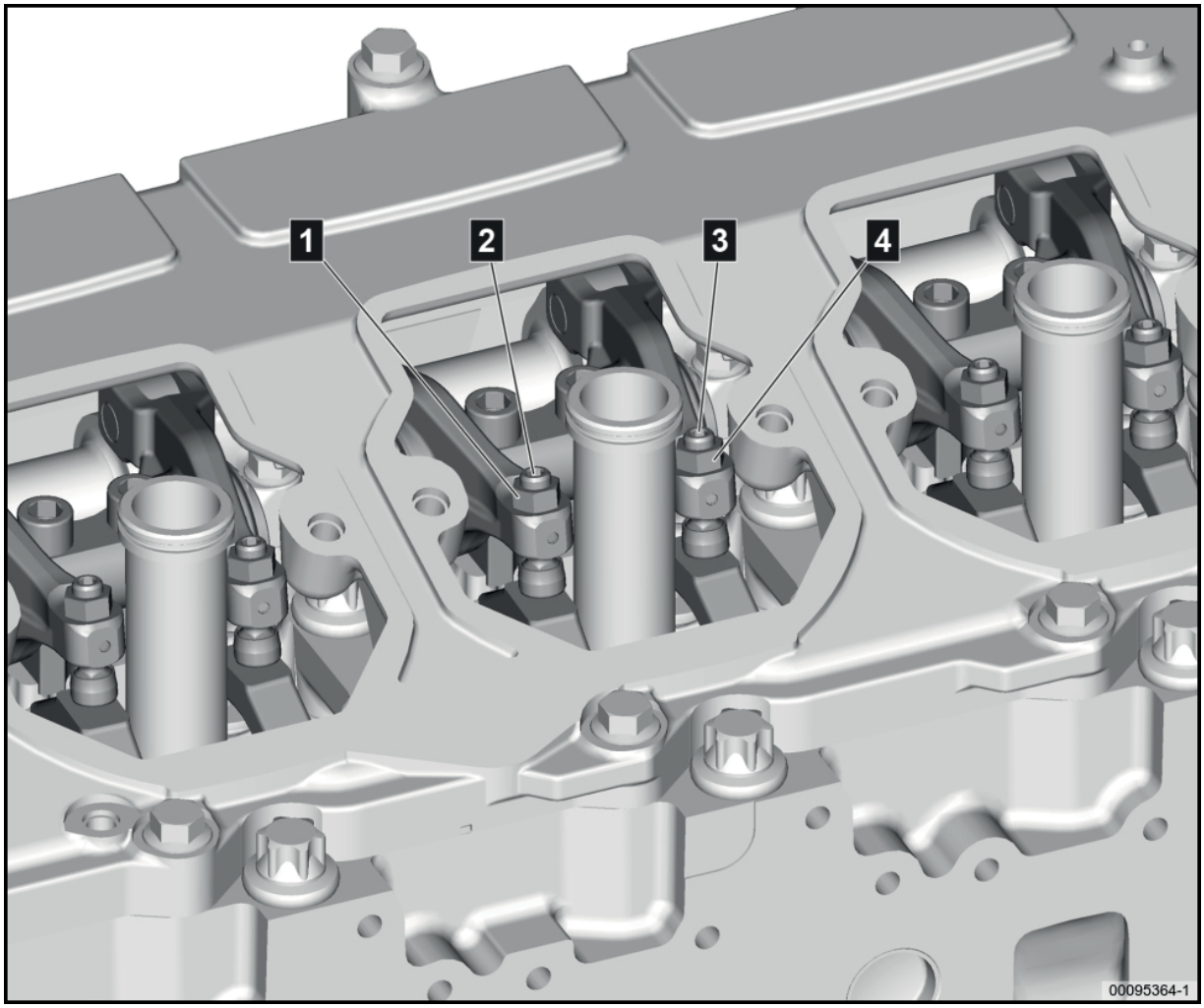
Tightening torque..... ..... 22 Nm

- ►Repeat the same procedure for all cylinder head covers

5.4.1.2 Check & adjust valve/s

Preparatory measures

- ►Removing/installing the cylinder head cover (small), Page 67



key

1 Adjusting screw, exhaust valve
2 Lock nut
3 Lock nut
4 Adjusting screw, intake valve

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Technical data

Tightening torques

Lock nuts..... M10x1-8.8..... ..... 45 Nm

Test and setting values

Intake valve clearance..... 0.50 mm

Exhaust valve clearance..... ..... 0.60 mm

Important information

NOTE

Risk of component damage due to incorrectly tightened bolted connections

Therefore:

- Only use an impact screwdriver to tighten to max. 50% of the specifie fina tightening torque.
- Final tightening must always be applied manually using a torque wrench.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair instructions accordingly.

Special tools

1

Engine cranking unit 80.99626-6008
Quantity 1
Cranking the engine in conjunction with: 80.99627-0001

2

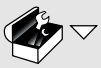
Gear ratchet 80.99627-0001
Quantity 1
Cranking the engine 1/2" in conjunction with:
80.99626-6008

3

Feeler gauge 08.75310-3306
Quantity 1
Adjusting the valve clearance

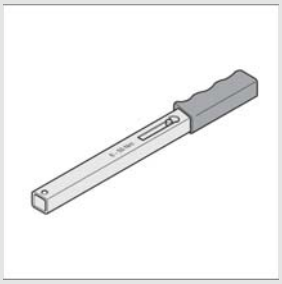
4

Valve adjusting wrench, wrench width 14 80.99603-6031
Quantity 1
Adjusting the valve clearance



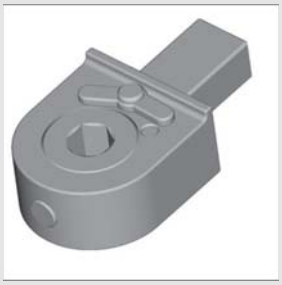
Valve adjusting wrench insert 80.99603-0337
Quantity 1

5



Torque wrench 08.06450-0006
Quantity 1
Adjusting the valve clearance

6



Ratchet 08.06410-9072
Quantity 1
Adjusting the valve clearance

7

Handle 08.06460-0003
Quantity 1

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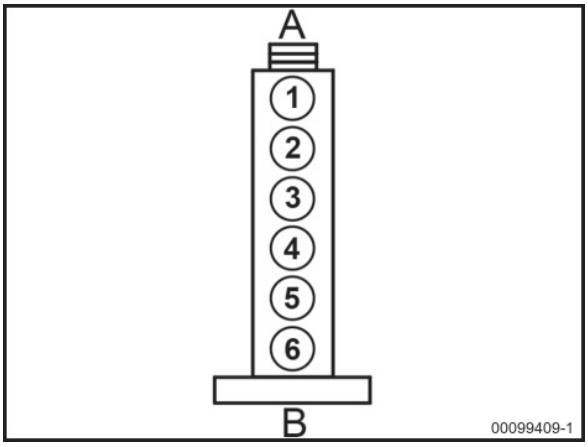
Check & adjust valve/s

Cylinder allocation E2676

Cylinder allocation for valve adjustment E2676

A = Vibration damper side

B = Flywheel side

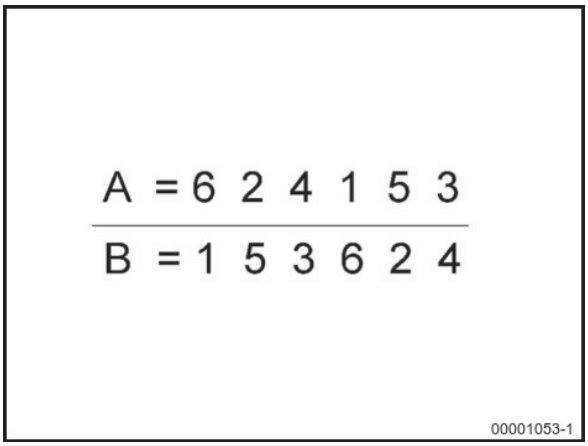


Bringing the engine in the adjusting position

►Mount the engine cranking unit [1]
►Crank the engine in the engine's running direction using the engine barring gear [1] and gear ratchet [2] until the rocker arms overlap
►Adjust free rocker arms as per table

A = Rocker arms in overlap

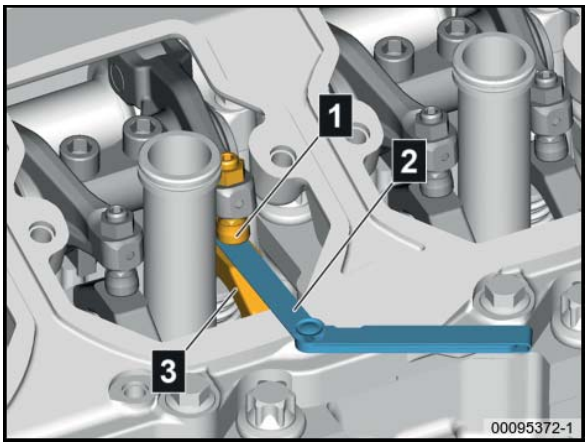
B = Rocker arms free



Checking the intake valve clearance

►Insert the 0.5 mm feeler gauge [3] **2** between the ball cup **1** and the valve crosshead **3**

The valve clearance must be adjusted if it is not 0.5 mm.

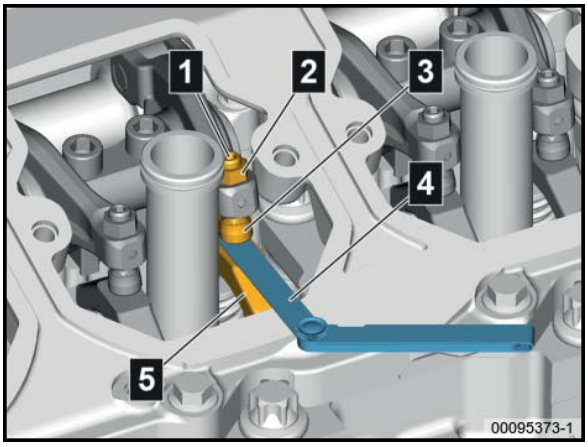


Adjusting the intake valve clearance

►Undo the lock nut **2** and adjusting screw **1**
►Insert the 0.5 mm feeler gauge [3] **4** between the ball cup **3** and the valve crosshead **5**
►Screw in the adjusting screw **1** until the 0.5 mm feeler gauge [3] **4** can be moved between the ball cup **3** and the valve crosshead **5** with little resistance
►Brace the adjusting screw **1** using the valve wrench size 14 [4], ratchet [6] and handle [7]
►Tighten lock nut **2** using the torque wrench [5]

Tightening torque..... ..... 45 Nm

►Check the setting again and, if necessary, repeat the setting procedure



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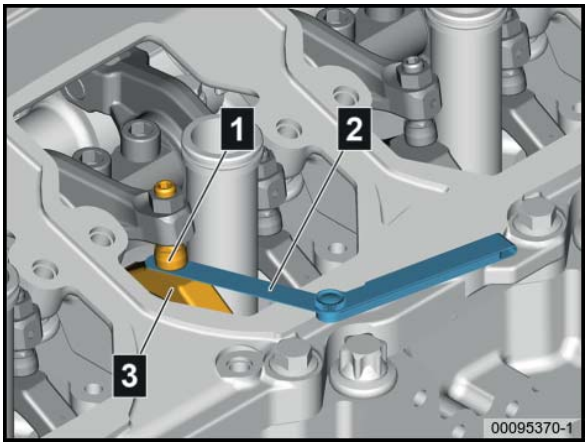
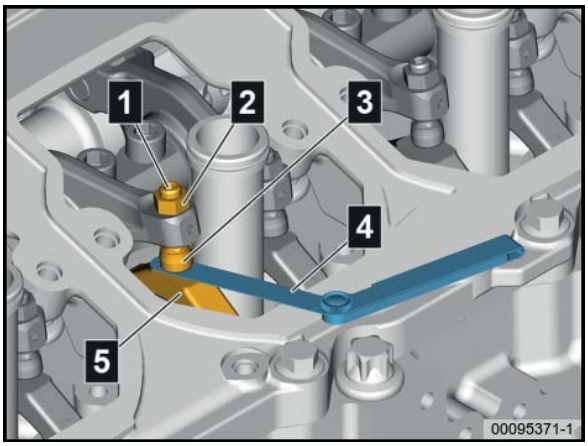
Checking the exhaust valve clearance



►Insert the 0.6 mm feeler gauge [3] **2** between the ball cup **1** and the valve crosshead **3**

The valve clearance must be adjusted if it is not 0.6 mm.

Adjusting the exhaust valve clearance



►Undo the lock nut **2** and adjusting screw **1**
►Insert the 0.6 mm feeler gauge [3] **4** between the ball cup **3** and the valve crosshead **5**
►Screw in the adjusting screw **1** until the 0.6 mm feeler gauge [3] **4** can be moved between the ball cup **3** and the valve crosshead **5** with little resistance
►Brace the adjusting screw **1** using the valve wrench size 14 [4], ratchet [6] and handle [7]
►Tighten lock nut **2** using the torque wrench [5]

Tightening torque..... ..... 45 Nm

►Check the setting again and, if necessary, repeat the setting procedure

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5.5.1 engine oil change

Engine oil change E2876

Technical data
Tightening torques

Oil filte lid in the oil filte (vertical oil filters ..... 25 Nm

Screw plug in oil sump..... 80 Nm

Test and setting values

Engine oil refill quantity (with filter change).....

E2876 TE302.....

deep oil sump..... 23 litres

E2876 LE202/212.....

deep oil sump..... 74 litres

E2876 LE302.....

deep oil sump..... 44 litres

deep oil sump (optional, only with natural gas operation)..... 31 litres

E2876 E302/312/322.....

shallow oil sump..... 31 litres

deep oil sump..... 73 litres

Consumables

Engine oil ..... see oil specification

⚠ WARNING

Risk of injury from hot service products

Therefore:
- Wear personal protective equipment.
- Only touch the oil drain plugs using chemical-resistant safety gloves.
- Follow the accident prevention regulations.
- Comply with occupational health and safety regulations.

NOTE

Hazard of component damage from using incorrect tools

The frequency of the impact screwdriver causes dirt particles to fall out of the filte element.

Therefore:
- Do not use an impact screwdriver to loosen or tighten the cover.

Tip for users

Drain the engine oil when the engine is at operating temperature.

Tip for users

The oil filte insert must be replaced during every engine oil change.

Tip for users

When changing the oil, use a container with adequate capacity to avoid any oil overflow

Tip for users

Only use service products in accordance with MAN regulations, as failure to do so will cause the liability for defects to lapse.

For basic information on the service products, refer to the publication “Service products for MAN gas engines”.

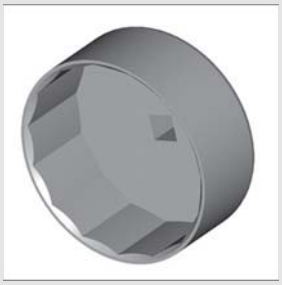
You can fin approved products on the Internet at:

https://ws-public.man-mn.com/portal/irj/asp

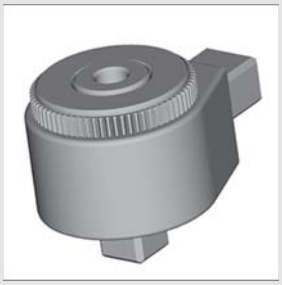
Literature reference

For information on engine oil see the MAN service product database.
↗ https://ws-public.man-mn.com/portal/irj/asp

Special tools

1 

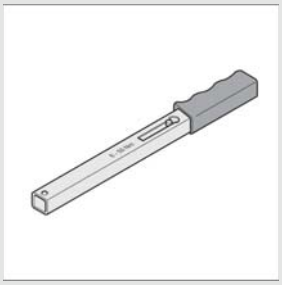
Keys 80.99603-0251
Quantity 1
Loosening the oil filte lid in conjunction with 08.06455-0001, 08.06460-0001

2 

Ratchet 08.06455-0001
Quantity 1
Tightening the oil filte lid

3

Handle 08.06460-0001
Quantity 1
Loosening the oil filte lid in conjunction with 08.06455-0001

4 

Torque wrench 08.06450-0006
Quantity 1
Tightening the oil filte lid in conjunction with 08.06455-0001

5

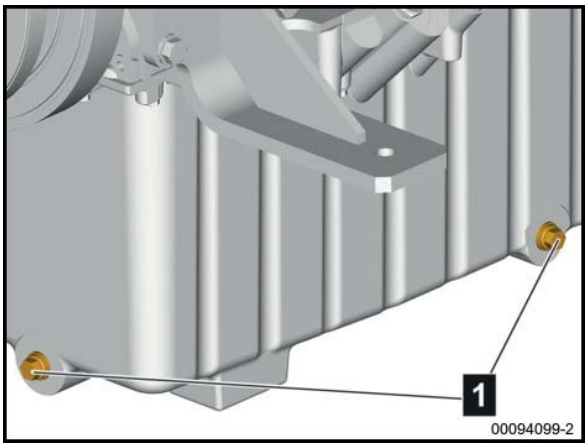
Ratchet 08.06455-0002
Quantity 1
Tightening the oil drain plug in conjunction with 08.06450-0002

Draining the engine oil

Tip for users

Attachments of the manufacturer of the overall plant (automatic refill lines, etc.) may have an impact on the draining process. Corresponding descriptions must be provided by the manufacturer of the overall plant.

Draining the engine oil (deep oil sump)



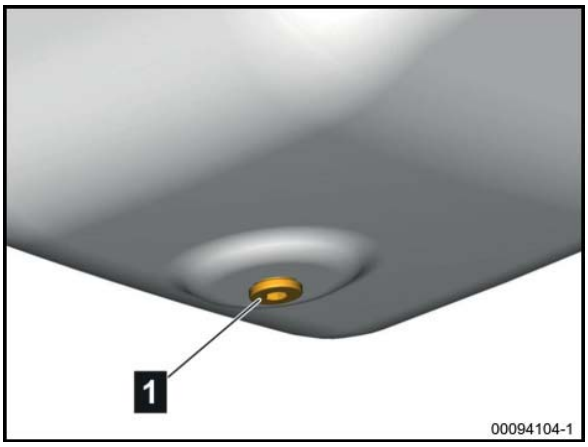
There are several oil drain plugs 1 to drain the oil.

Procedure is described with an oil drain plug here.

- ►Place a suitable container under the oil drain plug 1
- ►Unscrew the oil drain plug 1 from the oil sump and allow the engine oil to drain off completely
- ►Screw in the oil drain plug 1 with a new seal
- ►Tighten the oil drain plug 1 using torque wrench [4], ratchet [2] and suitable socket wrench insert

Tightening torque..... ..... 80 Nm

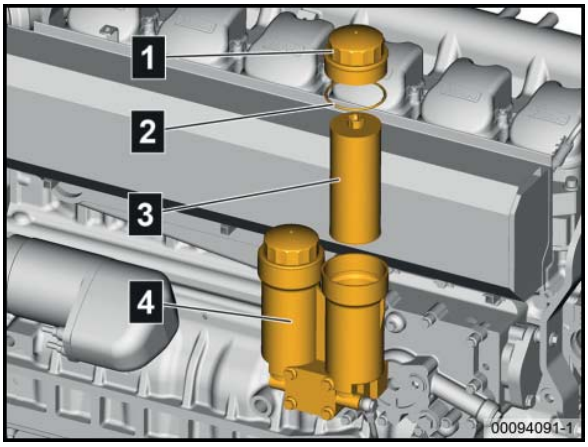
Draining the engine oil (shallow oil sump)



- ►Place a suitable container under the oil drain plug 1
- ►Unscrew the oil drain plug 1 from the oil sump and allow the engine oil to drain off completely
- ►Screw in the oil drain plug 1 with a new seal
- ►Tighten the oil drain plug 1 using torque wrench [4], ratchet [2] and suitable socket wrench insert

Tightening torque..... ..... 80 Nm

Changing the oil filter insert (vertical oil filters)



- ►Loosen the oil filte lid 1 using the handle [3], ratchet [3] and wrench [1], and unscrew by 2-3 turns
- ►Wait for approx. 2 minutes until the engine oil has drained out of the oil filte 4 into the oil sump
- ►Unscrew oil filte lid 1 from the oil filte 4 and remove the O-ring 2
- ►Remove the oil filte insert 3 from the oil filte lid 1
- ►Clean the oil filte lid 1
- ►Fit a new O-ring 2 onto the oil filte lid 1
- ►Insert the new oil filte insert 3 into the oil filte lid 1.
- ►Screw the filte lid 1 into the oil filte 4
- ►Tighten the oil filte lid 1 using torque wrench [4], ratchet [5] and wrench [1]

Tightening torque..... ..... 25 Nm

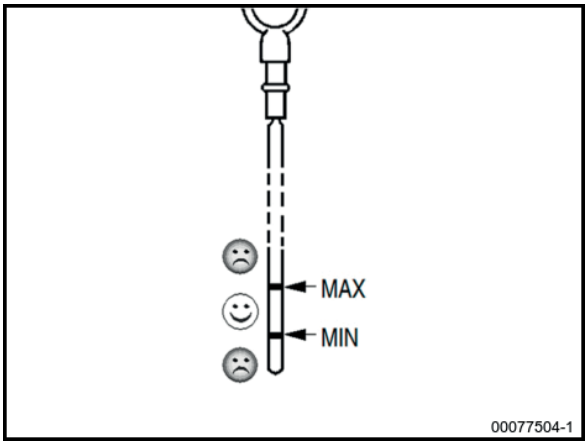
Proceed in the same way to replace the second filte insert.

Pouring in engine oil

NOTE

Risk of engine damage due to incorrect oil level

Therefore:
- Never fil more than the indicated oil quantity.
- Observe the Min/Max marks on the oil dipstick.
- Check the oil level and correct it if necessary.

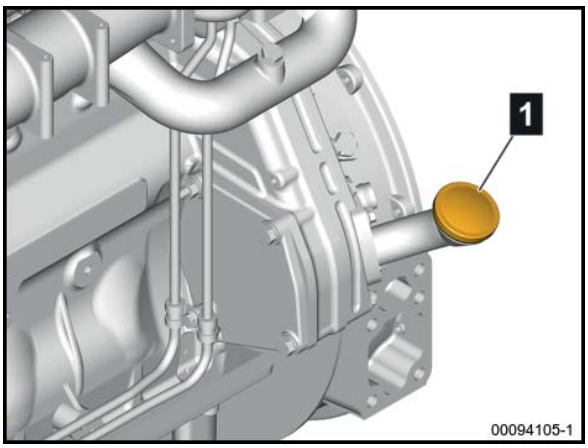


Pouring in engine oil

►Open the cover **1**
►Slowly fil in engine oil using the fille neck

Engine oil refil quantity ..... see Test and
(with filte change)..... setting values

►Screw the cover **1** back on
►Start the engine and let it run at low speed for a few minutes



NOTE

Risk of engine damage due to lack of oil pressure

Therefore:
- Observe the oil pressure gauge.
- Check the oil pressure and check for leaks
- If no oil pressure builds up after approx. 10 seconds of operation, immediately shut down the engine.
- Identify and rectify the cause.

►Setting down the engine
►Checking the engine oil level

5.5.2 Checking the engine oil level

Checking the E2876 engine oil level

NOTE

Risk of engine damage due to incorrect oil level

Therefore:
- Never fil more than the indicated oil quantity.
- Observe the Min/Max marks on the oil dipstick.
- Check the oil level and correct it if necessary.

Tip for users

Check the oil level only about 5 minutes after the machine has been shut down.

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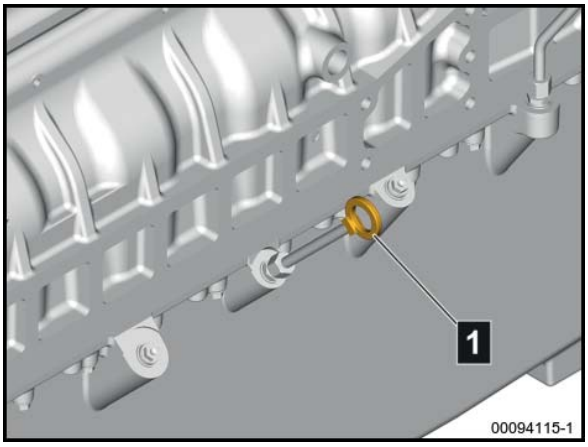
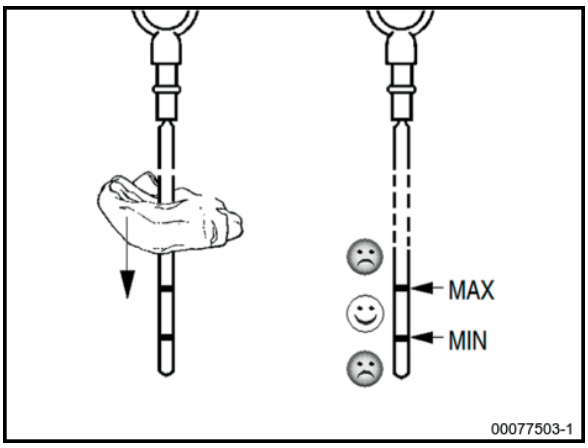
►Pull out the oil dipstick **1**.
►Wipe the oil dipstick **1** off with a clean, lint-free cloth.
►Insert the oil dipstick **1** again until it reaches the stop.
►Pull out the oil dipstick **1** again and check the oil level

The oil level must be between the MIN and MAX marks (notches) on the oil dipstick.

►Insert the oil dipstick **1** again until it reaches the stop.
►If necessary, top up engine oil or drain in case of overfil
►Check the oil level again

Proceed in the same way for the deep oil sump.





5.5.3 Changing the coolant

Change the coolant E2876

Technical data
Tightening torques

Screwing the screw plug into the oil cooler housing	M14x1.5		40 Nm
Total fillin amount of engine coolant			16 l

⚠ WARNING

Risk of injury from hot fluids

The coolant reaches high temperatures during operation and causes scalding if it comes into contact.

Therefore:

- Allow the engine to cool down.
- Handle the coolant drain plug with safety gloves only.

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

Therefore:

- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

ENVIRONMENTAL NOTICE

Risk of contaminating bodies of water and soil

Therefore:
- Collect service products using appropriate and sufficientl large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.
- Undiluted antifreeze must be treated as hazardous waste.

Tip for users

Only use service products in accordance with MAN regulations, as failure to do so will cause the liability for defects to lapse.

↗ https://ws-public.man-mn.com/portal/irj/asp

Literature reference

For information on radiator frost protection, see the MAN service product database.

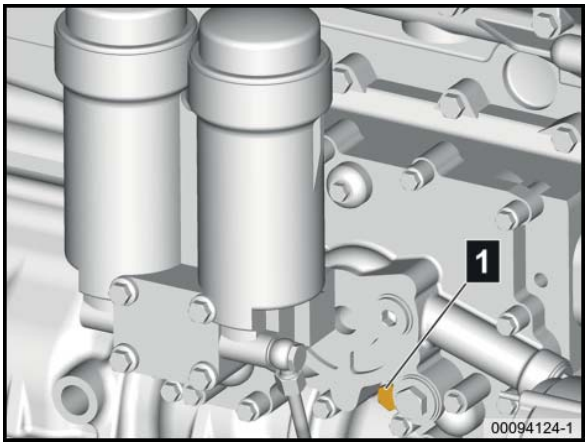
↗ https://ws-public.man-mn.com/portal/irj/asp

Drain coolant

Tip for users

The cooling system is installed by the manufacturer of the overall plant, therefore, only the procedure at the engine is described here. A detailed description is delivered by the manufacturer of the overall plant.

Draining the coolant from the engine



►Unscrew the drain plug **1** on the oil cooler housing
►Collect emerging coolant in a suitable container.
►Allow the coolant to drain completely
►Screw in the drain plug **1** with a new seal and tighten

Tightening torque..... ..... 40 Nm

►Draining the coolant from the cooling system and the heat exchanger (if installed), see corresponding instructions.

Topping up coolant

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

Therefore:
- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

NOTE

Risk of engine damage due to temperature differences

Therefore:
- Do not add cold coolant to a hot engine.

Tip for users

The cooling system is installed by the manufacturer of the overall plant. A detailed description is delivered by the manufacturer of the overall plant.

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Fill the cooling system of the engine with a mixture consisting of tap water and antifreeze based on ethylene glycol or anti-corrosion agent.

See the publication "Service products for MAN industrial gas engines".

The cooling system must be fille with coolant in accordance with the fillin instructions provided by the manufacturer of the overall system.

The proper mixing ratio of water and antifreeze must be restored.

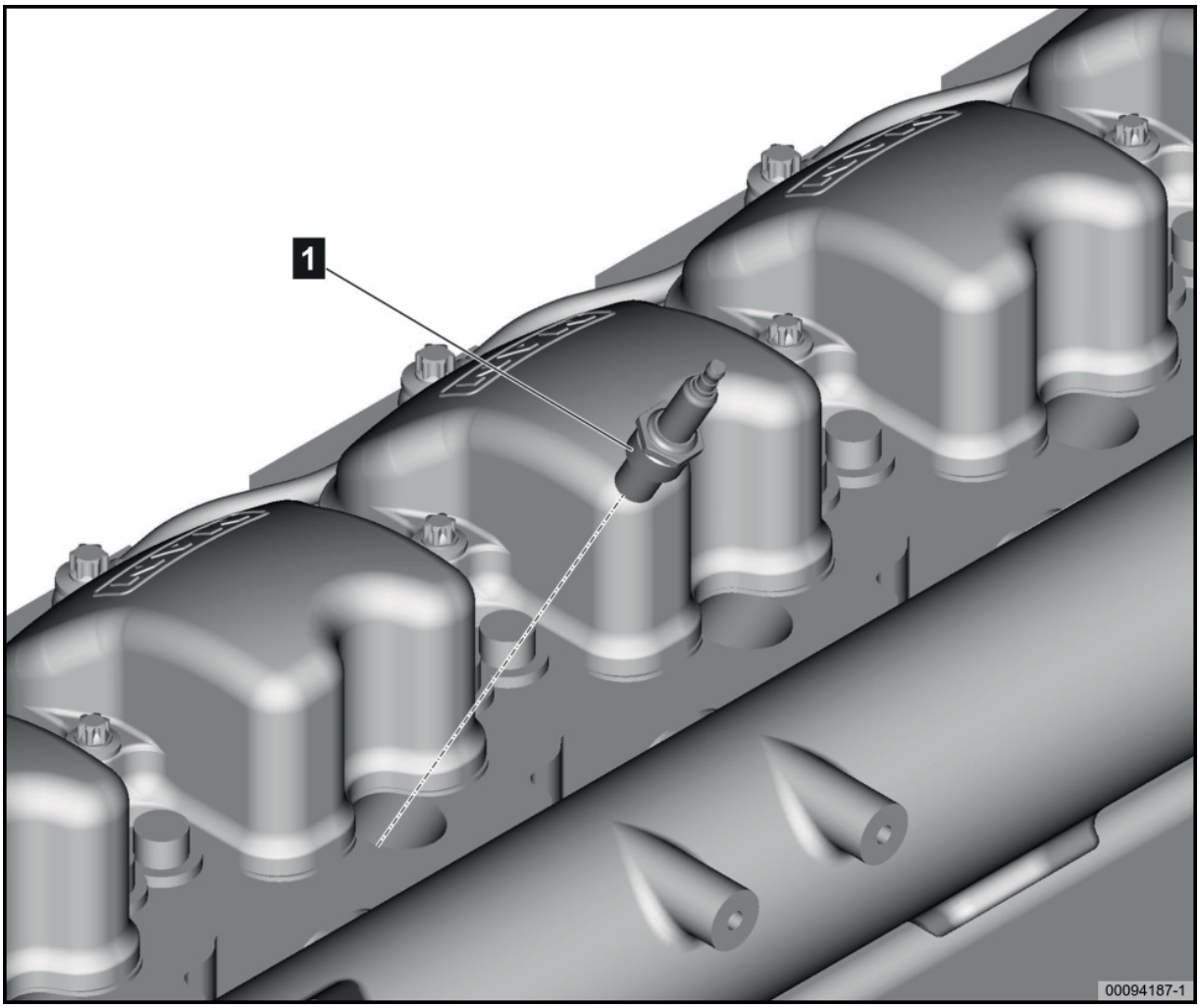
Cooling system with membrane expansion tank

Tip for users

The cooling system is installed by the manufacturer of the overall plant. A detailed description is delivered by the manufacturer of the overall plant.

- ►After fillin the cooling system, let the electric coolant pump run for approx. 15 minutes and vent the cooling system.
- ►Observe the cooling system pressure and check the coolant level.

5.5.4 Removing/installing the spark plug



key

1 Spark plug

Technical data

Tightening torques

Original equipment			
Spark plug thread, dry	M14x1.25		40 Nm
Third-party manufacturer			
Spark plug, third-party manufacturer	M14x1.25		See manufacturer's instructions

Test and setting values

Original equipment	
Electrode distance in the spark plug	0.28 ± 0.05 mm

Important information

NOTE

Risk of component damage due to incorrect tightening torque

The tightening torque should correspond to the structure of MAN spark plug.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

Tip for users

Do not reinstall damaged or dropped spark plugs!

Special tools

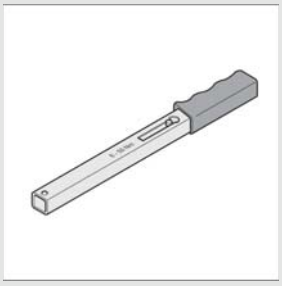
1

Handle 08.06460-0001
Quantity 1
Handle 9 x 12 x 400 mm

Removing spark plugs in conjunction with:

- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs 51.97710-0005

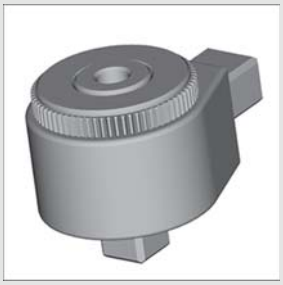
2



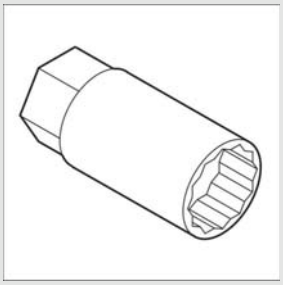
Torque wrench 08.06450-0006
Quantity 1
Torque wrench, 6 - 50 Nm / 9 x 12 x 333 mm, 3/8" square drive

Installing the spark plugs in conjunction with:

- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs 51.97710-0005

3 

Ratchet 08.06455-0001
Quantity 1
3/8” square ratchet 10 - 9 x 12
Removing spark plugs in conjunction with:
• Handle 08.06460-0001
• Socket wrench insert for spark plugs 51.97710-0005
Installing the spark plugs in conjunction with:
• Torque wrench 08.06450-0006
• Socket wrench insert for spark plugs 51.97710-0005

4 

Socket for spark plugs 51.97710-0005
Quantity 1
Removing the spark plugs in conjunction with:
• Handle 08.06460-0001
• Ratchet 08.06455-0001
Installing the spark plugs in conjunction with:
Torque wrench 08.06450-0006
• Ratchet 08.06455-0001

Removing spark plugs

Removing spark plugs

⚠ DANGER

Danger to life from electrical power

Touching the ignition system during operation is life-threatening.

Therefore:

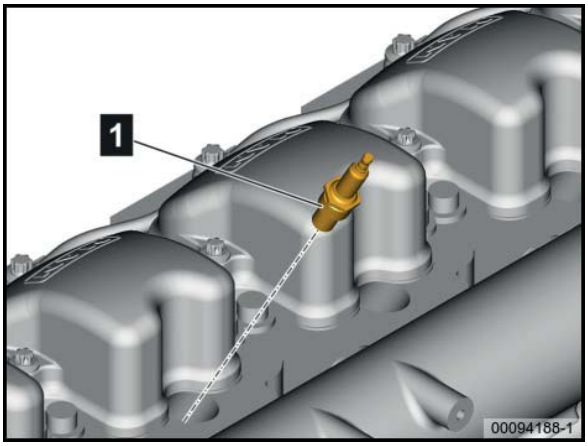
- Never disconnect the spark plug connector while the engine is running.

►Pull off the spark plug connector

Tip for users

Prior to dismounting, use compressed air to remove any fouling and contamination from the installation bay.

►Use compressed air to clean the installation bay
►Assemble the special tool consisting of handle [1], ratchet [3], extension and socket wrench insert for spark plugs [4]
►Loosen and unscrew the spark plugs **1** using the special tool

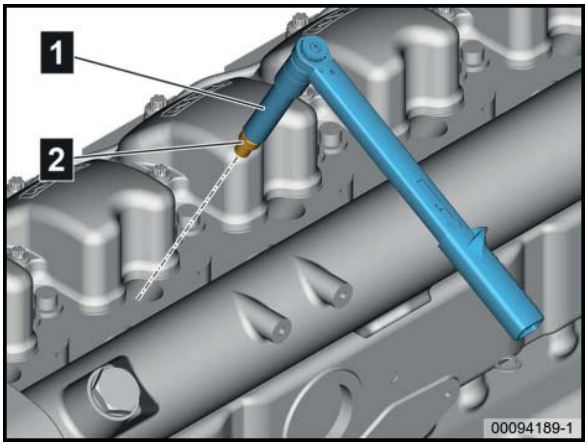


Installing spark plugs

Screwing in the spark plugs

Tip for users

Do not reinstall damaged or dropped spark plugs!



NOTE

Risk of component damage due to incorrect tightening torque

The tightening torque should correspond to the structure of MAN spark plug.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

►Screw in the spark plug **2** by hand using the socket wrench insert for spark plugs [4]

►Assemble the special tool **1** consisting of torque wrench [2], ratchet [3], extension and socket wrench insert for spark plugs [4]

►Tighten the spark plugs **2** using the special tool **1**

Tightening torque values of original equipment

Tightening torque (dry thread)..... ..... 30 Nm

Tightening torque values third-party manufacturer

Tightening torque third-party manufacturer..... ..... See manufacturer's instructions

►Position the spark plug connectors and let it lock into place

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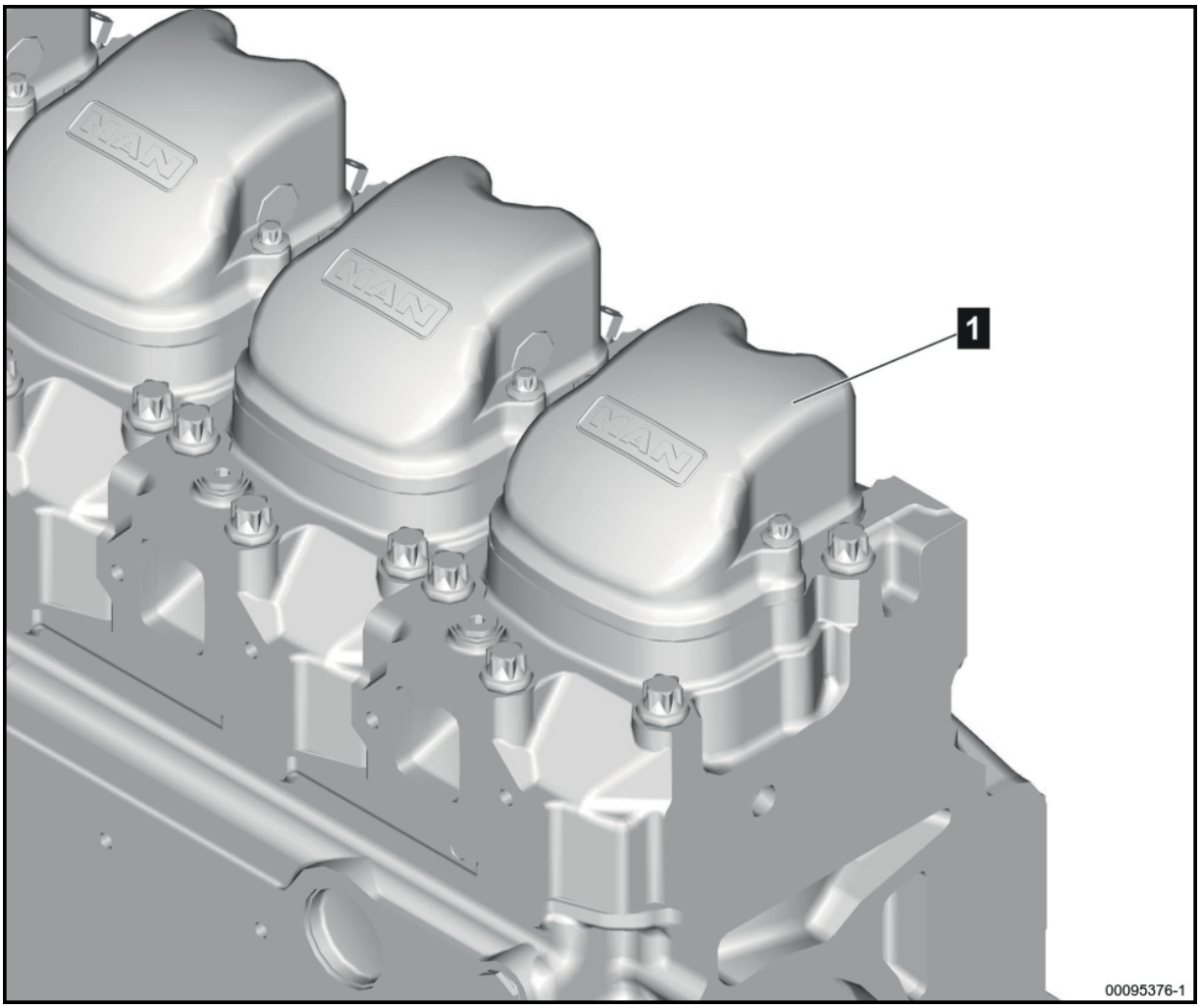
5.5.1 Checking and adjusting E2876 valve clearance

5.5.1.1 Removing/installing the cylinder head cover



key

1 Cylinder head cover

Important information

NOTE

Risk of component damage due to incorrectly tightened bolted connections

Therefore:

- Only use an impact screwdriver for preliminary tightening to max. 50 % of fina tightening torque.
- Final tightening must always be applied manually using a torque wrench

NOTE

Risk of damage to component by contaminants

Therefore:

- Clean components and sealing surfaces before the assembly with suitable means
- Protect cleaned surfaces from re-contamination

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

ENVIRONMENTAL NOTICE

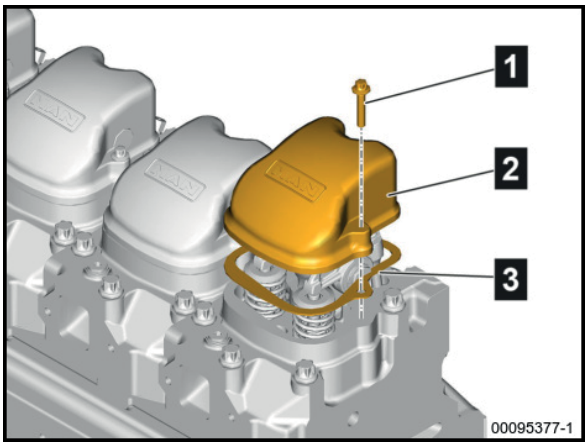
Risk of contaminating bodies of water and soil

Therefore:

- Collect service products using appropriate and sufficientl large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.

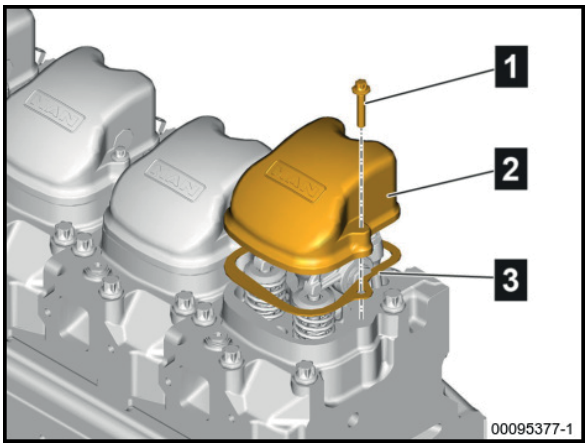
Removing the cylinder head cover

Removing the cylinder head cover



►Unscrew the mounting bolts 1
►Remove the cylinder head cover 2 with seal 3 from the cylinder head
►Clean the areas to be sealed

Mounting the cylinder head cover



►Fit the cylinder head cover 2 with a new seal 3
►Screw in mounting bolts 1 and tighten crosswise

5.5.1.2 Check & adjust valve/s

Preparatory measures

►Removing/installing the cylinder head cover, Page 84

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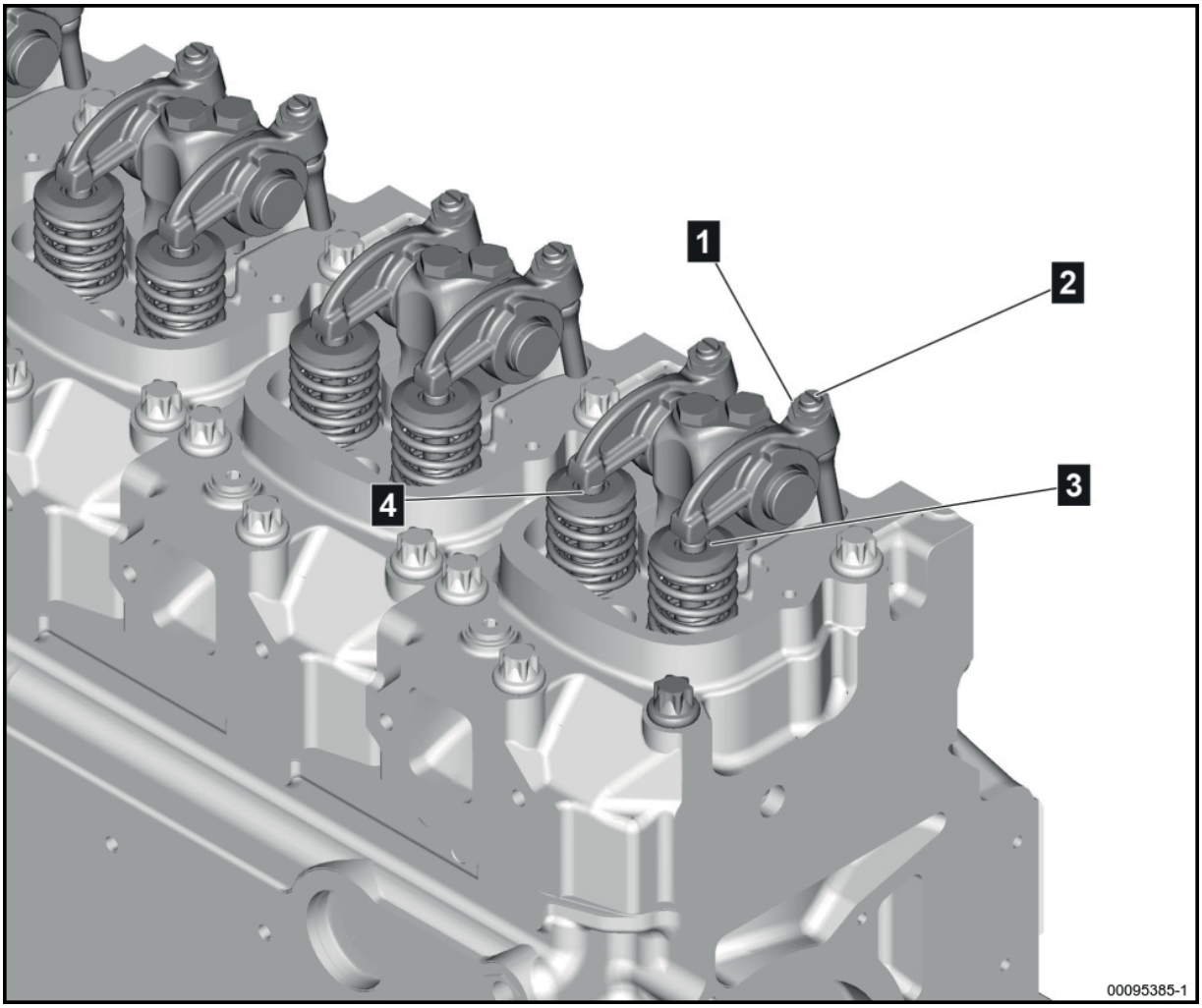

key

1 Adjusting screw, exhaust valve
2 Lock nut
3 Lock nut
4 Adjusting screw, intake valve

Technical data

Tightening torques

Lock nuts..... M12x1-8.8..... ..... 50 Nm

Test and setting values

Intake valve clearance..... 0.50 mm

Exhaust valve clearance..... ..... 0.50 mm

Important information

NOTE

Risk of component damage due to incorrectly tightened bolted connections

Therefore:

- Only use an impact screwdriver to tighten to max. 50% of the specifie fina tightening torque.
- Final tightening must always be applied manually using a torque wrench.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair instructions accordingly.

Special tools

1

Engine cranking unit 80.99626-6008
Quantity 1
Cranking the engine in conjunction with: 80.99627-0001

2

Gear ratchet 80.99627-0001
Quantity 1
Cranking the engine 1/2" in conjunction with:
80.99626-6008

3

Feeler gauge 80.99607-6019
Quantity 1

4

Keys 80.99603-6007
Quantity 1

5

Handle 08.06460-0003
Quantity 1

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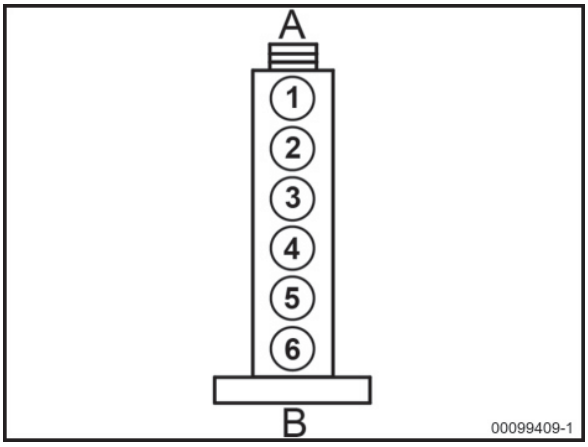
Check & adjust valve/s

Cylinder allocation E2876

Cylinder allocation for valve adjustment E2876

A = Vibration damper side

B = Flywheel side

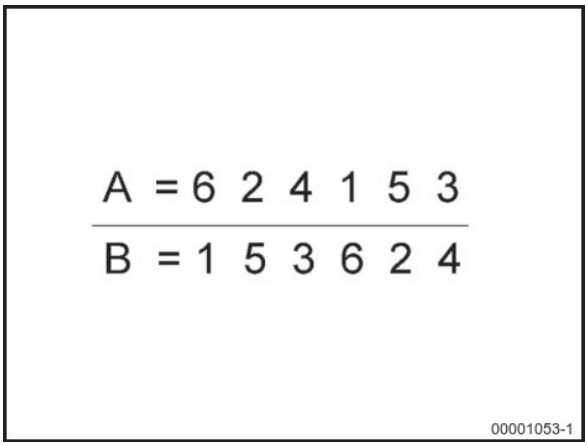


Bringing the engine in the adjusting position

- ►Mount the engine cranking unit [1]
- ►Crank the engine in the engine's running direction using the engine barring gear [1] and gear ratchet [2] until the rocker arms overlap
- ►Adjust free rocker arms as per table

A = Rocker arms in overlap

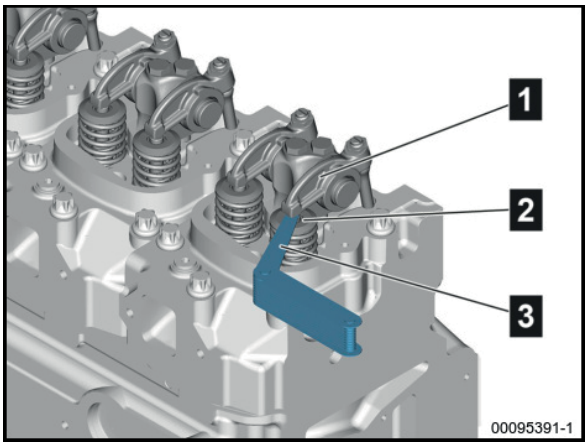
B = Rocker arms free



Checking the intake valve clearance

- ►Insert the 0.5 mm feeler gauge [3] **3** between the rocker arm **1** and the valve **2**

The valve clearance must be adjusted if it is not 0.5 mm.

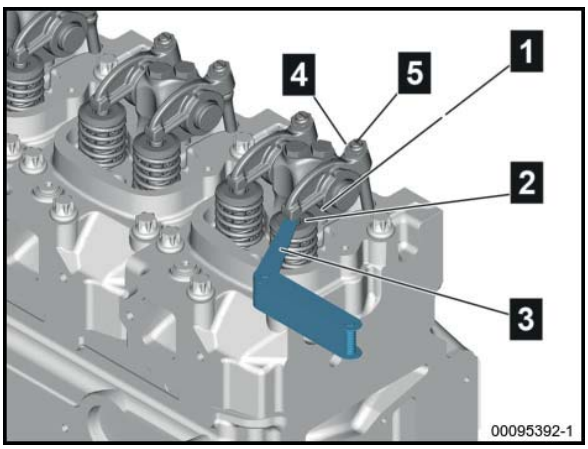


Adjusting the intake valve clearance

- ►Undo the lock nut **5** and adjusting screw **4**
- ►Insert the 0.5 mm feeler gauge [3] **3** between the rocker arm **1** and the valve **2**
- ►Screw in the adjusting screw **4** until the 0.5 mm leaf of the feeler gauge [3] **3** can be moved between the rocker arm **1** and the valve **2** with little resistance
- ►Brace the adjusting screw **4** using the wrench [4] and handle [5]
- ►Tighten the lock nut **5**

Tightening torque..... ..... 50 Nm

- ►Check the setting again and, if necessary, repeat the setting procedure



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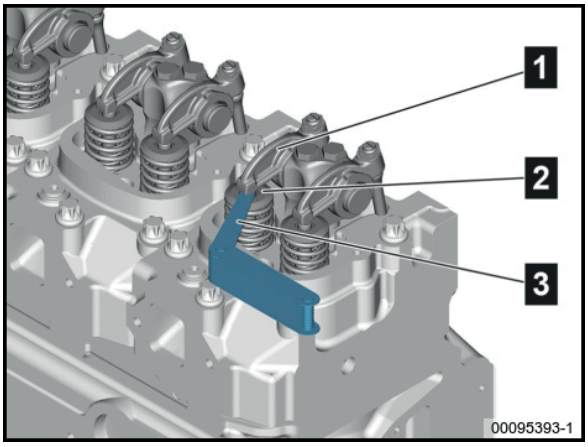
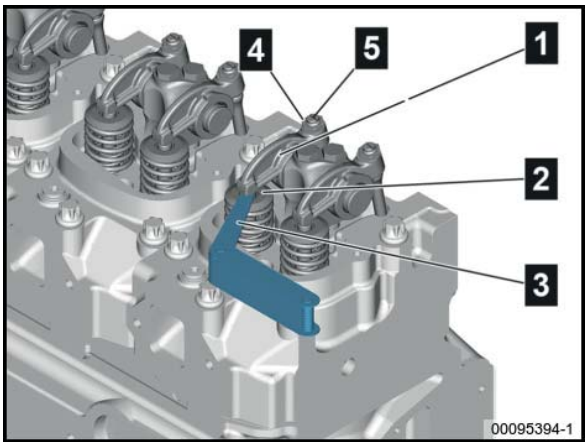
Checking the exhaust valve clearance



►Insert the 0.5 mm feeler gauge [3] **3** between the rocker arm **1** and the valve **2**

The valve clearance must be adjusted if it is not 0.5 mm.

Adjusting the exhaust valve clearance



►Undo the lock nut **5** and adjusting screw **4**
►Insert the 0.5 mm feeler gauge [3] **3** between the rocker arm **1** and the valve **2**
►Screw in the adjusting screw **4** until the 0.5 mm leaf of the feeler gauge [3] **3** can be moved between the rocker arm **1** and the valve **2** with little resistance
►Brace the adjusting screw **4** using the wrench [4] and handle [5]
►Tighten the lock nut **5**

Tightening torque..... ..... 50 Nm

►Check the setting again and, if necessary, repeat the setting procedure

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5.6.1 engine oil change

Engine oil change E2848 / E2842

Technical data
Tightening torques

Mounting bolt of oil filte body on oil cooler housing		50 Nm
Oil drain plug in oil filte body		40 + 10 Nm
Oil filte lid in the oil filte (vertical oil filters		25 Nm
Screw plug in oil sump	M26x1.5	80 Nm

Test and setting values

Engine oil refill quantity (with filter change)

E2848 LE302	
deep oil sump	73 litres
E2848 LE322	
semi-fla oil sump	33 litres
deep oil sump	93 litres
E2842 E302/312, E2842 LE202/312/322	
semi-fla oil sump	33 litres
deep oil sump	93 litres

Consumables

Engine oil	see oil specification

⚠ WARNING

Risk of injury from hot service products

Therefore:
- Wear personal protective equipment.
- Only touch the oil drain plugs using chemical-resistant safety gloves.
- Follow the accident prevention regulations.
- Comply with occupational health and safety regulations.

NOTE

Hazard of component damage from using incorrect tools

The frequency of the impact screwdriver causes dirt particles to fall out of the filte element.

Therefore:
- Do not use an impact screwdriver to loosen or tighten the cover.

Tip for users

Drain the engine oil when the engine is at operating temperature.

Tip for users

The oil filte insert must be replaced during every engine oil change.

Tip for users

When changing the oil, use a container with adequate capacity to avoid any oil overflow

Tip for users

Only use service products in accordance with MAN regulations, as failure to do so will cause the liability for defects to lapse.

For basic information on the service products, refer to the publication “Service products for MAN gas engines”.

You can fin approved products on the Internet at:

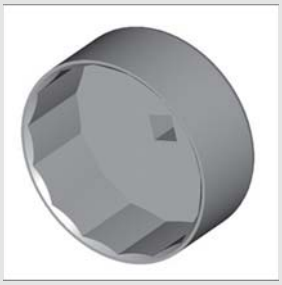
https://ws-public.man-mn.com/portal/irj/asp

Literature reference

For information on engine oil see the MAN service product database.
↗ https://ws-public.man-mn.com/portal/irj/asp

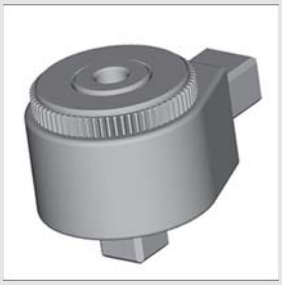
Special tools

1



Keys 80.99603-0251
Quantity 1
Loosening the oil filte lid in conjunction with 08.06455-0001, 08.06460-0001

2

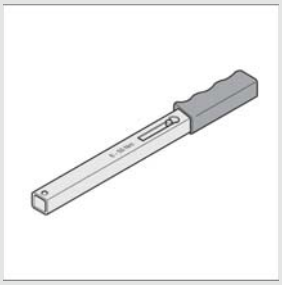


Ratchet 08.06455-0001
Quantity 1
Tightening the oil filte lid

3

Handle 08.06460-0001
Quantity 1
Loosening the oil filte lid in conjunction with 08.06455-0001

4



Torque wrench 08.06450-0006
Quantity 1
Tightening the oil filte lid in conjunction with 08.06455-0001

5

Ratchet 08.06455-0002
Quantity 1
Tightening the oil drain plug in conjunction with 08.06450-0002

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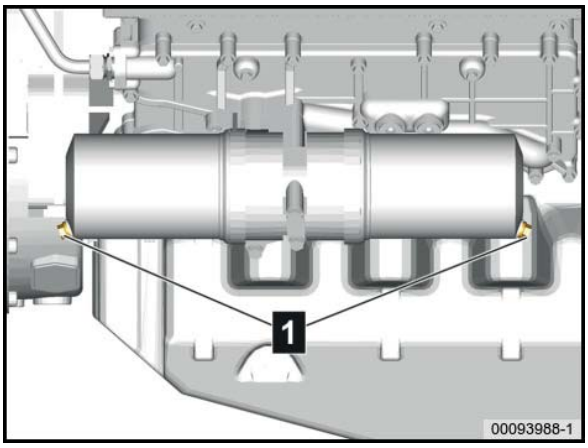
Draining the engine oil

Tip for users

Attachments of the manufacturer of the overall plant (automatic refill lines, etc.) may have an impact on the draining process. Corresponding descriptions must be provided by the manufacturer of the overall plant.

- ►Place a suitable container under the oil drain plug **1**
- ►Unscrew oil drain plug **1** on the oil filte body and allow the oil to drain off completely
- ►Wait until the oil has completely drained from the engine oil module to the oil sump
- ►Screw in the oil drain plug **1** with a new seal and tighten

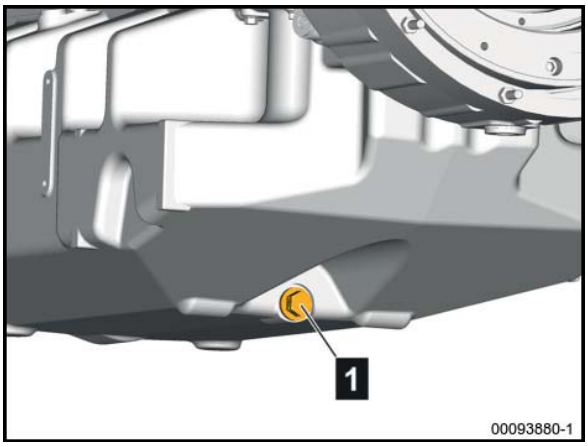
Tightening torque..... ..... 40 Nm



Draining the engine oil

- ►Place a suitable container under the oil drain plug **1**
- ►Unscrew the oil drain plug **1** from the oil sump and allow the engine oil to drain off completely
- ►Screw in the oil drain plug **1** with a new seal
- ►Tighten the oil drain plug **1** using torque wrench [4], ratchet [2] and suitable socket wrench insert

Tightening torque..... ..... 80 Nm



Changing the oil filter insert (horizontal oil filter)

- ►Unscrew the mounting bolt **1** of the filte body
- ►Remove the filte body **2** including filte insert **4**.
- ►Remove the filte insert **4** from the filte body **2**
- ►Clean the filte body **2**
- ►Insert a new filte insert **4** and position the filte body **2** with new O-ring **3**

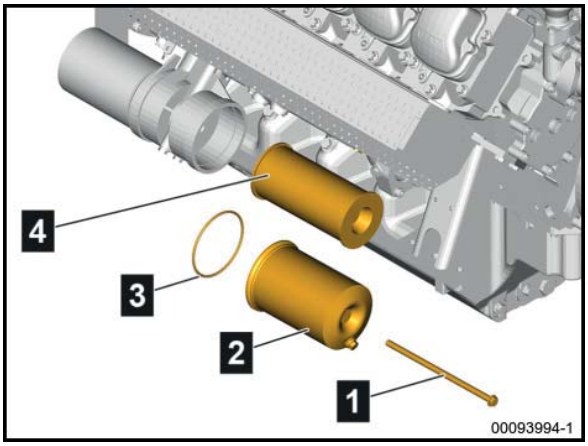
Tip for users

Hold the filte body tightly while tightening the mounting bolt to avoid twisting of the seal.

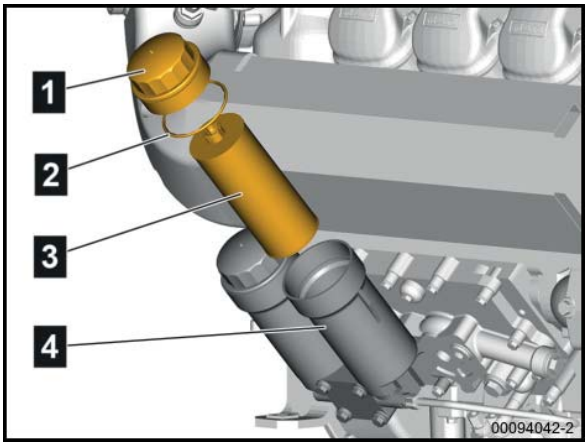
- ►Screw the mounting bolt **1** into the filte body **2** and tighten

Tightening torque..... ..... 50 Nm

Proceed in the same way to replace the second filte insert.



Changing the oil filter insert (vertical oil filters)



- ►Unscrew oil filte lid **1** from oil filte **4** using handle [3], ratchet [3], and wrench [1]
- ►Unscrew oil filte lid **1** from the oil filte **4** and remove the O-ring **2**
- ►Remove the oil filte insert **3** from the oil filte lid **1**
- ►Clean the oil filte lid **1**
- ►Fit a new O-ring **2** onto the oil filte lid **1**
- ►Insert the new oil filte insert **3** into the oil filte lid **1**.
- ►Screw the filte lid **1** into the oil filte **4**
- ►Tighten the oil filte lid **1** using torque wrench [4], ratchet [5] and wrench [1]

Tightening torque..... ..... 25 Nm

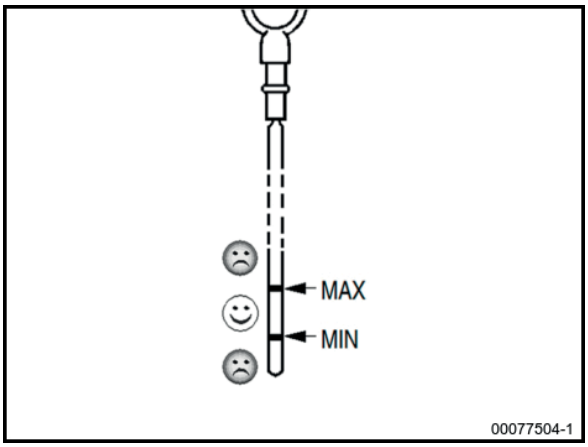
Proceed in the same way to replace the second filte insert.

Pouring in engine oil

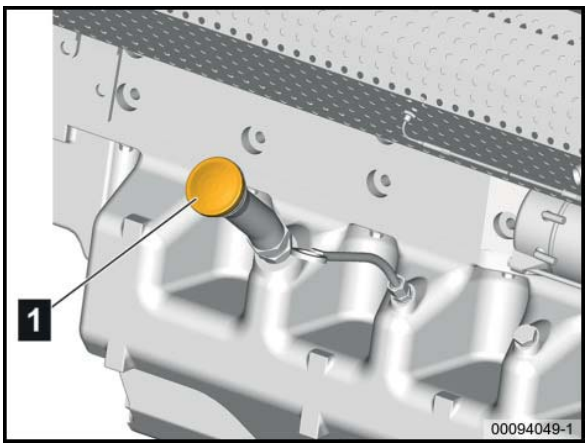
NOTE

Risk of engine damage due to incorrect oil level

Therefore:
- Never fil more than the indicated oil quantity.
- Observe the Min/Max marks on the oil dipstick.
- Check the oil level and correct it if necessary.



Filling in engine oil at the oil sump



- ►Open the cover **1**
- ►Slowly fil in engine oil using the fille neck

Engine oil refil quantity ..... see Test and (with filte change)..... setting values

- ►Screw the cover **1** back on
- ►Start the engine and let it run at low speed for a few minutes

NOTE

Risk of engine damage due to lack of oil pressure

Therefore:
- Observe the oil pressure gauge.
- Check the oil pressure and check for leaks
- If no oil pressure builds up after approx. 10 seconds of operation, immediately shut down the engine.
- Identify and rectify the cause.

- ►Setting down the engine
- ►Checking the engine oil level

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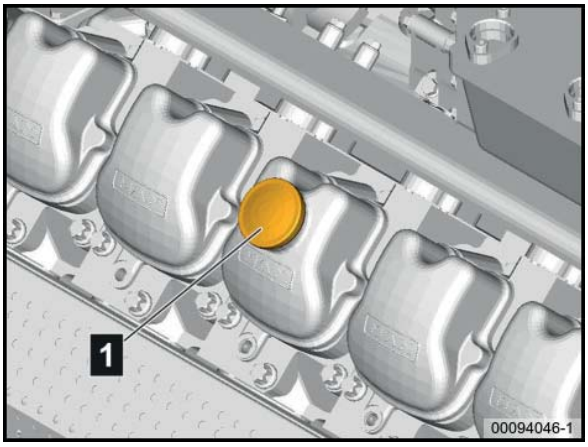
Filling in engine oil at the cylinder head cover



►Open the cover **1**
►Slowly fil in engine oil using the fille neck

Engine oil refil quantity ..... see Test and
(with filte change)..... setting values

►Screw the cover **1** back on
►Start the engine and let it run at low speed for a few minutes

NOTE

Risk of engine damage due to lack of oil pressure

Therefore:
- Observe the oil pressure gauge.
- Check the oil pressure and check for leaks
- If no oil pressure builds up after approx. 10 seconds of operation, immediately shut down the engine.
- Identify and rectify the cause.

►Setting down the engine
►Checking the engine oil level

5.6.2 Checking the engine oil level

Checking the E2848/E2842 engine oil level

NOTE

Risk of engine damage due to incorrect oil level

Therefore:
- Never fil more than the indicated oil quantity.
- Observe the Min/Max marks on the oil dipstick.
- Check the oil level and correct it if necessary.

Tip for users

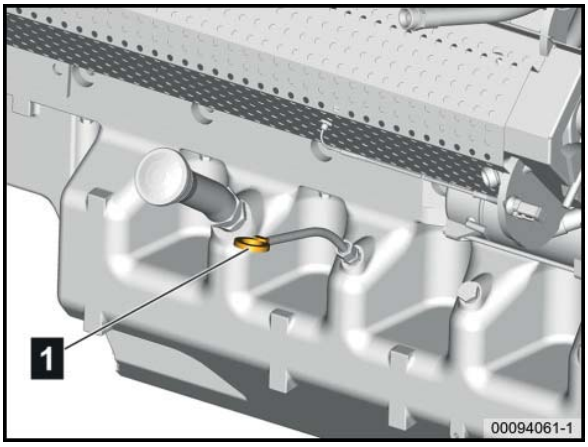
Check the oil level with the engine in horizontal position, and at the earliest approx. 5 minutes after the engine has been switched off.

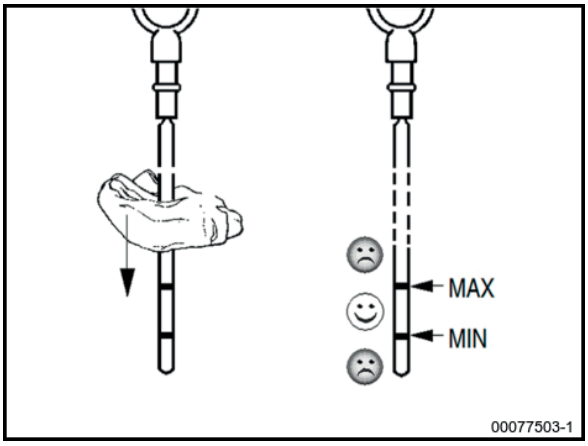
►Pull out the oil dipstick 1.
►Wipe the oil dipstick 1 off with a clean, lint-free cloth.
►Insert the oil dipstick 1 again until it reaches the stop.
►Pull out the oil dipstick 1 again and check the oil level

The oil level must be between the MIN and MAX marks (notches) on the oil dipstick.

►Insert the oil dipstick 1 again until it reaches the stop.
►If necessary, top up engine oil or drain in case of overfil
►Check the oil level again

Proceed in the same way for the deep oil sump.





5.6.3 Changing the coolant

Changing the coolant E2848 / E 2842

Technical data
Tightening torques

Screwing the screw plug into the oil cooler housing	M14x1.5		40 Nm
E2848			.
Total fillin amount of engine coolant			16 l
E2842			.
Total fillin amount of engine coolant			23 l

⚠ WARNING

Risk of injury from hot fluids

The coolant reaches high temperatures during operation and causes scalding if it comes into contact.

Therefore:

- Allow the engine to cool down.
- Handle the coolant drain plug with safety gloves only.

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

Therefore:

- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

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ENVIRONMENTAL NOTICE

Risk of contaminating bodies of water and soil

Therefore:

- Collect service products using appropriate and sufficientl large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.
- Undiluted antifreeze must be treated as hazardous waste.

Tip for users

Only use service products in accordance with MAN regulations, as failure to do so will cause the liability for defects to lapse.

↗ https://ws-public.man-mn.com/portal/irj/asp

Literature reference

For information on radiator frost protection, see the MAN service product database.

↗ https://ws-public.man-mn.com/portal/irj/asp

Drain coolant

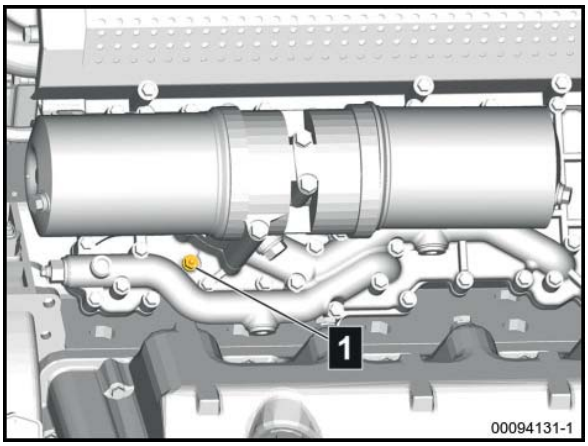
Tip for users

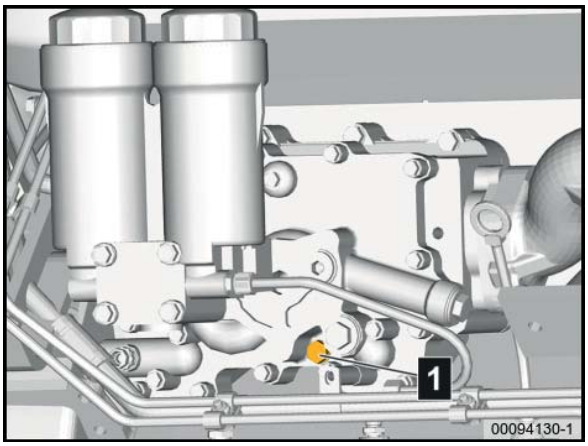
The cooling system is installed by the manufacturer of the overall plant, therefore, only the procedure at the engine is described here. A detailed description is delivered by the manufacturer of the overall plant.

Draining the coolant (oil cooler housing)

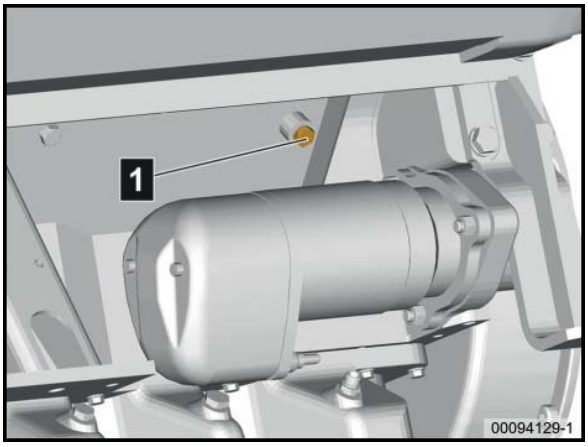
►Unscrew the drain plug **1** on the oil cooler housing
►Collect emerging coolant in a suitable container.
►Allow the coolant to drain completely
►Screw in the drain plug **1** with a new seal and tighten

Tightening torque..... ..... 40 Nm





Draining the coolant (crankcase)



►Unscrew the drain plug 1 on the crankcase
►Collect emerging coolant in a suitable container.
►Allow the coolant to drain completely
►Screw in the drain plug 1 with a new seal and tighten
►Screw in the drain plug 1 with a new seal and tighten

Draining the coolant from the cooling system and the heat exchanger (if installed), see corresponding instructions.

Topping up coolant

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

Therefore:

- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

NOTE

Risk of engine damage due to temperature differences

Therefore:

- Do not add cold coolant to a hot engine.

Tip for users

The cooling system is installed by the manufacturer of the overall plant. A detailed description is delivered by the manufacturer of the overall plant.

Fill the cooling system of the engine with a mixture consisting of tap water and antifreeze based on ethylene glycol or anti-corrosion agent.

See the publication "Service products for MAN industrial gas engines".

The cooling system must be fille with coolant in accordance with the fillin instructions provided by the manufacturer of the overall system.

The proper mixing ratio of water and antifreeze must be restored.

Cooling system with membrane expansion tank

Tip for users

The cooling system is installed by the manufacturer of the overall plant. A detailed description is delivered by the manufacturer of the overall plant.

►After fillin the cooling system, let the electric coolant pump run for approx. 15 minutes and vent the cooling system.
►Observe the cooling system pressure and check the coolant level.

5.6.4 Removing/installing the spark plug

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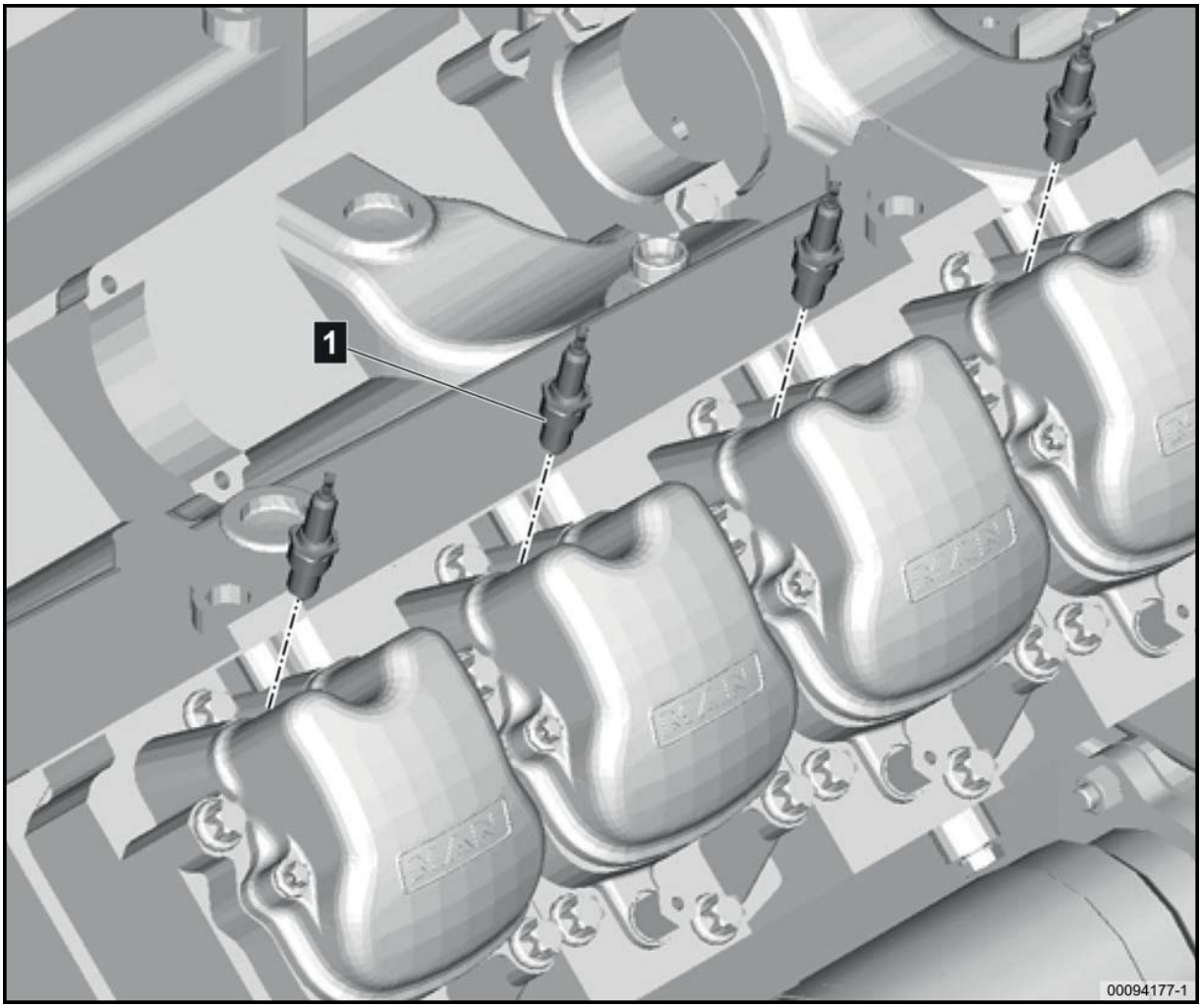


key

1 Spark plug

Technical data

Tightening torques

Original equipment			
Spark plug thread, dry	M14x1.25		40 Nm
Third-party manufacturer			
Spark plug, third-party manufacturer	M14x1.25		See manufacturer's instructions

Test and setting values

Original equipment	
Electrode distance in the spark plug	0.28 ± 0.05 mm

Important information

NOTE

Risk of component damage due to incorrect tightening torque

The tightening torque should correspond to the structure of MAN spark plug.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

Tip for users

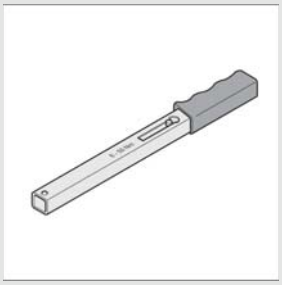
Do not reinstall damaged or dropped spark plugs!

Special tools

1

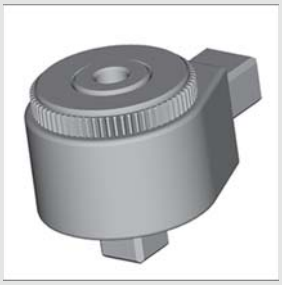
Handle 08.06460-0001
Quantity 1
Handle 9 x 12 x 400 mm
Removing spark plugs in conjunction with:
- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs 51.97710-0005

2



Torque wrench 08.06450-0006
Quantity 1
Torque wrench, 6 - 50 Nm / 9 x 12 x 333 mm, 3/8" square drive
Installing the spark plugs in conjunction with:
- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs 51.97710-0005

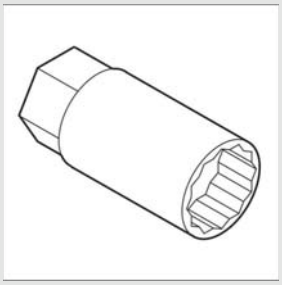
3



Ratchet 08.06455-0001
Quantity 1
3/8” square ratchet 10 - 9 x 12
Removing spark plugs in conjunction with:
- Handle 08.06460-0001
- Socket wrench insert for spark plugs 51.97710-0005

Installing the spark plugs in conjunction with:
- Torque wrench 08.06450-0006
- Socket wrench insert for spark plugs 51.97710-0005

4



Socket for spark plugs 51.97710-0005
Quantity 1
Removing the spark plugs in conjunction with:
- Handle 08.06460-0001
- Ratchet 08.06455-0001

Installing the spark plugs in conjunction with:
Torque wrench 08.06450-0006
- Ratchet 08.06455-0001

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Removing spark plugs

Removing spark plugs

⚠ DANGER

Danger to life from electrical power

Touching the ignition system during operation is life-threatening.

Therefore:

- Never disconnect the spark plug connector while the engine is running.

►Pull off the spark plug connector

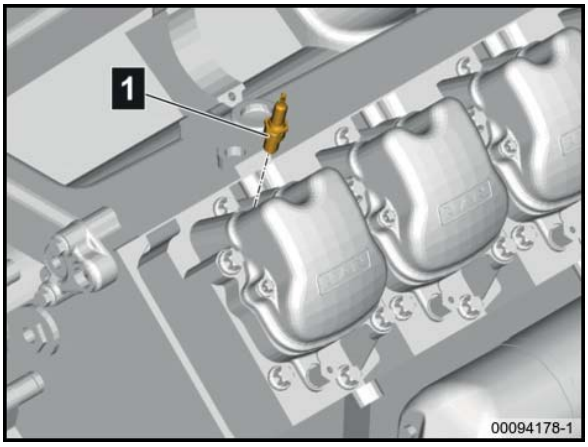
Tip for users

Prior to dismounting, use compressed air to remove any fouling and contamination from the installation bay.

►Use compressed air to clean the installation bay

►Assemble the special tool consisting of handle [1], ratchet [3], extension and socket wrench insert for spark plugs [4]

►Loosen and unscrew the spark plugs **1** using the special tool



Installing spark plugs

Screwing in the spark plugs

Tip for users

Do not reinstall damaged or dropped spark plugs!

NOTE

Risk of component damage due to incorrect tightening torque

The tightening torque should correspond to the structure of MAN spark plug.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

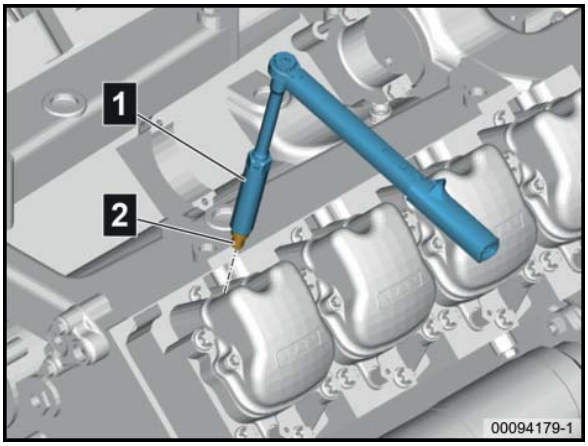
►Screw in the spark plug **2** by hand using the socket wrench insert for spark plugs [4]

►Assemble the special tool **1** consisting of torque wrench [2], ratchet [3], extension and socket wrench insert for spark plugs [4]

►Tighten the spark plugs **2** using the special tool **1**

Tightening torque values of original equipment

Tightening torque (dry thread)..... ..... 40 Nm



Tightening torque values third-party manufacturer

Tightening torque.....	See manufacturer's instructions

► Position the spark plug connectors and let it lock into place

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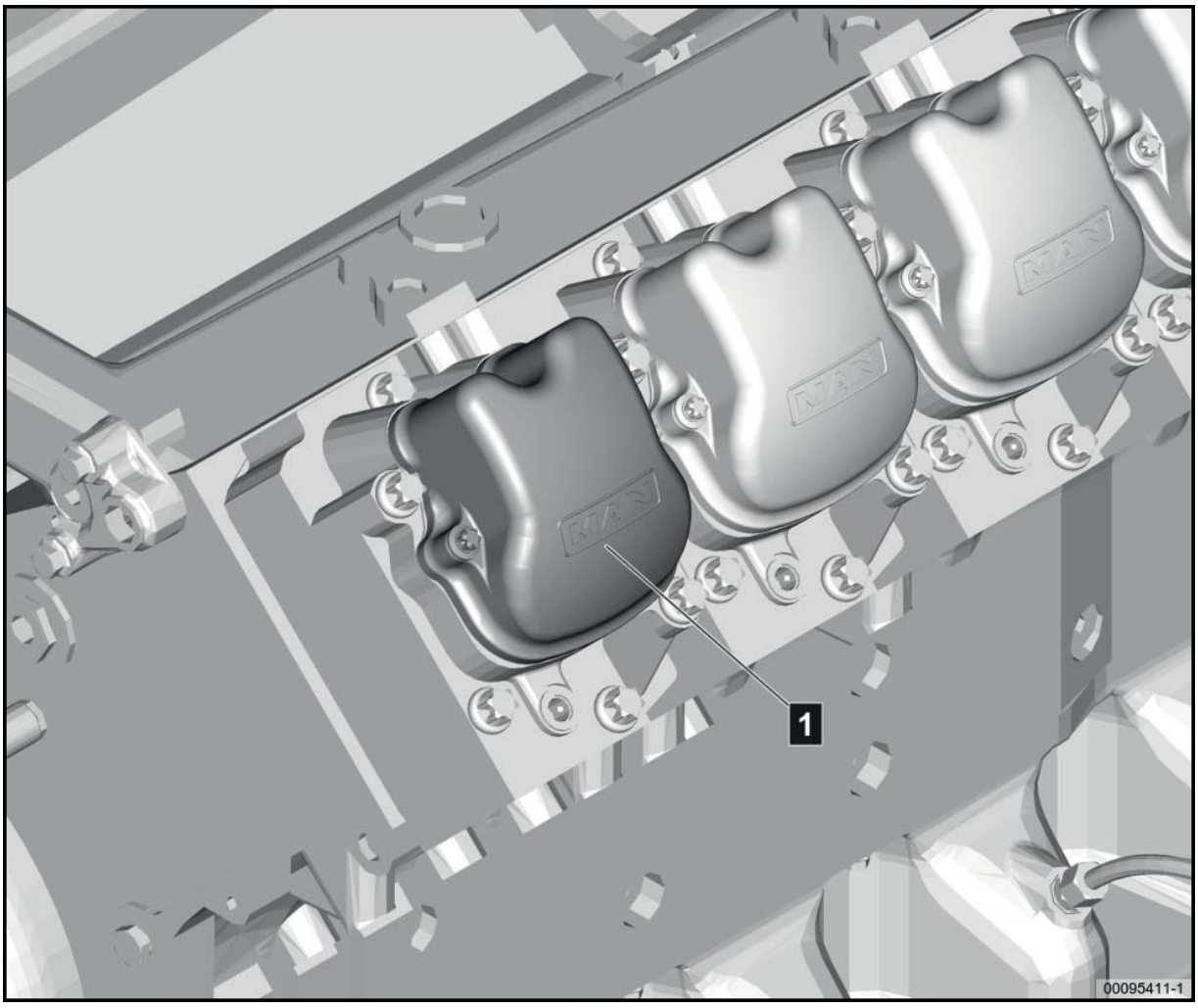
5.6.1 Checking and adjusting E2848/E2842 valve clearance

5.6.1.1 Removing/installing the cylinder head cover



key

1 Cylinder head cover

Important information

NOTE

Risk of component damage due to incorrectly tightened bolted connections

Therefore:
- Only use an impact screwdriver for preliminary tightening to max. 50 % of fina tightening torque.
- Final tightening must always be applied manually using a torque wrench

NOTE

Risk of damage to component by contaminants

Therefore:
- Clean components and sealing surfaces before the assembly with suitable means
- Protect cleaned surfaces from re-contamination

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

ENVIRONMENTAL NOTICE

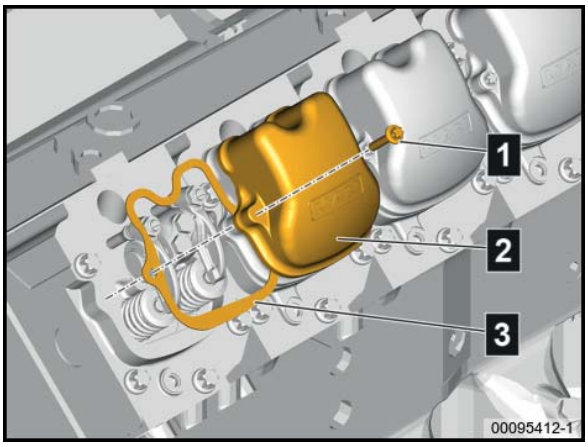
Risk of contaminating bodies of water and soil

Therefore:

- Collect service products using appropriate and sufficientl large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.

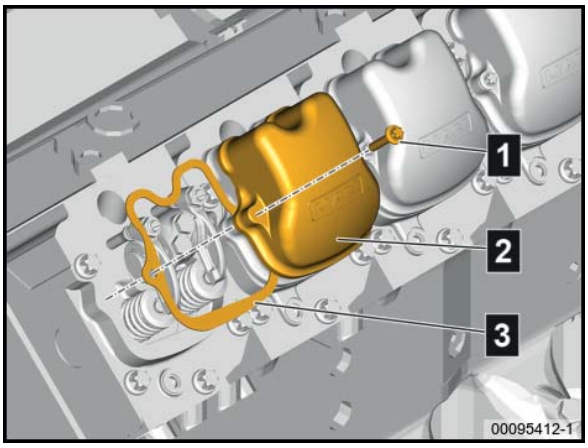
Removing the cylinder head cover

Removing the cylinder head cover



►Unscrew the mounting bolts 1
►Remove the cylinder head cover 2 with seal 3 from the cylinder head
►Clean the areas to be sealed

Mounting the cylinder head cover



►Fit the cylinder head cover 2 with a new seal 3
►Screw in mounting bolts 1 and tighten crosswise

5.6.1.2 Check & adjust valve/s

Preparatory measures

►Removing/installing the cylinder head cover, Page 102

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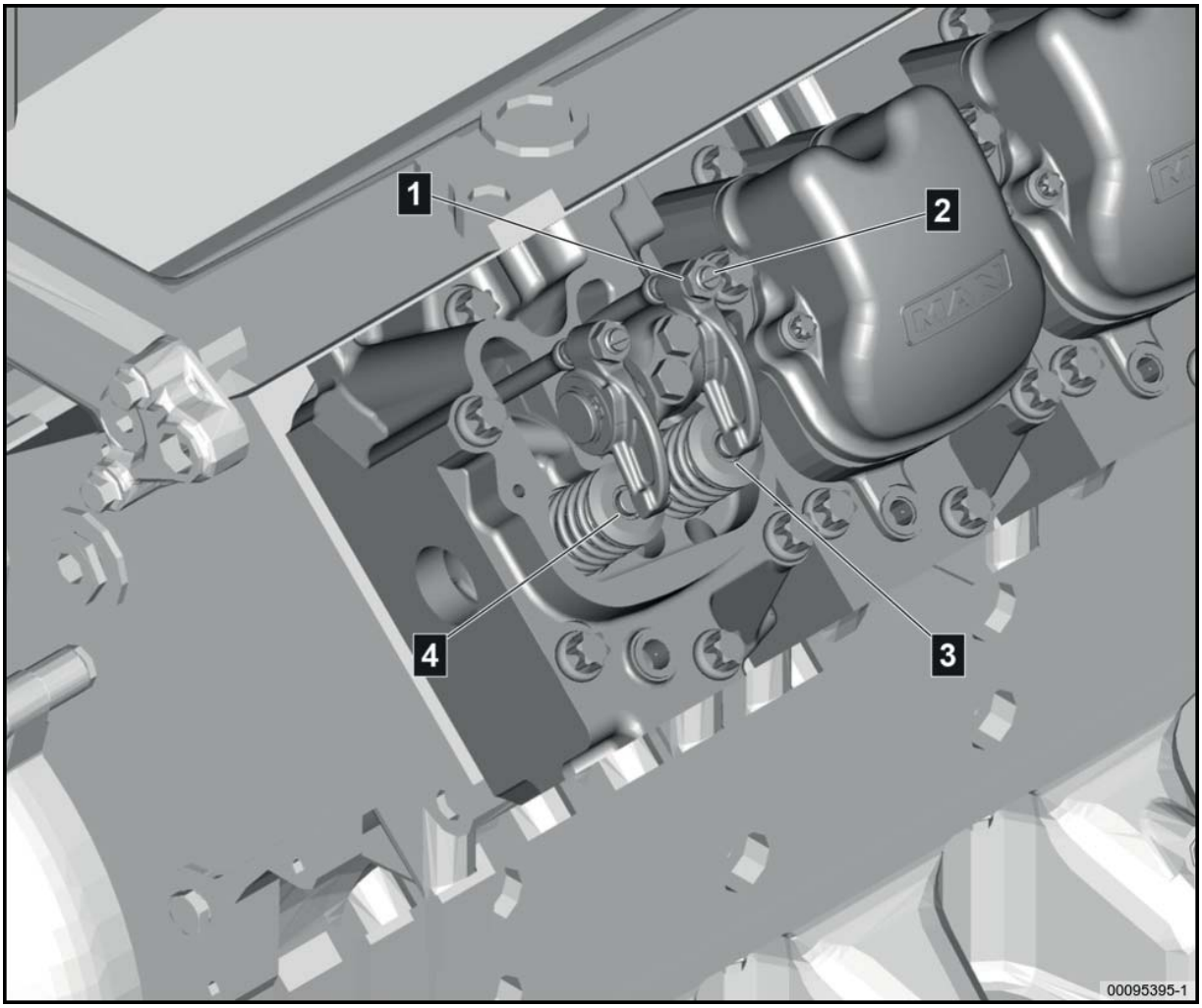

key

1 Adjusting screw	3 Intake valve
2 Lock nut	4 Exhaust valve

Technical data

Tightening torques

Lock nuts..... M12x1-8.8..... ..... 50 Nm

Test and setting values

Intake valve clearance..... 0.50 mm

Exhaust valve clearance..... ..... 0.50 mm

Important information

NOTE

Risk of component damage due to incorrectly tightened bolted connections

Therefore:

- Only use an impact screwdriver to tighten to max. 50% of the specifie fina tightening torque.
- Final tightening must always be applied manually using a torque wrench.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair instructions accordingly.

Special tools

1

Engine cranking unit 80.99626-6008
Quantity 1
Cranking the engine in conjunction with: 80.99627-0001

2

Gear ratchet 80.99627-0001
Quantity 1
Cranking the engine 1/2" in conjunction with:
80.99626-6008

3

Feeler gauge 80.99607-6019
Quantity 1

4

Keys 80.99603-6007
Quantity 1

5

Handle 08.06460-0003
Quantity 1

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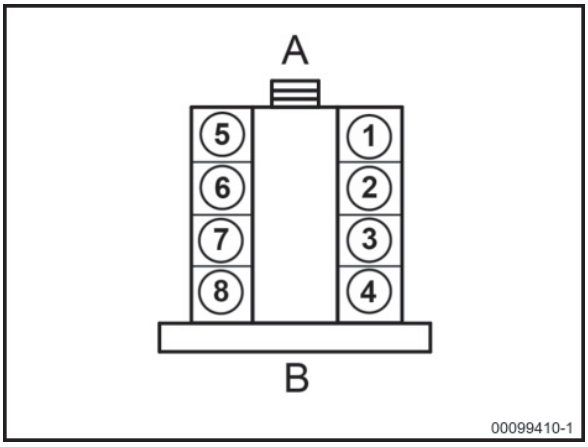
Check & adjust valve/s

Cylinder allocation E2848

Cylinder allocation for valve adjustment E2848

A = Vibration damper side

B = Flywheel side

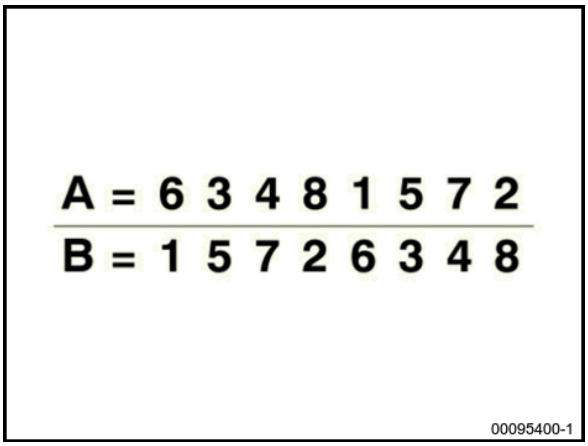


Bringing the engine in the adjusting position (E2848)

- ►Mount the engine cranking unit [1]
- ►Crank the engine in the engine's running direction using the engine barring gear [1] and gear ratchet [2] until the rocker arms overlap
- ►Adjust free rocker arms as per table

A = Rocker arms in overlap

B = Rocker arms free

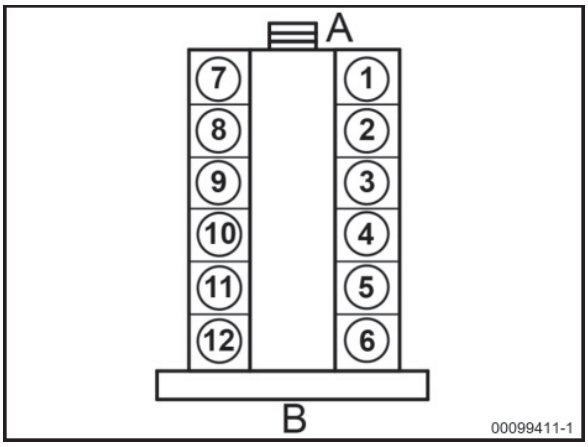


Cylinder allocation E2842

Cylinder allocation for valve adjustment E2842

A = Vibration damper side

B = Flywheel side

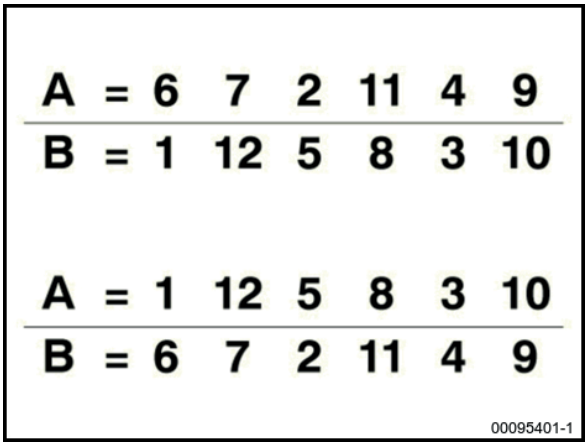


Bringing the engine in the adjusting position (E2842)

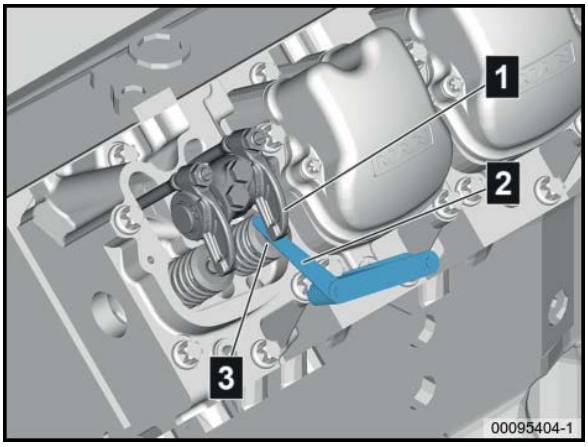
- ►Mount the engine cranking unit [1]
- ►Crank the engine in the engine's running direction using the engine barring gear [1] and gear ratchet [2] until the rocker arms overlap
- ►Adjust free rocker arms as per table

A = Rocker arms in overlap

B = Rocker arms free



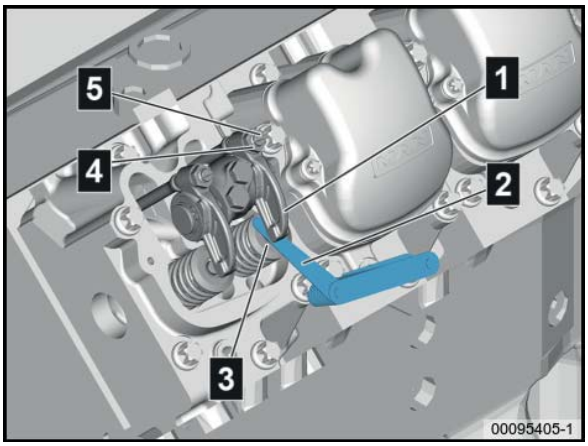
Checking the intake valve clearance



►Insert the 0.5 mm feeler gauge [3] 3 between the rocker arm 1 and the valve 2

The valve clearance must be adjusted if it is not 0.5 mm.

Adjusting the intake valve clearance

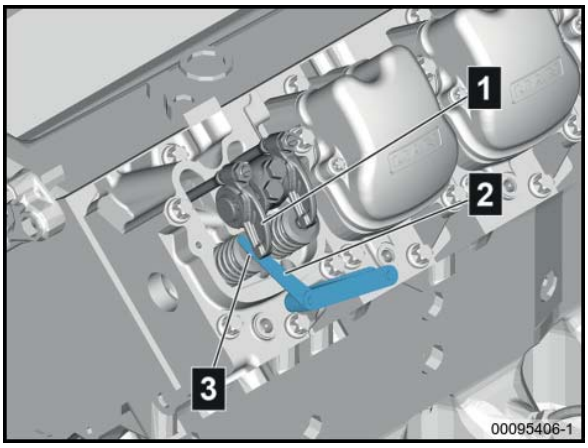


►Undo the lock nut 5 and adjusting screw 4
►Insert the 0.5 mm feeler gauge [3] 3 between the rocker arm 1 and the valve 2
►Screw in the adjusting screw 4 until the 0.5 mm leaf of the feeler gauge [3] 3 can be moved between the rocker arm 1 and the valve 2 with little resistance
►Brace the adjusting screw 4 using the wrench [4] and handle [5]
►Tighten the lock nut 5

Tightening torque..... ..... 50 Nm

►Check the setting again and, if necessary, repeat the setting procedure

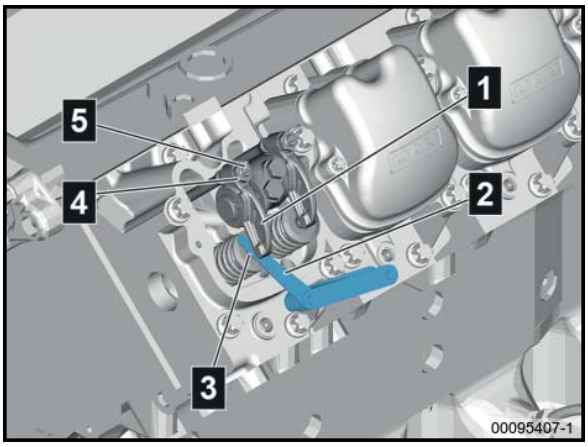
Checking the exhaust valve clearance



►Insert the 0.5 mm feeler gauge [3] 3 between the rocker arm 1 and the valve 2

The valve clearance must be adjusted if it is not 0.5 mm.

Adjusting the exhaust valve clearance



►Undo the lock nut 5 and adjusting screw 4
►Insert the 0.5 mm feeler gauge [3] 3 between the rocker arm 1 and the valve 2
►Screw in the adjusting screw 4 until the 0.5 mm leaf of the feeler gauge [3] 3 can be moved between the rocker arm 1 and the valve 2 with little resistance
►Brace the adjusting screw 4 using the wrench [4] and handle [5]
►Tighten the lock nut 5

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Tightening torque..... ..... 50 Nm

► Check the setting again and, if necessary, repeat the setting procedure

5.7.1 engine oil change

Engine oil change E32

Technical data
Tightening torques

Oil filte lid on oil module			40 + 10 Nm
Screw plug in oil sump	M18x1.5		80 Nm
Screw plug in oil sump	M26x1.5		80 Nm

Test and setting values
Engine oil refill quantity (with filter change)

Standard oil sump	93 litres
Deep oil sump	105 litres

Consumables

Engine oil	see oil specification

⚠ WARNING

Risk of injury from hot service products

Therefore:
- Wear personal protective equipment.
- Only touch the oil drain plugs using chemical-resistant safety gloves.
- Follow the accident prevention regulations.
- Comply with occupational health and safety regulations.

NOTE

Hazard of component damage from using incorrect tools

The frequency of the impact screwdriver causes dirt particles to fall out of the filte element.

Therefore:
- Do not use an impact screwdriver to loosen or tighten the cover.

Tip for users

Drain the engine oil when the engine is at operating temperature.

Tip for users

The oil filte insert must be replaced during every engine oil change.

Tip for users

When changing the oil, use a container with adequate capacity to avoid any oil overflow

Tip for users

Only use service products in accordance with MAN regulations, as failure to do so will cause the liability for defects to lapse.

For basic information on the service products, refer to the publication “Service products for MAN gas engines”.

You can fin approved products on the Internet at:

https://ws-public.man-mn.com/portal/irj/asp

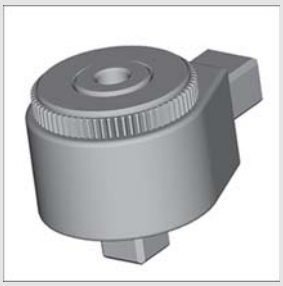
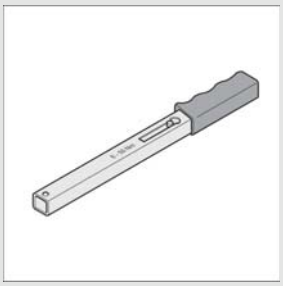
Literature reference

For information on engine oil see the MAN service product database.

↗ https://ws-public.man-mn.com/portal/irj/asp

https://truckmanualshub.com/

Special tools

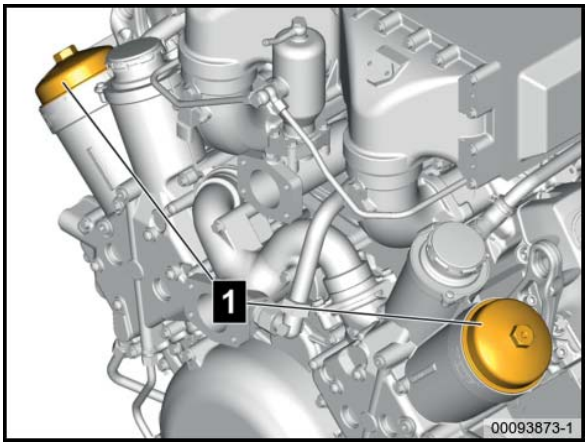
1		**Socket wrench insert** Quantity 1 Size 36 Unscrewing the oil filte lid Tightening the oil filte lid in conjunction with 08.06455-0001 and 08.06450-0006	80.99603-0325
2		**Ratchet** Quantity 1 Tightening the oil filte lid	08.06455-0001
3		**Handle** Quantity 1 Loosening the oil filte lid in conjunction with 08.06455-0001	08.06460-0001
4		**Torque wrench** Quantity 1 Tightening the oil filte lid in conjunction with 08.06455-0001	08.06450-0006
5		**Ratchet** Quantity 1 Tightening the oil drain plug in conjunction with 08.06450-0002	08.06455-0002

Draining the engine oil

Tip for users

Attachments of the manufacturer of the overall plant (automatic refill lines, etc.) may have an impact on the draining process. Corresponding descriptions must be provided by the manufacturer of the overall plant.

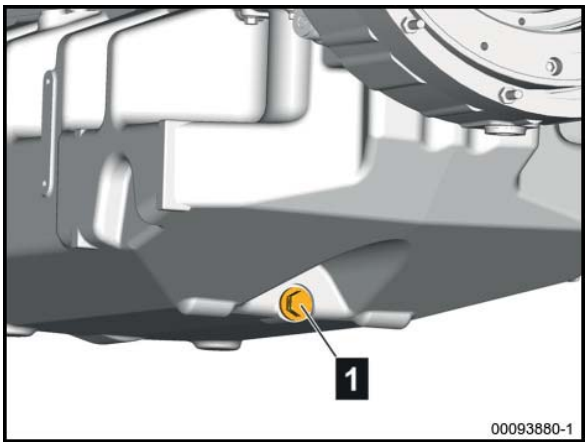
► Unscrew the oil filte lid **1** using the handle [3], undo the ratchet adapter [3] and size 36 socket [1] and unscrew by 2-3 turns.
► Wait until the oil has completely drained from the engine oil module to the oil sump



Draining the engine oil

► Place a suitable container under the oil drain plug **1**
► Unscrew the oil drain plug **1** from the oil sump and allow the engine oil to drain off completely
► Screw in the oil drain plug **1** with a new seal
► Tighten the oil drain plug **1** using torque wrench [4], ratchet [2] and suitable socket wrench insert

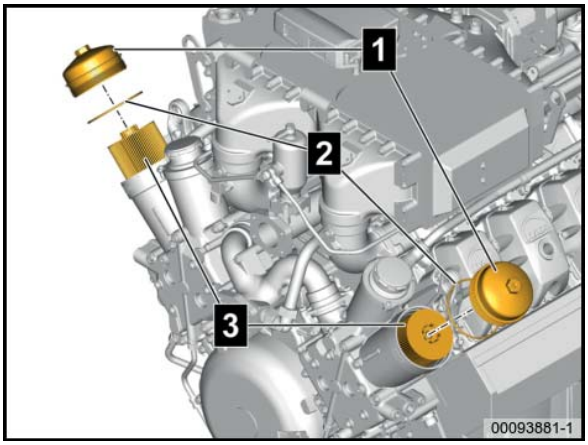
Tightening torque..... ..... 80 Nm



Changing oil filter insert

► Unscrew the oil filte lid **1** from oil module using the handle [3], ratchet [3] and size 36 socket wrench insert [1]
► Unscrew the oil filte lid **1** from the oil module and remove the O-ring **2**
► Remove the oil filte insert **3** from the oil module
► Clean the oil filte lid **1**
► Clean the oil filte housing with a lint-free, clean cloth
► Fit a new O-ring **2** onto the oil filte lid **1**
► Insert the new oil filte insert **3** into the oil filte lid **1**.
► Screw oil filte lid **1** into the oil module
► Tighten oil filte lid **1** with the torque wrench, ratchet and socket wrench insert

Tightening torque..... .... 40 + 10 Nm

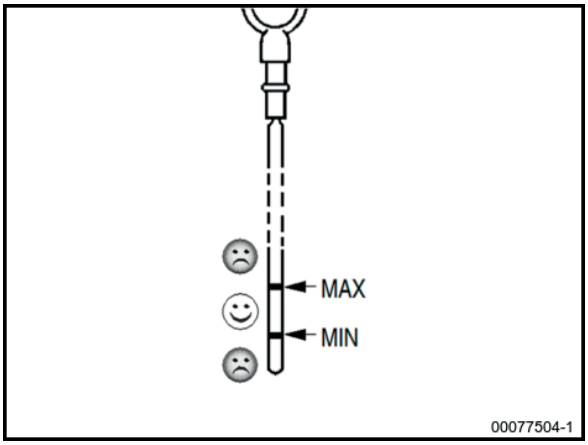


Pouring in engine oil

NOTE

Risk of engine damage due to incorrect oil level

Therefore:
- Never fil more than the indicated oil quantity.
- Observe the Min/Max marks on the oil dipstick.
- Check the oil level and correct it if necessary.



Filling in engine oil at the oil sump

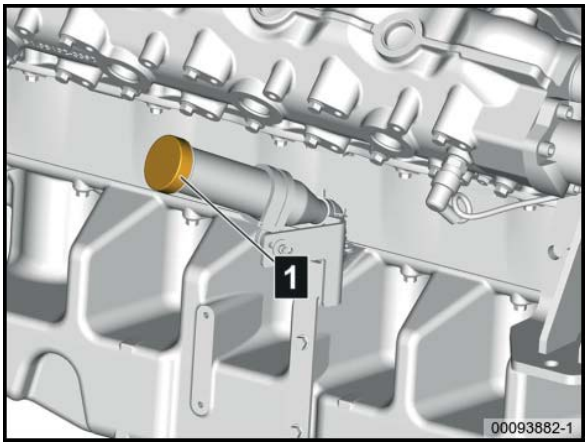
►Open the cover 1
►Slowly fil in engine oil using the fille neck

Standard oil sump

Engine oil refil quantity (with filte ..... 93 l change).....

Deep oil sump

Engine oil refil quantity (with filte ..... 105 l change).....



►Screw the cover 1 back on
►Start the engine and let it run at low speed for a few minutes

NOTE

Risk of engine damage due to lack of oil pressure

Therefore:
- Observe the oil pressure gauge.
- Check the oil pressure and check for leaks
- If no oil pressure builds up after approx. 10 seconds of operation, immediately shut down the engine.
- Identify and rectify the cause.

►Setting down the engine
►Checking the engine oil level

Filling in engine oil at the oil module

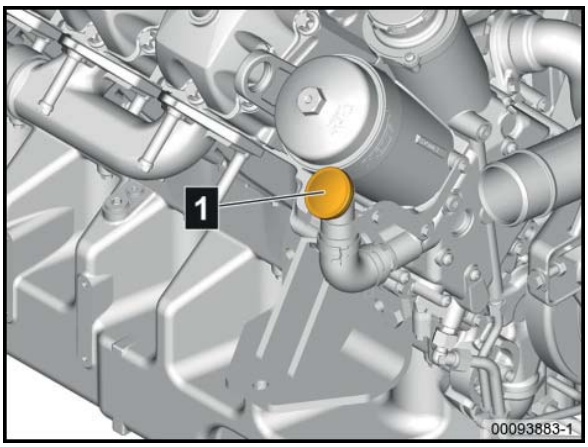
►Open the cover 1
►Slowly fil in engine oil using the fille neck

Standard oil sump

Engine oil refil quantity (with filte ..... 93 litres change).....

Deep oil sump

Engine oil refil quantity (with filte ..... 105 litres change).....



►Screw the cover 1 back on
►Start the engine and let it run at low speed for a few minutes

NOTE

Risk of engine damage due to lack of oil pressure

Therefore:
- Observe the oil pressure gauge.
- Check the oil pressure and check for leaks
- If no oil pressure builds up after approx. 10 seconds of operation, immediately shut down the engine.
- Identify and rectify the cause.

►Setting down the engine
►Checking the engine oil level

5.7.2 Checking the engine oil level

Checking the engine oil level E32

NOTE

Risk of engine damage due to incorrect oil level

Therefore:
- Never fil more than the indicated oil quantity.
- Observe the Min/Max marks on the oil dipstick.
- Check the oil level and correct it if necessary.

Tip for users

Check the oil level with the engine in horizontal position, and at the earliest approx. 5 minutes after the engine has been switched off.

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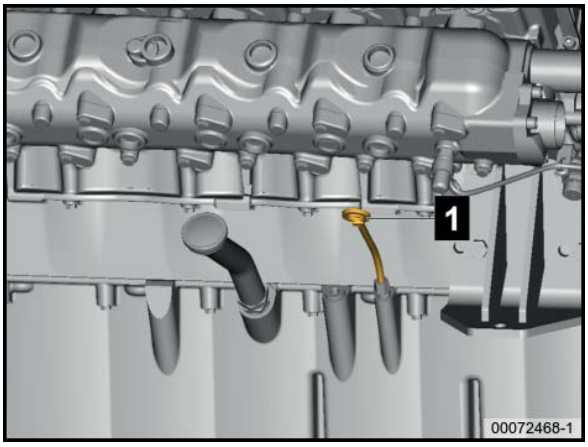
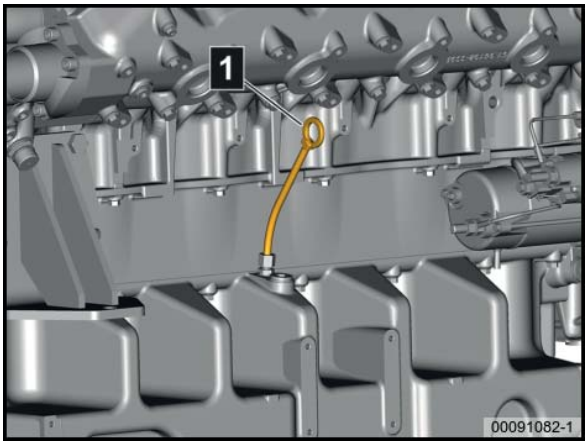
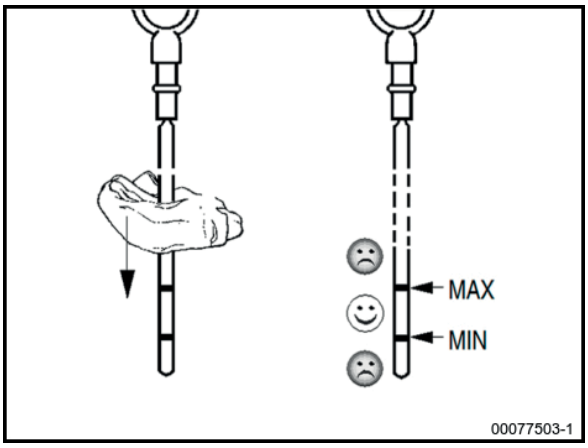
►Pull out the oil dipstick **1**.
►Wipe the oil dipstick **1** off with a clean, lint-free cloth.
►Insert the oil dipstick **1** again until it reaches the stop.
►Pull out the oil dipstick **1** again and check the oil level

The oil level must be between the MIN and MAX marks (notches) on the oil dipstick.

►Insert the oil dipstick **1** up to the stop.
►If necessary, top up engine oil or drain in case of overfil
►Check the oil level again







5.7.3 Changing the coolant

Changing the coolant E32

Technical data
Tightening torques

Total fillin amount of engine coolant..... 55 l

⚠ WARNING

Risk of injury from hot fluids

The coolant reaches high temperatures during operation and causes scalding if it comes into contact.

Therefore:

- Allow the engine to cool down.
- Handle the coolant drain plug with safety gloves only.

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

Therefore:

- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

ENVIRONMENTAL NOTICE

Risk of contaminating bodies of water and soil

Therefore:

- Collect service products using appropriate and sufficientl large containers.
- Observe local legal regulations for disposal.
- Submit used oil for used oil recycling.
- Undiluted antifreeze must be treated as hazardous waste.

Tip for users

Only use service products in accordance with MAN regulations, as failure to do so will cause the liability for defects to lapse.

↗ https://ws-public.man-mn.com/portal/irj/asp

Literature reference

For information on radiator frost protection, see the MAN service product database.

↗ https://ws-public.man-mn.com/portal/irj/asp

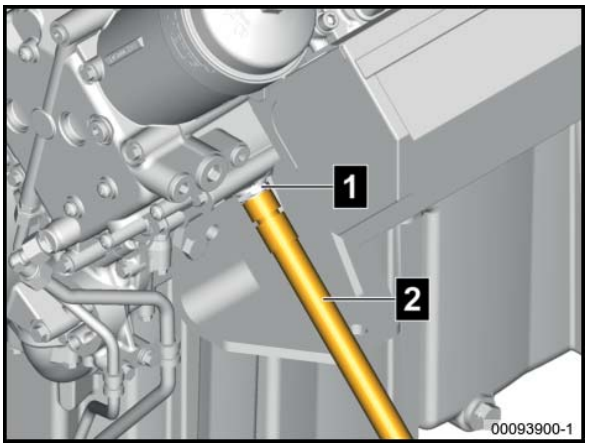
Tip for users

The cooling system is installed by the manufacturer of the overall plant, therefore, only the procedure at the engine is described here. A detailed description is delivered by the manufacturer of the overall plant.

Draining the coolant from the engine

Tip for users

To drain the coolant, use hose line 51.96341-0319.



►Unscrew and remove the protective cap from the drain valve **1**.

►Attach the drain hose **2** completely to the drain valve **1**.

►Collect emerging coolant in a suitable container.

►Once the coolant has drained completely, unscrew the drain hose **2**.

►Screw the protective cap onto the drain valve **1**.

►Repeat the procedure for the other side of the engine.

►Draining the coolant from the cooling system and the heat exchanger (if installed), see corresponding instructions.

Topping up coolant

ENVIRONMENTAL NOTICE

Danger of environmental pollution caused by improper handling of service products

Considerable damage is caused to the environment.

Therefore:

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- Observe national safety regulations.
- Collect service products using appropriate and sufficientl large containers.
- Only store service products in original containers.
- Absorb leaked service products with binding agent and dispose of properly.
- Inform the responsible local authority about the damage, if necessary.
- Drain cleaning liquid and rinsing water through an oil separator with a sludge trap.

NOTE

Risk of engine damage due to temperature differences

Therefore:
- Do not add cold coolant to a hot engine.

Tip for users

The cooling system is installed by the manufacturer of the overall plant. A detailed description is delivered by the manufacturer of the overall plant.

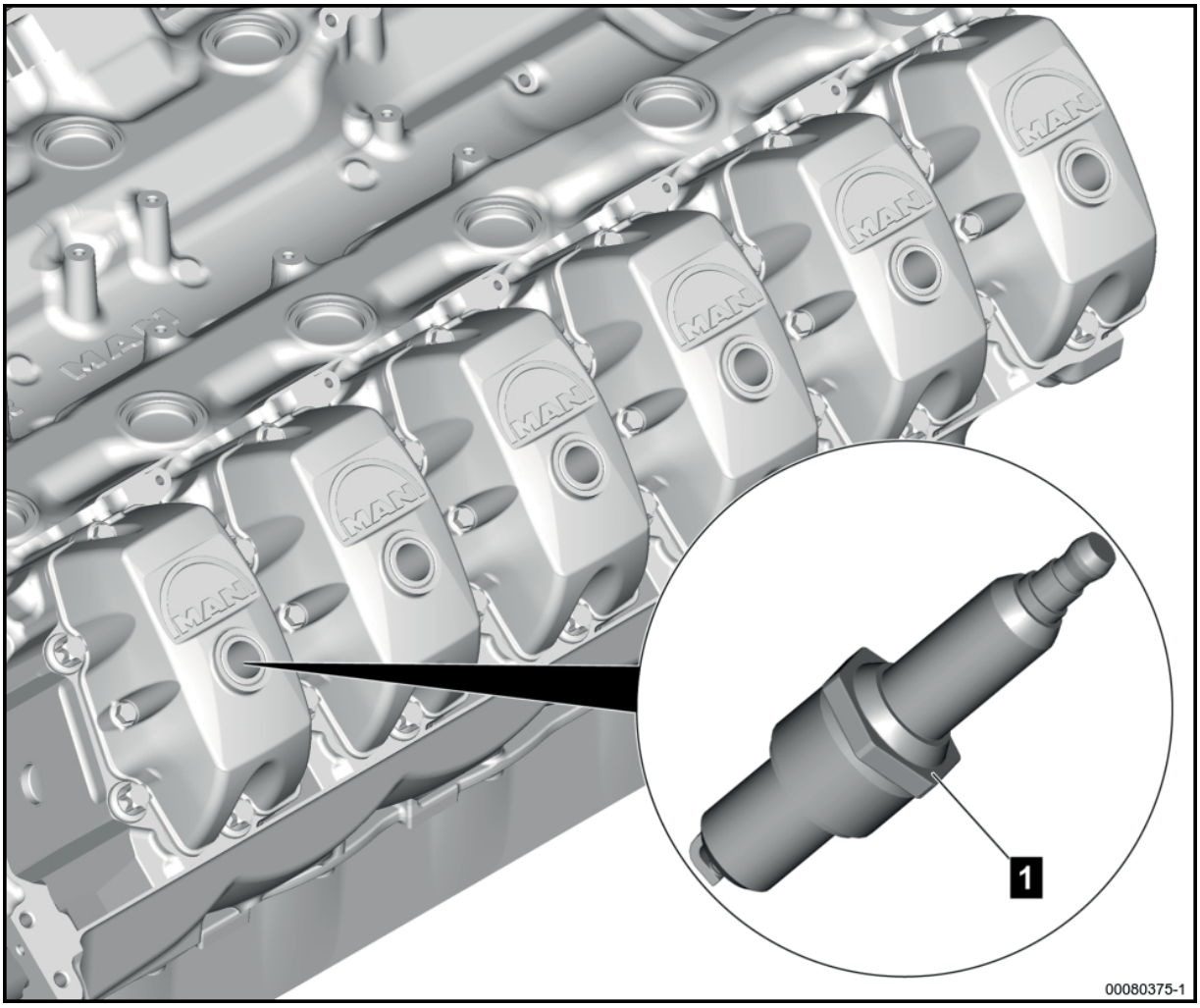
Fill the cooling system of the engine with a mixture consisting of tap water and antifreeze based on ethylene glycol or anti-corrosion agent.

See the publication "Service products for MAN industrial gas engines".

The cooling system must be fille with coolant in accordance with the fillin instructions provided by the manufacturer of the overall system.

The proper mixing ratio of water and antifreeze must be restored.

5.7.4 Removing/installing the spark plug



key

1 Spark plug

Technical data
Tightening torques

Original equipment		
Spark plug (dry thread)	M14x1.25	40 Nm
Third-party manufacturer		
Spark plug, third-party manufacturer		See manufacturer's instructions

Test and setting values

Electrode distance in the spark plug	0.2 ± 0.05 mm

Important information

NOTE

Risk of component damage due to incorrect tightening torque

The tightening torque refers to the spark plug installed by MAN.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

Tip for users

Do not reinstall damaged or dropped spark plugs!

Special tools

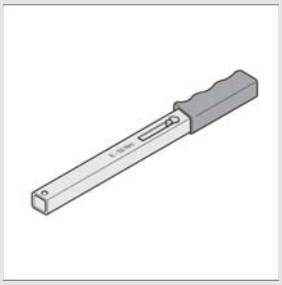
1

Handle 08.06460-0001
Quantity 1
Handle 9 x 12 x 400 mm

Removing spark plugs in conjunction with:

- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs 51.97710-0005

2



Torque wrench 08.06450-0006
Quantity 1
Torque wrench, 6 - 50 Nm / 9 x 12 x 333 mm, 3/8" square drive

Installing the spark plugs in conjunction with:

- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs 51.97710-0005

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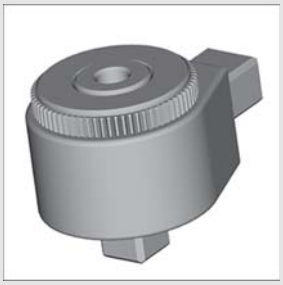
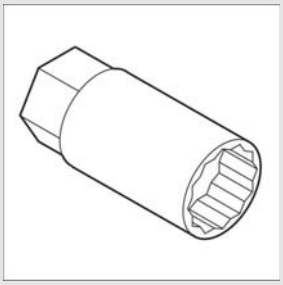
3		**Ratchet** Quantity 1 3/8” square ratchet 10 - 9 x 12 Removing spark plugs in conjunction with: • Handle 08.06460-0001 • Socket wrench insert for spark plugs 51.97710-0005 Installing the spark plugs in conjunction with: • Torque wrench 08.06450-0006 • Socket wrench insert for spark plugs 51.97710-0005	08.06455-0001
4		**Socket for spark plugs** Quantity 1 Removing the spark plugs in conjunction with: • Handle 08.06460-0001 • Ratchet 08.06455-0001 Installing the spark plugs in conjunction with: Torque wrench 08.06450-0006 • Ratchet 08.06455-0001	51.97710-0005

Removing spark plugs

Unscrewing the spark plugs

⚠ DANGER

Danger to life from electrical power

Touching the ignition system during operation is life-threatening.

Therefore:

- Never disconnect the spark plug connector while the engine is running.

►Pull off the spark plug connector

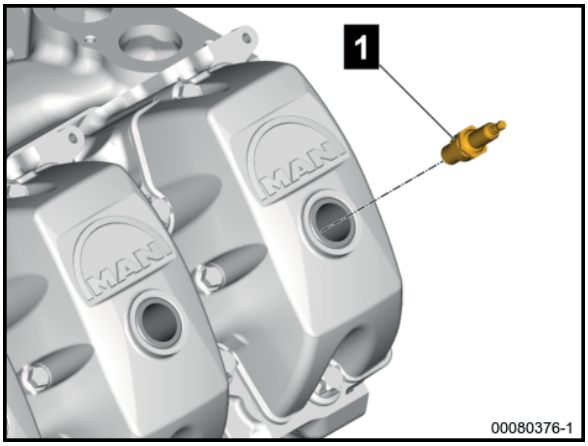
Tip for users

Prior to dismounting, use compressed air to remove any fouling and contamination from the installation bay.

►Use compressed air to clean the installation bay

►Assemble the special tool consisting of handle [1], ratchet [3], extension and socket wrench insert for spark plugs [4]

►Loosen and unscrew the spark plugs **1** using the special tool

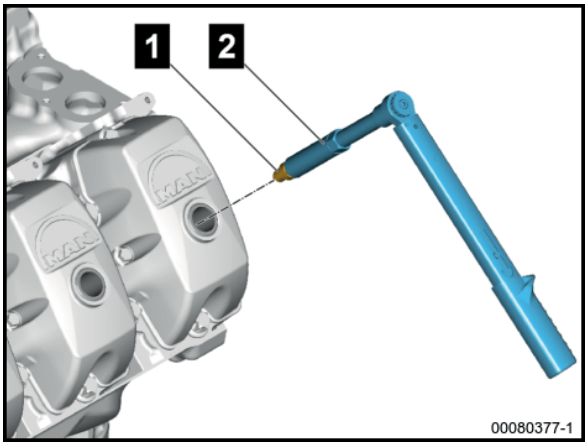


Installing spark plugs

Screwing in the spark plugs

Tip for users

Do not reinstall damaged or dropped spark plugs!



NOTE

Risk of component damage due to incorrect tightening torque

The tightening torque refers to the spark plug installed by MAN.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

►Screw in the spark plug **1** by hand using the socket wrench insert for spark plugs [4]

►Assemble the special tool consisting of torque wrench [2], ratchet [3], extension and socket wrench insert for spark plugs [4]

►Tighten the spark plug **1** using the special tool **2**

Tightening torque values of original equipment

Tightening torque (dry thread)..... ..... 40 Nm

Tightening torque values third-party manufacturer

Tightening torque third-party manufacturer..... ..... See manufacturer's instructions

►Position the spark plug connectors and let it lock into place

5.7.5 Removing/installing the spark plug with locking element

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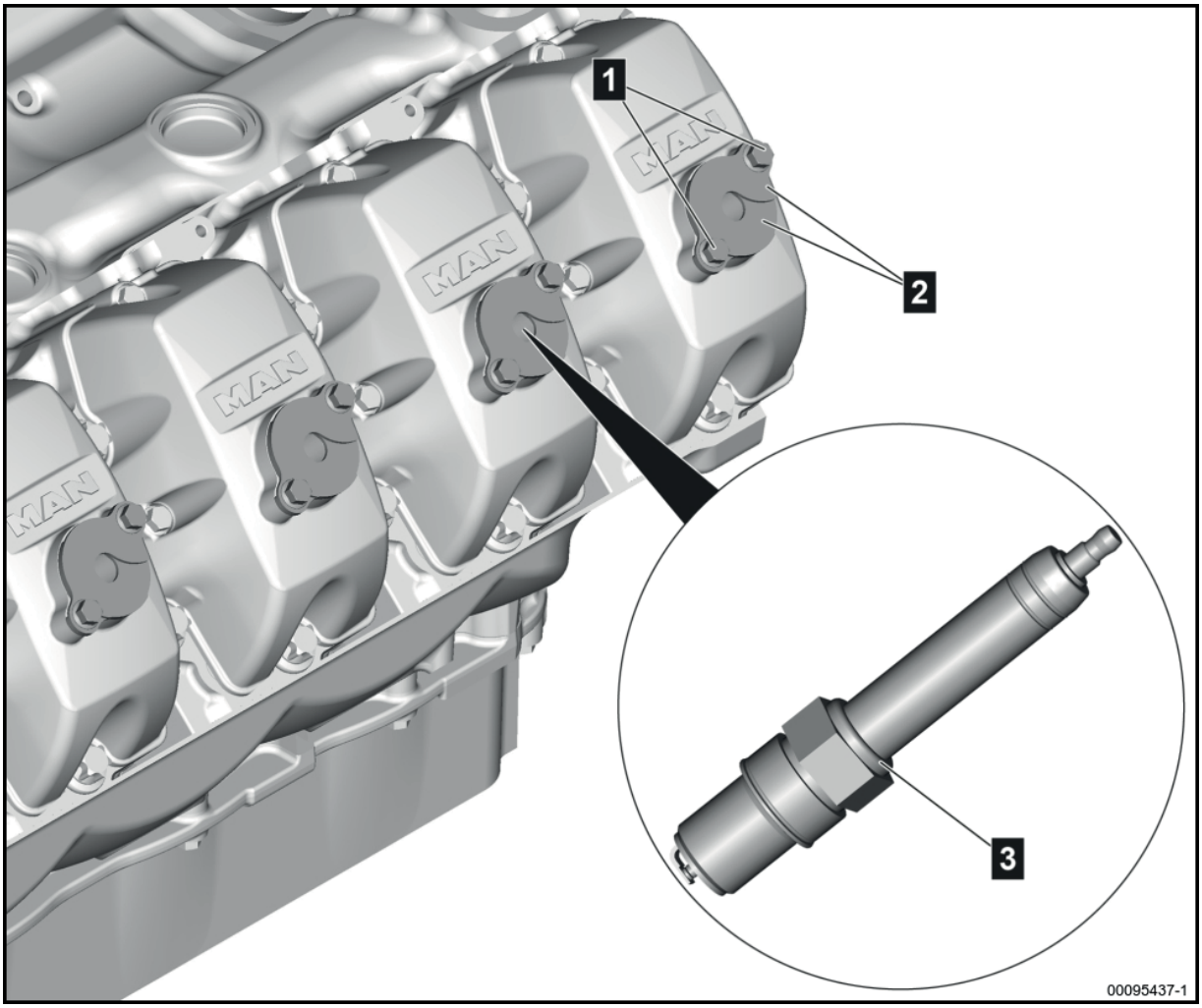


key

1 Mounting bolt
2 Locking element
3 Spark plug

Technical data

Tightening torques

Original equipment		
Spark plug (dry thread)	**M14**x1.25	40 Nm
Spark plug (dry thread)	**M18**x1.5	50 + 70 Nm
Third-party manufacturer		
Spark plug, third-party manufacturer		See manufacturer's instructions

Test and setting values

Original equipment	
Spark plug electrode gap **M14**x1.25	0.28 ± 0.05 mm
Spark plug electrode gap **M18**x1.5	0.3 $^{}_{-0.05}$ mm

Important information

NOTE

Risk of component damage due to incorrect tightening torque

The tightening torque should correspond to the structure of MAN spark plug.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

Tip for users

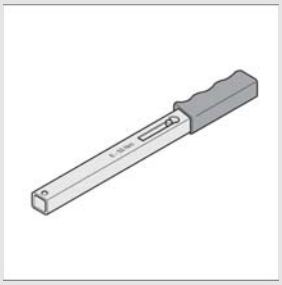
Do not reinstall damaged or dropped spark plugs!

Special tools

1

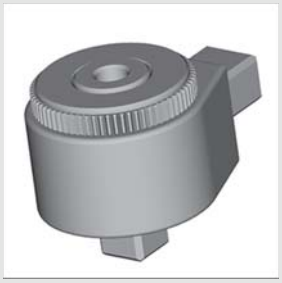
Handle 08.06460-0001
Quantity 1
Handle 9 x 12 x 400 mm
Removing spark plugs in conjunction with:
- Ratchet 08.06455-0001
- Socket wrench insert for spark plugs

2



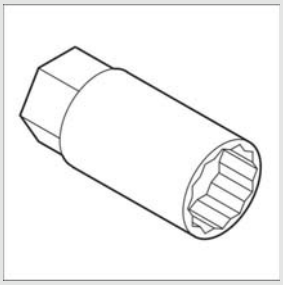
Torque wrench 08.06450-0006
Quantity 1
Torque wrench, 6 - 50 Nm / 9 x 12 x 333 mm, 3/8" square drive
Installing the spark plugs in conjunction with:
Ratchet 08.06455-0001
- Socket wrench insert for spark plugs

3



Ratchet 08.06455-0001
Quantity 1
3/8” square ratchet 10 - 9 x 12
Removing spark plugs in conjunction with:
- Handle 08.06460-0001
- Socket wrench insert for spark plugs 51.97710-0005

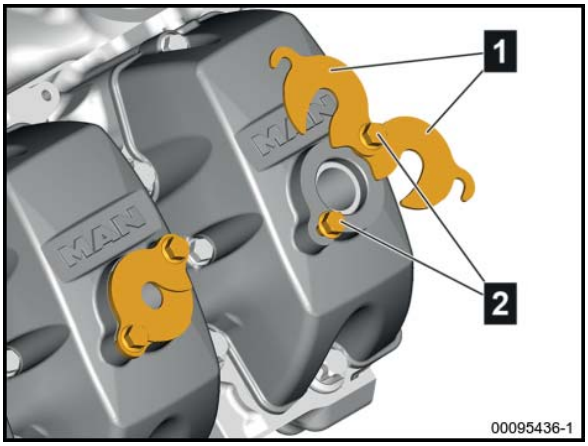
Installing the spark plugs in conjunction with:
- Torque wrench 08.06450-0006
- Socket wrench insert for spark plugs

4		**Socket for spark plugs** Quantity 1 Removing spark plugs **(M14)** in conjunction with: • Handle 08.06460-0001 • Ratchet 08.06455-0001 Installing the spark plugs in conjunction with: Torque wrench 08.06450-0006 • Ratchet 08.06455-0001	51.97710-0005
5		**Spark plug wrench** Quantity 1 Removing spark plugs **(M18)** in conjunction with: • Handle 08.06460-0001 • Ratchet 08.06455-0001 Installing the spark plugs in conjunction with: Torque wrench 08.06450-0006 • Ratchet 08.06455-0001	08.06141-9066

Removing spark plugs

Loosening the locking elements

►Loosen the mounting bolts **2** (do not unscrew)
►Fold away the locking elements **1** to the side



Unscrewing the spark plugs

⚠ DANGER

Danger to life from electrical power

Touching the ignition system during operation is life-threatening.

Therefore:

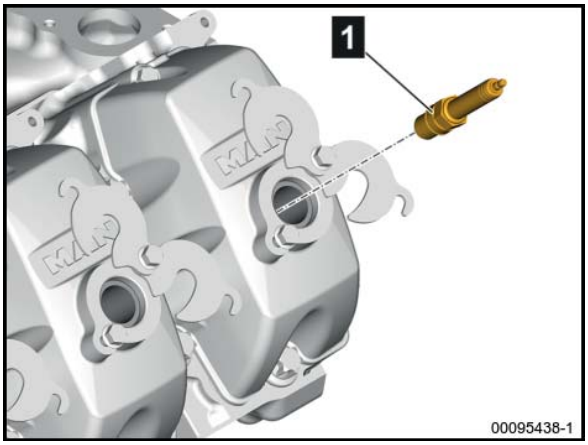
- Never disconnect the spark plug connector while the engine is running.

►Pull off the ignition cable

Tip for users

Prior to dismounting, use compressed air to remove any fouling and contamination from the installation bay.

►Use compressed air to clean the installation bay
►Assemble the special tool consisting of handle [1], ratchet [3], extension and socket wrench insert for spark plugs **M14** [4] or **M18** [5]
►Loosen and unscrew the spark plugs **1** using the special tool



Installing spark plugs

Tip for users

In case of reusing the spark plugs **M18**, the seal must be replaced.

►Remove the old seal from the spark plug **M18** 1
►Slide a new seal onto the spark plug **M18** 1

Tip for users

Do not reinstall damaged or dropped spark plugs!

NOTE

Risk of component damage due to incorrect tightening torque

The tightening torque should correspond to the structure of MAN spark plug.

Therefore:

- Check type of spark plugs currently installed.
- Do not use an impact screwdriver to loosen or tighten.
- Final tightening must always be applied manually using a torque wrench.
- Tightening torque according to spark plug manufacturer's instructions.
- If in doubt, contact the manufacturer.

Screwing in the spark plug M14x1.25

►Screw in the spark plug **M14** 1 by hand using the socket wrench insert for spark plugs (M14) [4]
►Assemble the special tool consisting of torque wrench [2], ratchet [3], extension and socket wrench insert for spark plugs **M14** [4]
►Tighten the spark plug 1 using the special tool 2

Tightening values for original equipment spark plug M14x1.25

Tightening torque..... ..... 40 Nm

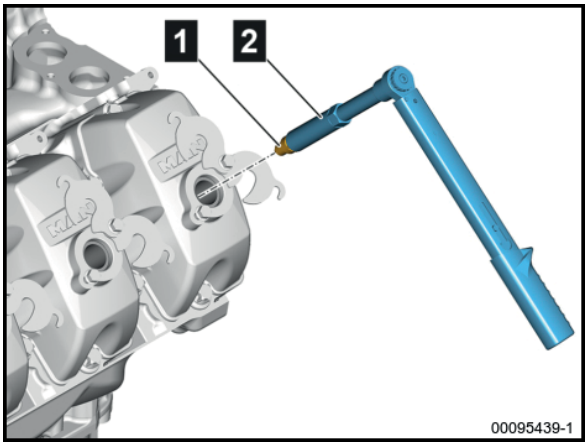
Screwing in the spark plug M18x1.5

►Screw in the spark plug **M18** 1 and seal by hand using the socket wrench insert for spark plugs (M18)
►Assemble the special tool consisting of torque wrench [2], ratchet [3], extension and socket wrench insert for spark plugs **M18** [5]
►Tighten the spark plug 1 using the special tool 2

Tightening values original equipment spark plug M18x1.5

Tightening torque..... .... 50-70 Nm

Tightening values third-party manufacturer (M14 and M18)



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Tightening torque	....	See manufacturer's instructions

►Insert the ignition cable and allow to engage

Attaching the locking elements

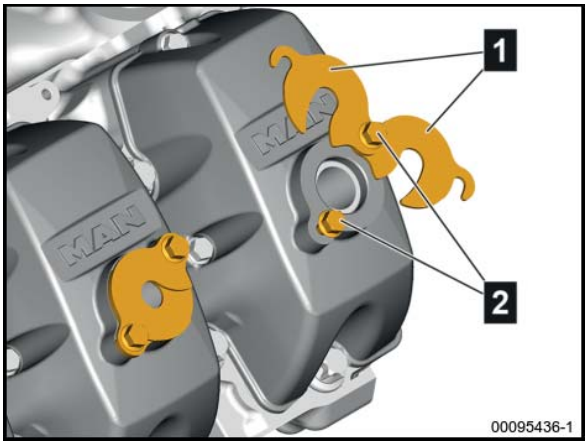
⚠ WARNING

Risk of injury due to wrong ignition cable

Safety equipment malfunction due to a non-matching combination of safety elements and the installed ignition cables.

Therefore:

- Verify which ignition cables are installed and consult the manufacturer or the supplier of the ignition cable regarding the safety equipment.



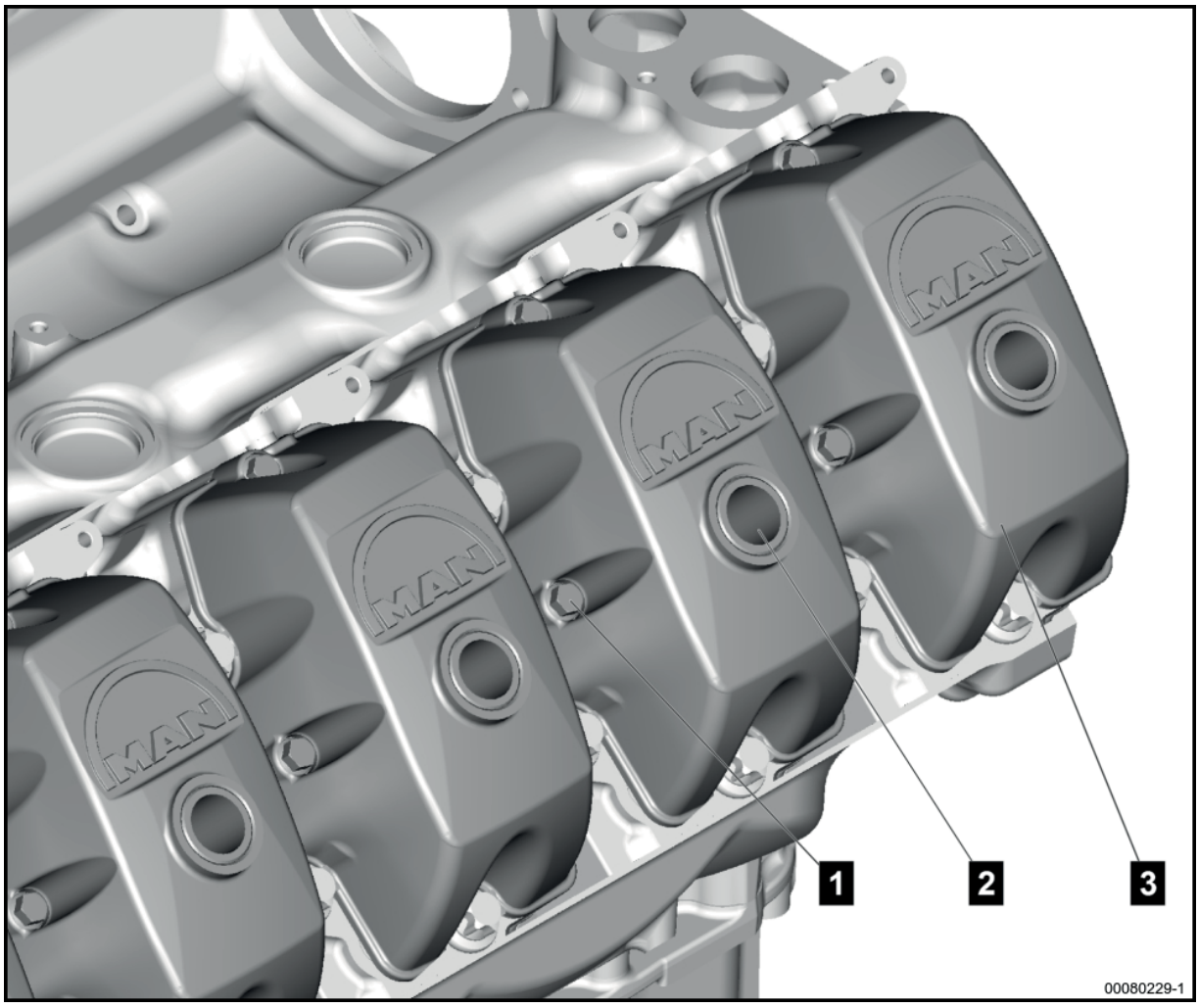
►Fold back the locking elements **1** into their installation position

►Tighten the mounting bolts **2**

►Check locking elements **1** and ignition cable for secure fi and correct installation position

5.7.1 Checking and adjusting E3268/E3262 valve clearance

5.7.1.1 Removing/installing the cylinder head cover



key

1 Mounting bolt
2 Spark plug guide tube
3 Cylinder head cover

Consumables

Castrol low-temperature grease 09.15011-0029

Important information

NOTE

Risk of component damage due to incorrectly tightened bolted connections

Therefore:

- In preliminary tightening, use an impact screwdriver with max. 50% of the prescribed fina tightening torque.
- Final tightening must always be applied manually using a torque wrench.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

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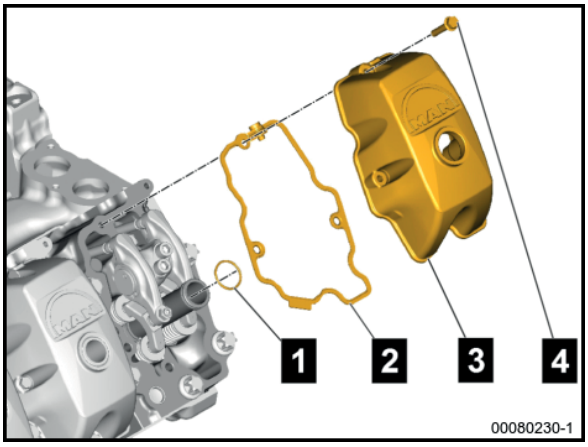
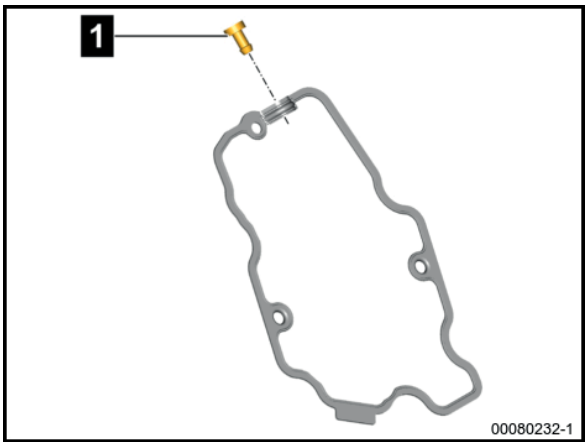
Removing the cylinder head cover

Removing the cylinder head cover



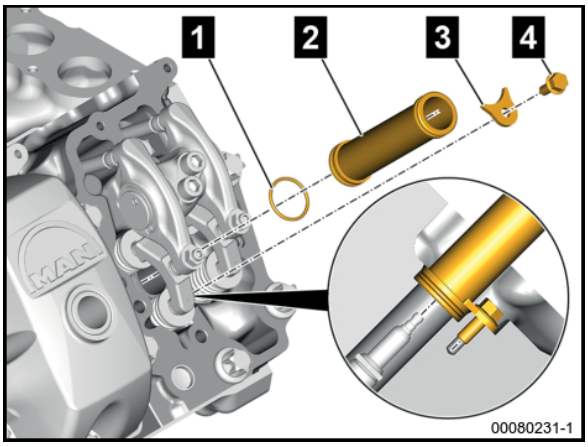
- ►Unscrew the mounting bolts 4
- ►Remove the cylinder head cover 3 with seal 2
- ►Remove the O-ring 1
- ►Clean the areas to be sealed

Removing the plug



- ►Push the plug 1 out of the seal

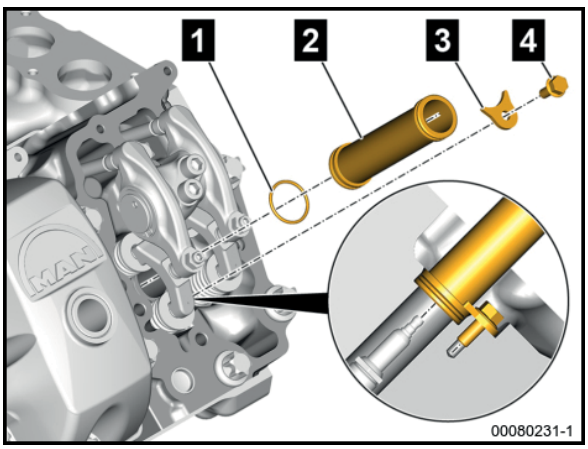
Detaching the guide tube for the spark plug



- ►Unscrew the mounting bolt 4
- ►Remove the pressure flang 3
- ►Pull out the guide tube 2 with O-ring 1
- ►Clean the areas to be sealed

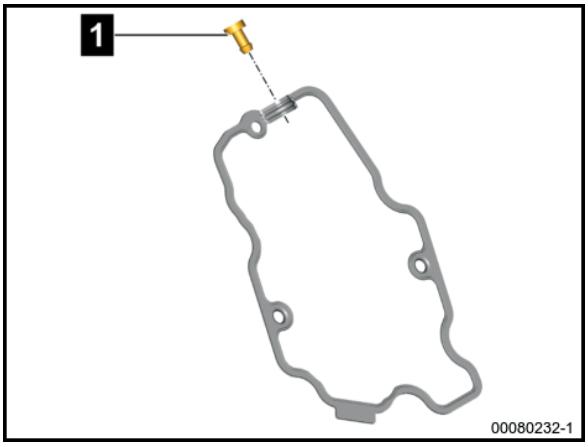
Installing the cylinder head cover

Attaching the guide tube for the spark plug



- ►Clean the areas to be sealed
- ►Insert the guide tube 2 with a new O-ring 1
- ►Attach the pressure flang 3
- ►Screw in and tighten the mounting bolt 4

Installing the plug



►Apply Castrol low-temperature grease to the sealing plug 1 and insert the plug into the seal

Tightening the cylinder head cover mounting bolts

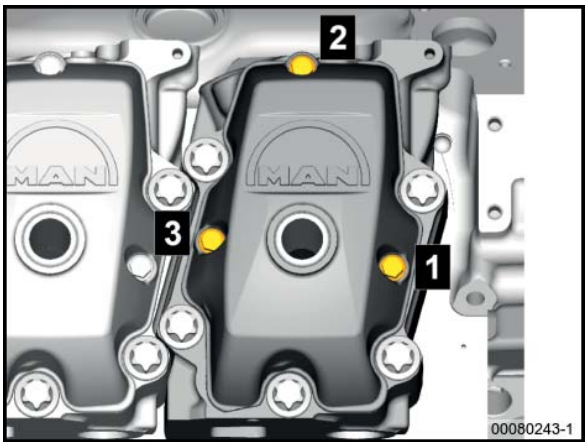
NOTE

Risk of component damages due to incorrect tightening sequence

Therefore:
- Follow the tightening sequence, otherwise the component might break.

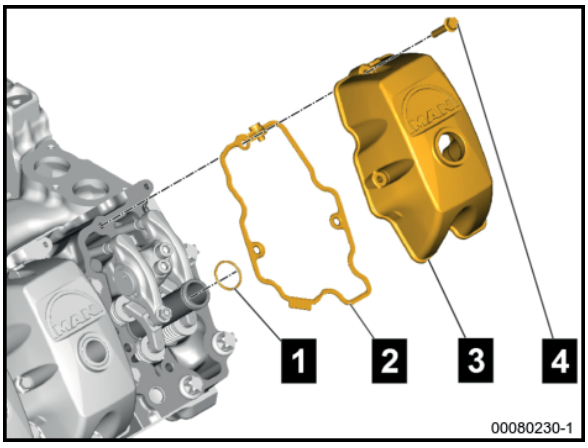
Tip for users

Tighten the cylinder head cover from right to left to slip the cut edge onto the seal.



►Tighten the mounting bolts 1 to 3 in the tightening sequence

Mounting the cylinder head cover



►Clean the areas to be sealed
►Insert a new O-ring 1 into the guide tube
►Check the seal 2 for damages, renew if necessary
►Position the cylinder head cover 3 including seal 2 on the cylinder head
►Screw in and tighten the mounting bolts 4

5.7.1.2 Check & adjust valve/s

Preparatory measures

►Removing/installing the cylinder head cover, Page 125

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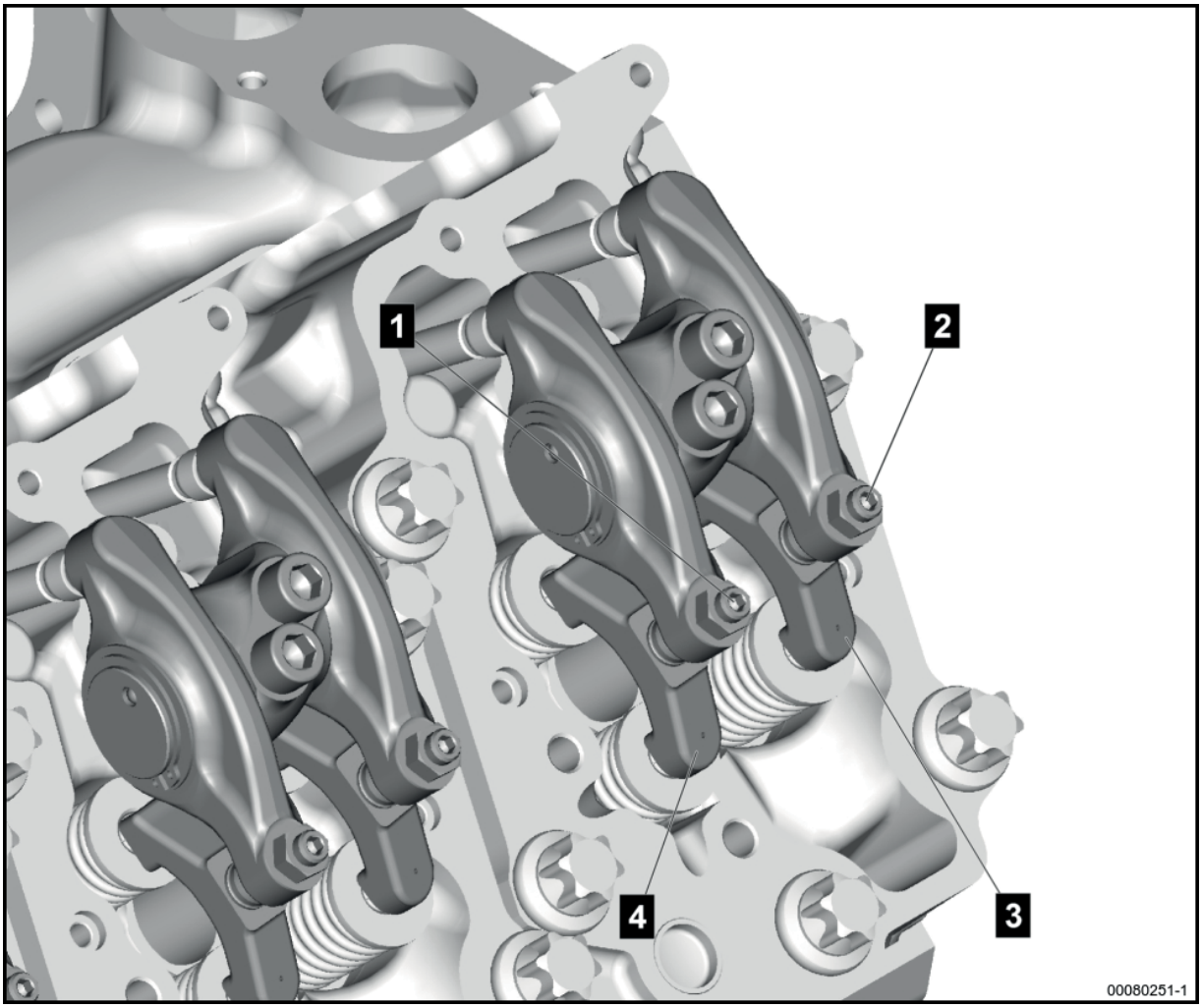


key

1 Adjusting screw, exhaust valve
2 Adjusting screw, intake valve
3 Valve crosshead, intake valve
4 Valve crosshead, exhaust valve

Technical data

Tightening torques

Lock nut, rocker arm adjusting screw..... M10x1-22H..... ..... 45 Nm

Test and setting values

Intake valve clearance..... 0.50 mm

Exhaust valve clearance..... ..... 0.60 mm

Important information

NOTE

Risk of component damage due to incorrectly tightened bolted connections

Therefore:

- In preliminary tightening, use an impact screwdriver with max. 50% of the prescribed fina tightening torque.
- Final tightening must always be applied manually using a torque wrench.

NOTE

Risk of engine damage due to incorrect valve clearance

Therefore:

- Only set the valve clearances whilst the engine is cold.

Tip for users

The repair manual describes the repair method of an engine variant as an example.

Illustrations and the corresponding descriptions do not always correspond to the engine being repaired as it was not possible to take into account all engine versions.

In cases such as these, plan and execute the repair measures accordingly.

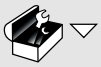
Special tools

1

Feeler gauge, 7-leaf version 08.75310-3309
Quantity 1
Adjusting the valve clearance

2

Valve adjusting wrench, wrench width 14 80.99603-6031
Quantity 1
Wrench width 14 adjusting the valve clearance in conjunction with: 08.06460-0003



Valve adjusting wrench insert 80.99603-0337
Quantity 1

3

Handle 08.06460-0003
Quantity 1
Detachable handle 9 X 12 - 150 mm adjust the valve clearance

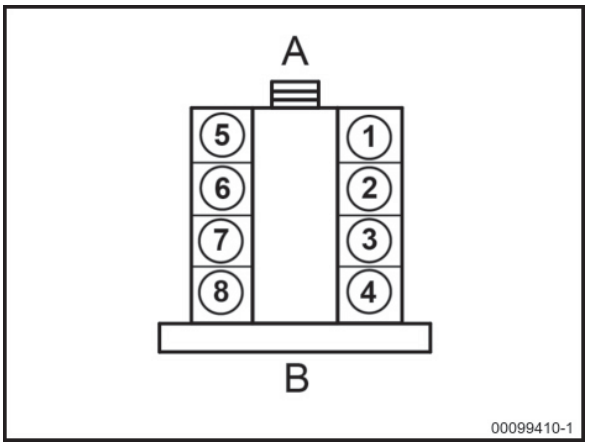
Checking and adjusting valve clearance

Cylinder allocation E3268

Cylinder allocation for valve adjustment E3268

A = Vibration damper side

B = Flywheel side



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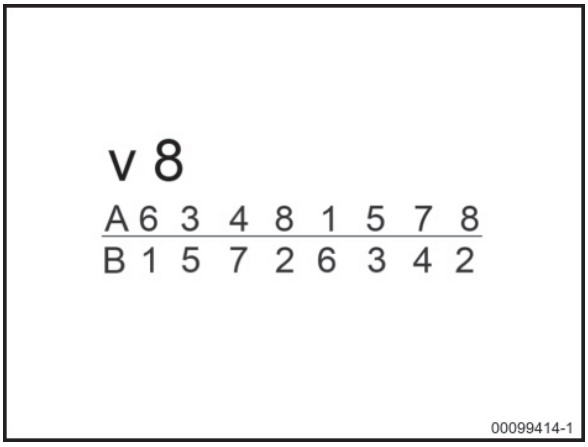
Bringing the engine in the adjusting position E3268

►Crank the engine in its running direction using the engine cranking unit and gear ratchet until the rocker arms are in overlap

►Adjust the free rocker arms as indicated in the table above

A = Rocker arms overlap

B = Rocker arms free for valve clearance setting

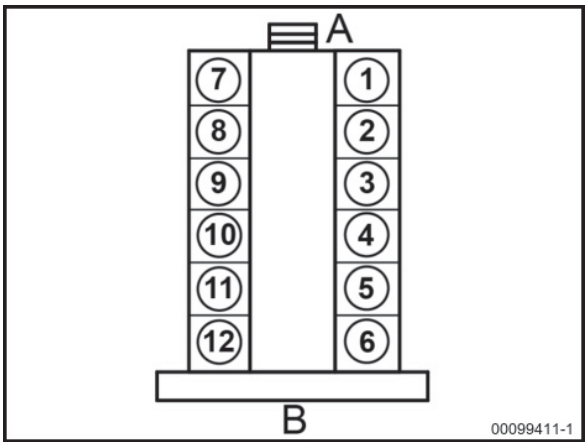


Cylinder allocation E3262

Cylinder allocation for valve adjustment E3262

A = Vibration damper side

B = Flywheel side



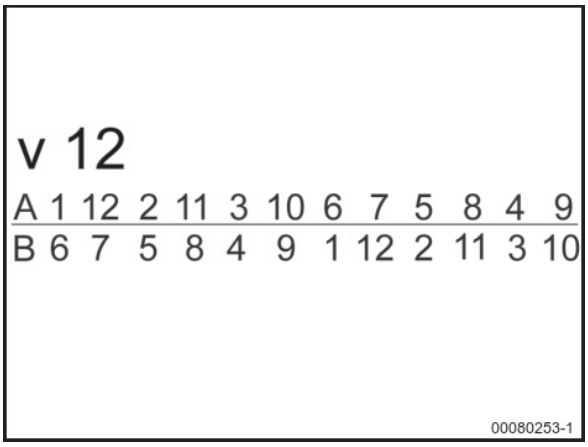
Bringing the engine in the adjusting position E3262

►Crank the engine in its running direction using the engine cranking unit and gear ratchet until the rocker arms are in overlap

►Adjust the free rocker arms as indicated in the table above

A = Rocker arms overlap

B = Rocker arms free for valve clearance setting

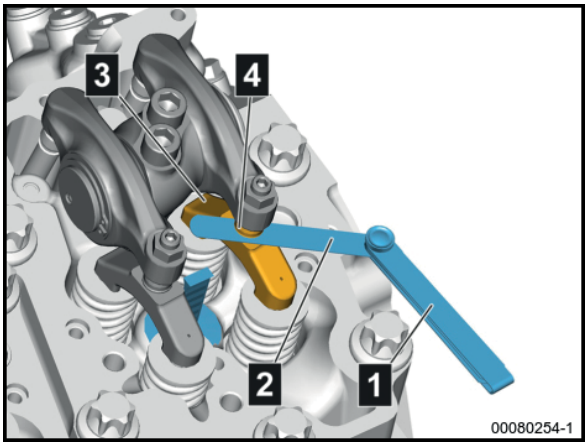


Checking the intake valve clearance

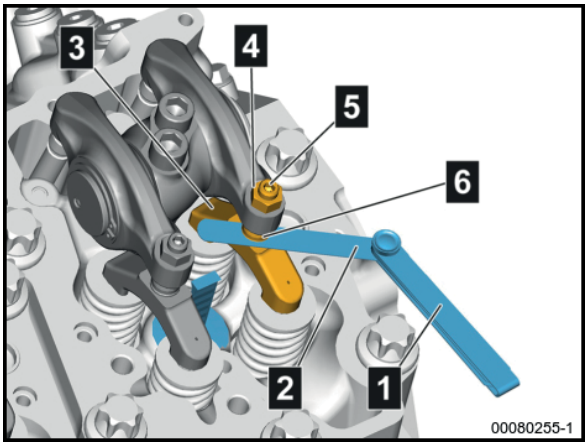
►Insert the feeler gauge [1] **1** 0.5 mm leaf **2** between the ball cup **4** and the valve crosshead **3**

►Checking the intake valve clearance

The valve clearance must be adjusted if it is not 0.50 mm.



Adjusting the intake valve clearance

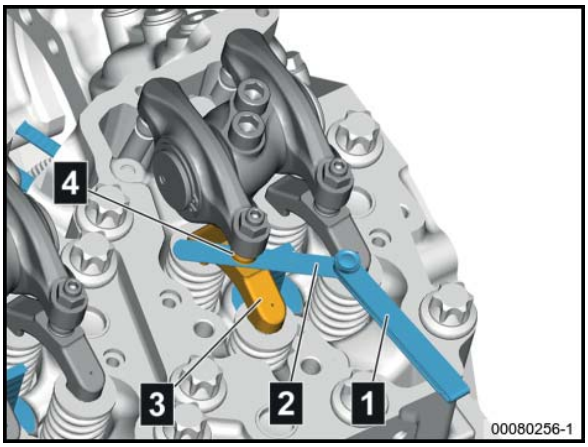


- ►Undo the lock nut 4
- ►Turn the adjusting screw 5 back until the feeler gauge [1] 1 with 0.5 mm leaf 2 can be inserted between the ball cup 6 and the valve crosshead 3
- ►Screw in the adjusting screw 5 until the 0.5 mm leaf 2 with the feeler gauge [1] 1 can be moved between the ball socket 6 and the valve crosshead 3 with little resistance (sucking)
- ►Brace the adjusting screw 5 with the valve adjusting wrench size 14 [2] and the handle [3] and tighten the lock nut 4

Tightening torque..... .... 45 Nm

- ►Check the intake valve clearance and repeat the adjustment process as required.

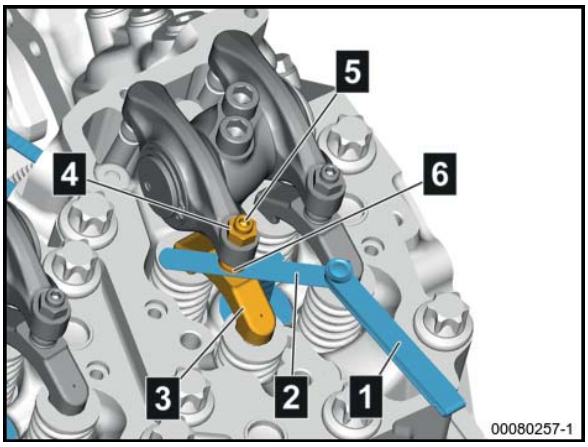
Checking the exhaust valve clearance



- ►Insert the feeler gauge [1] 1 0.6 mm leaf 2 between the ball cup 4 and the valve crosshead 3
- ►Checking the exhaust valve clearance

The valve clearance must be adjusted if it is not 0.60 mm.

Adjusting the exhaust valve clearance



- ►Undo the lock nut 4
- ►Turn the adjusting screw 5 back until the feeler gauge [1] 1 with 0.6 mm leaf 2 can be inserted between the ball cup 6 and the valve crosshead 3
- ►Screw in the adjusting screw 5 until the 0.6 mm leaf 2 with the feeler gauge [1] 1 can be moved between the ball cup 6 and the valve crosshead 3 with little resistance (sucking)
- ►Brace the adjusting screw 5 with the valve adjusting wrench size 14 [2] and the handle [3] and tighten the lock nut 4

Tightening torque..... .... 45 Nm

- ►Check the exhaust valve clearance and repeat the adjustment process as required

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