Explanation of icons

Warning notices

Warnings in this operator's manual are identified by symbols. The information has been introduced with signal words that express the extent of risk or danger.

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.

WARNING

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

CAUTION

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

NOTE

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

Tips and Recommendations

Tip for users

Tips and recommendations as well as information for efficient and trouble-free operation.

ENVIRONMENTAL NOTE

Tips on conduct for environmental protection.

General information

- This symbol indicates a listing at the first level.

► This symbol indicates an action / sequence of actions.

1 This symbol indicates an item of a graphic display in the text.

[1] This symbol indicates the position of a special tool in the text after it is listed in the chapter.

2. Information on how to avoid damage and premature wear on units

General

- Units are only built for the purpose designated in the scope of delivery (according to their intended use), which is defined by the device manufacturer: Any other use is classified as not in accordance with the designated use. The manufacturer is not liable for damage caused as a result of such other use. In the event of such other use, the user alone bears the risk.
- The intended use also includes adherence to the operating and maintenance conditions defined by the manufacturer.
- The unit must only be used, maintained and repaired by personnel who are acquainted with it and have been instructed about any potential danger.
- The manufacturer does not assume any liability for damage to property or personal injury resulting from unauthorised modifications to the engine.
- Tampering with the injection and control system can also influence the performance and emissions behaviour of the unit. Compliance with the legal environmental regulations would then no longer be guaranteed.
- Should malfunctions occur, the cause must be determined and rectified immediately.
- Thoroughly clean the units prior to repair work and ensure that all openings where the ingress of dirt could cause functional or safety issues are sealed.
- Never allow units to run dry, i.e. without lubrication.
- Never allow engines to run without coolant.
- If units are not ready for operation, attach a relevant sign to them to indicate this.
- Only use service fluids that comply with the MAN service fluid recommendations as the manufacturer's warranty will be invalidated otherwise. You can find a list of approved products on the Internet at: https://mmrepro.mn.man.de/bstwebapp/BSTServlet
- Adhere to the specified service intervals.
- Do not fill engine/gear oil above the maximum level mark. Do not exceed the maximum permitted operational tilt.
- The special measures described in MAN Works Standard M 3069 Part 3 are necessary if buses/coaches or trucks are to be withdrawn from service or held in storage for longer than 3 months.

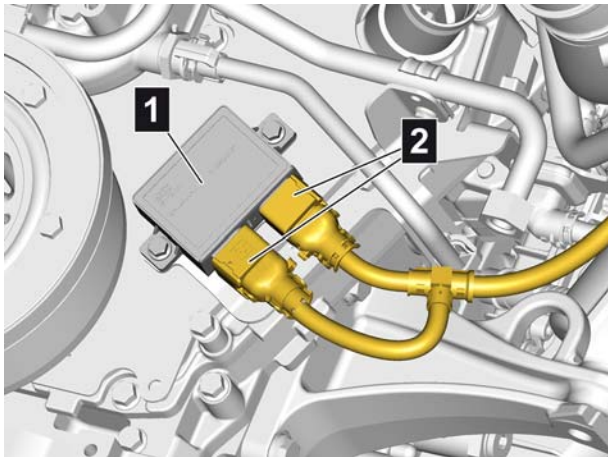
3. Liability limitations for spare parts and accessories

General

- Only use accessories expressly approved by MAN Truck & Bus AG and MAN genuine parts for your MAN vehicle. MAN Truck & Bus AG accepts no liability for any other products.

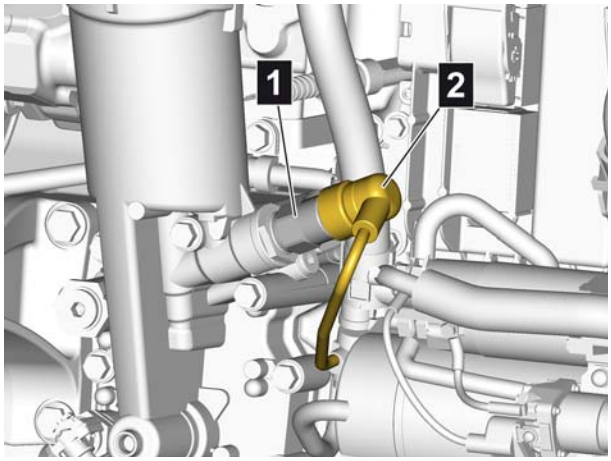
Disconnect the electrical connection of relay

► Disconnecting the electrical connection from the relay 2, 1



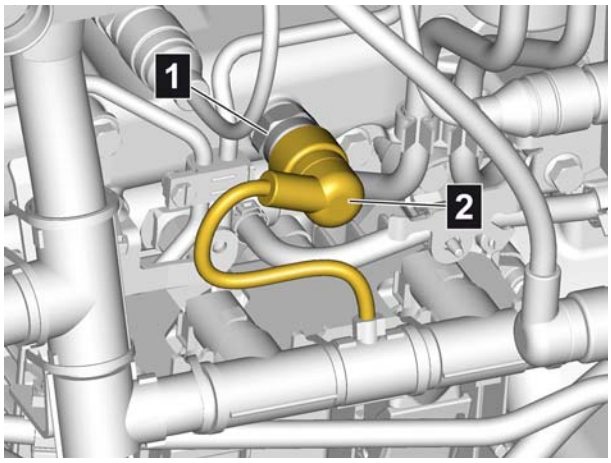
Disconnecting the oil module pressure sensor electrical connection

► Disconnect the electrical connection 2 from the pressure sensor 1

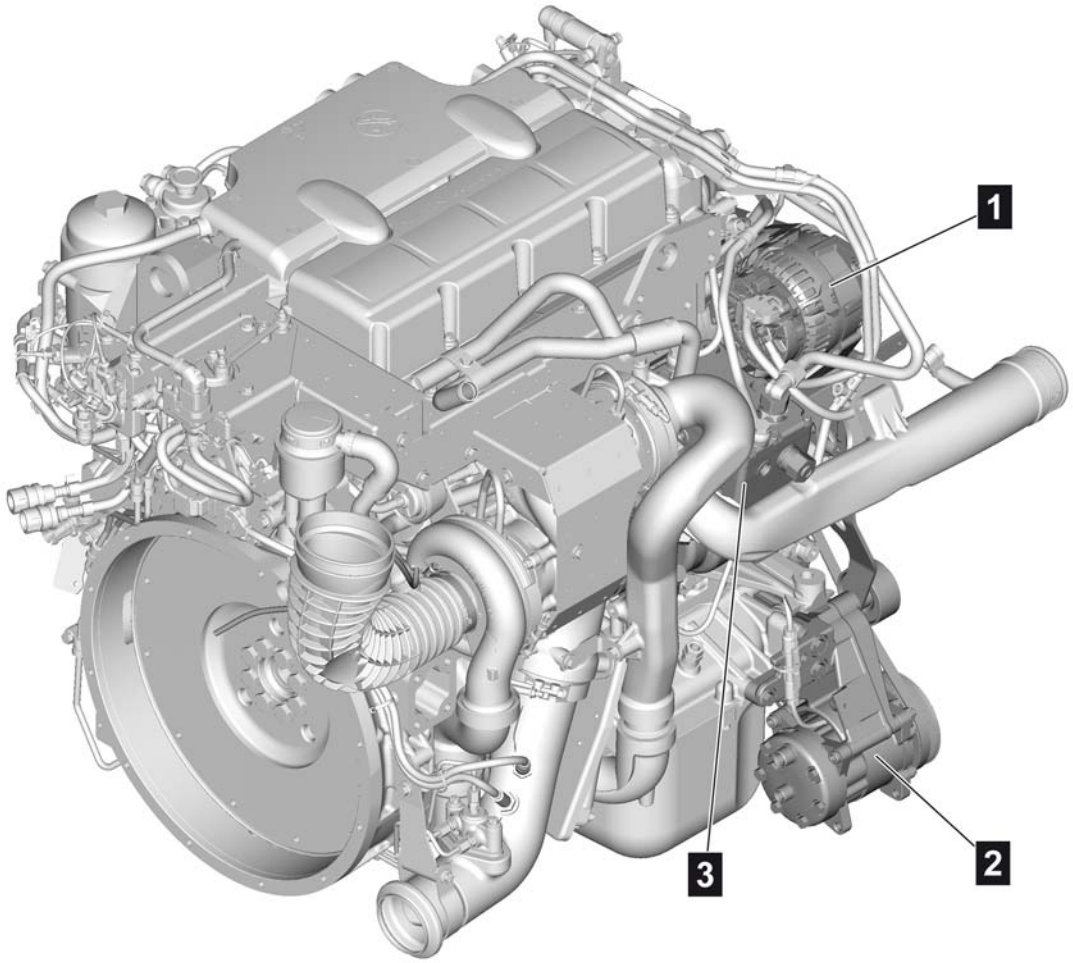


Disconnecting the air distributor pipe temperature sensor electrical connection

► Disconnecting the temperature sensor electrical connection 2, 1



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

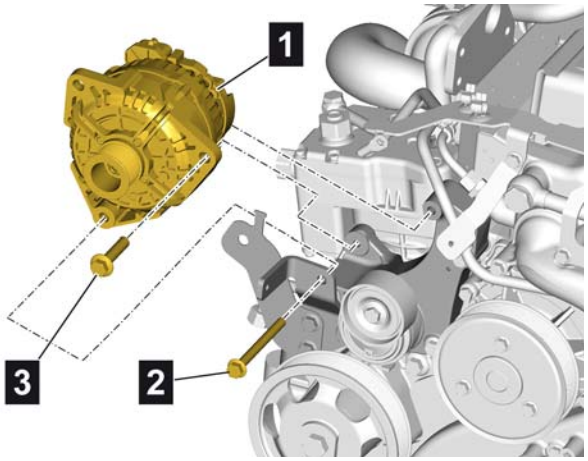


1 Alternator
2 Refrigerant compressor
3 Air compressor

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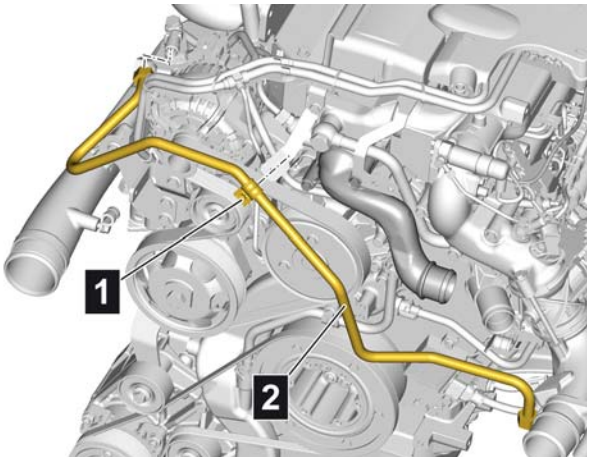
Mount the alternator

- ► Inserting the alternator 1
- ► Screw the mounting bolts 2 and 3 in as marked and tighten



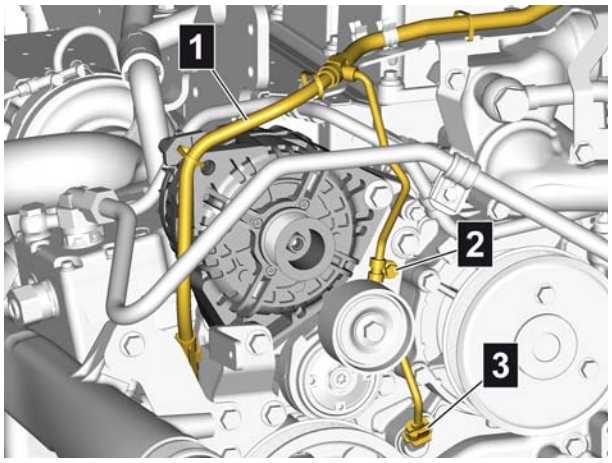
Fitting the brake line

- ► Positioning the brake line 2
- ► Screwing on and tightening the brake line union nuts 2
- ► Screw on and tighten the mounting bolts 1



Connecting the electrical connection to the cable harness

- ► Connect the electrical connection 3
- ► Screw on and tighten the mounting bolts 2
- ► Route the cable harness 1 and secure using cable ties
- ► Tighten and cut ends of cable ties using cable tie pliers [3]



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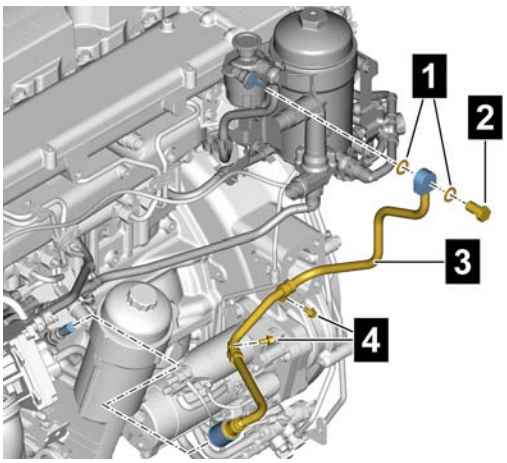
Removing the high-pressure pump

Detach the fuel line

ENVIRONMENTAL NOTE

Collect any fuel that escapes in a suitable container.

- ► Unscrew the mounting bolts 4
- ► Unscrew the hollow screw 2 and remove it with the seals 1
- ► Pull the fuel line 3 off using the size 1 unlocking tool [11] and the release handle [10]
- ► Seal fuel line 3 with protective sleeve Z 28 x 20 [5] and cap [3]
- ► Detach the fuel line 3
- ► Plug the connections with protective sleeve Z12 x 16 [4] and end plugs [13]

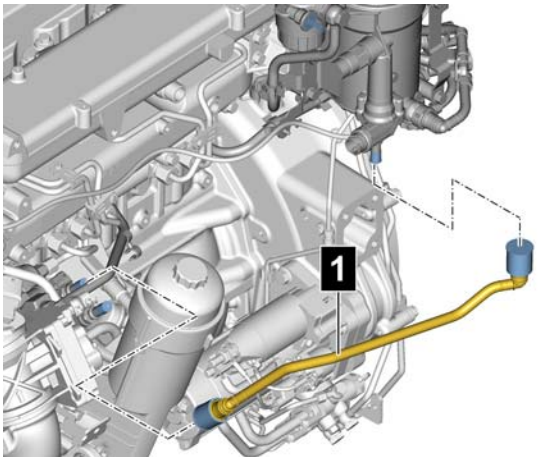


Removing fuel lines

ENVIRONMENTAL NOTE

Collect any fuel that escapes in a suitable container.

- ► Pulling off the fuel line 1 with an unlocking tool insert Size1 [11] and unlocking tool handle [10]
- ► Plug the fuel line 1 with protective sleeve Z 28 x 20 [5]
- ► Plug the connections with the protective sleeve Z 12 x 16 [4]

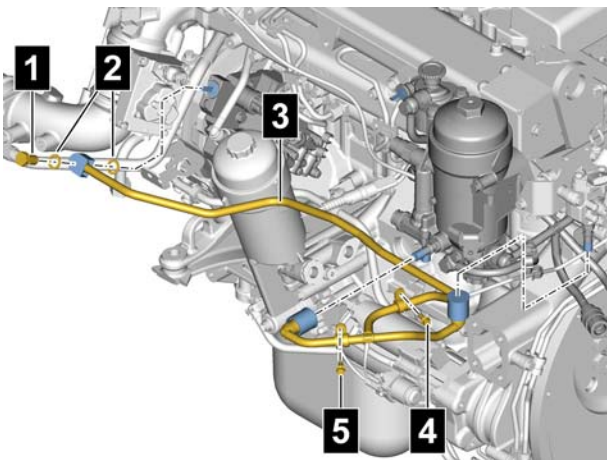


Removing fuel lines

ENVIRONMENTAL NOTE

Collect any fuel that escapes in a suitable container.

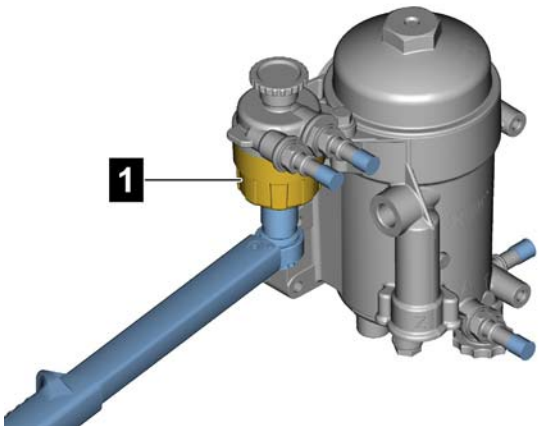
- ► Unscrew the mounting bolts 4 and 5
- ► Unscrew the hollow screw 1 and remove it with the seals 2
- ► Pulling off the fuel line 3 with an unlocking tool insert Size1 [11] and unlocking tool handle [10]
- ► Detach the fuel line 3
- ► Plug the fuel line 3 with protective sleeve Z 28 x 20 [5] and cap [3]
- ► Plug the connections with protective sleeve Z12 x 16 [4] and end plugs [13]



Tightening the fuel pre-filter cover

► Tighten the fuel pre-filter cover using the socket wrench size 19 [2]

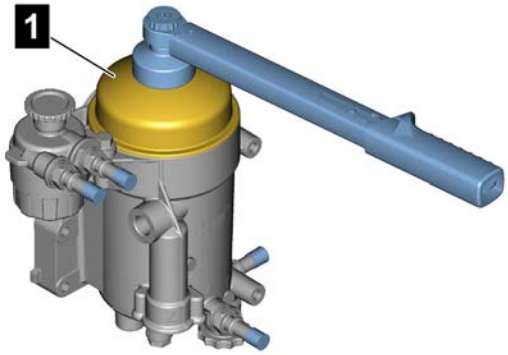
Tightening torque . . . . . 12 Nm



Tightening the fuel filter cover

► Tighten the fuel filter cover using the socket wrench size 36 [1]

Tightening torque . . . . . 25 Nm

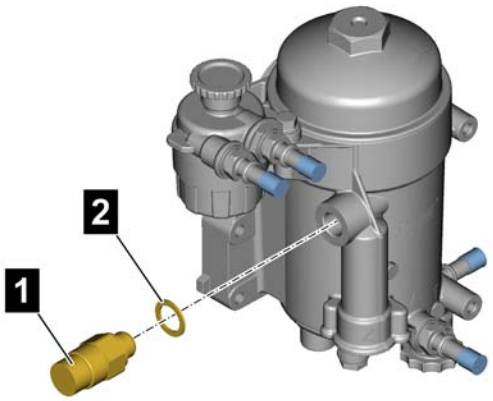


Installing the pressure sensor

► Screw the pressure sensor 1 in with a new seal 2

► Tighten the pressure sensor 1

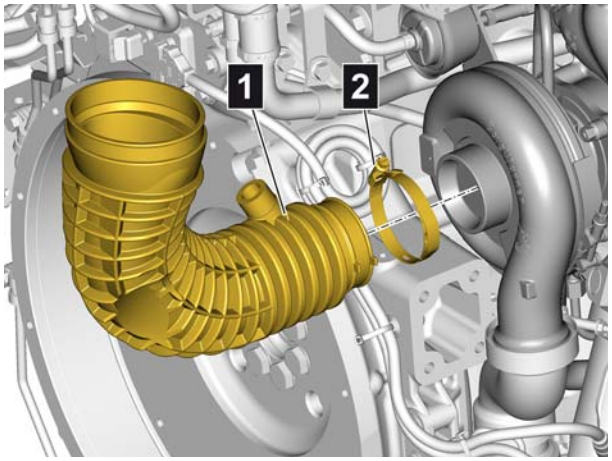
Tightening torque . . . . . 47 Nm



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and the respective safety instructions in the chapters.

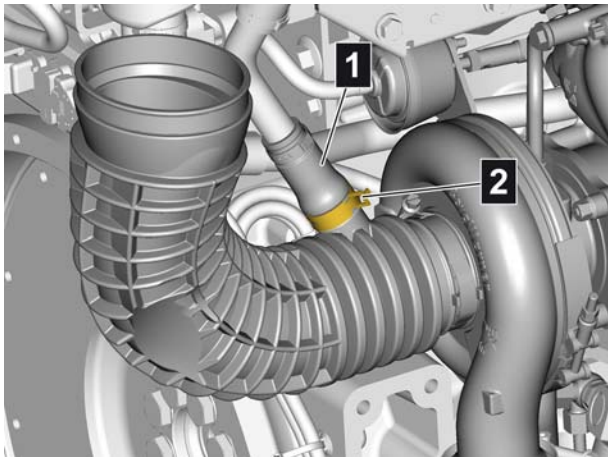
Attach the intake fitting

- ► Positioning the intake fitting 1 with hose clamp 2 as marked
- ► Tighten the hose clamp 2



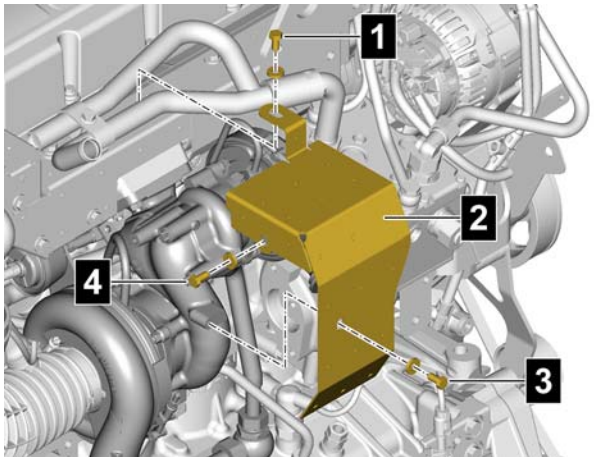
Attaching the hose

- ► Positioning the moulded hose 1 with spring band clamp 2
- ► Installing the spring band clamp 2 with hose clamp pliers for spring band clamps [2]



Attaching the heat shield

- ► Position the heat shield 2
- ► Screwing in and tightening the mounting bolts 1, 3 and 4 with washers

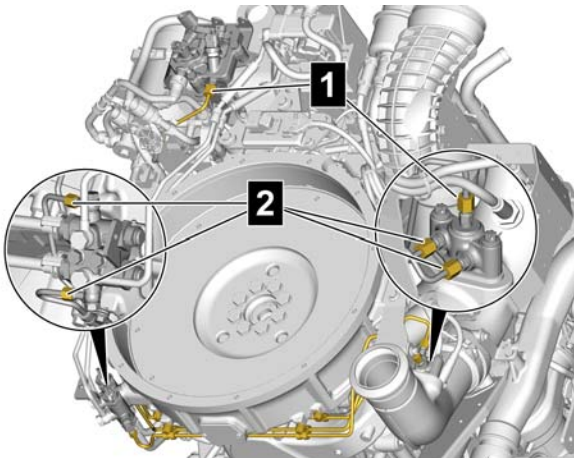


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and the respective safety instructions in the chapters.

Removing the HCI system

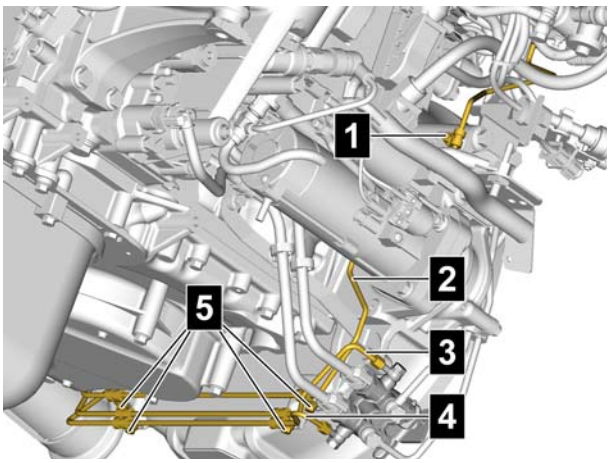
Detaching the connections of the hydrocarbon injection system

- ► Unscrew the fuel line union nuts 1
- ► Unscrewing the union nuts of the cooling pipes 2



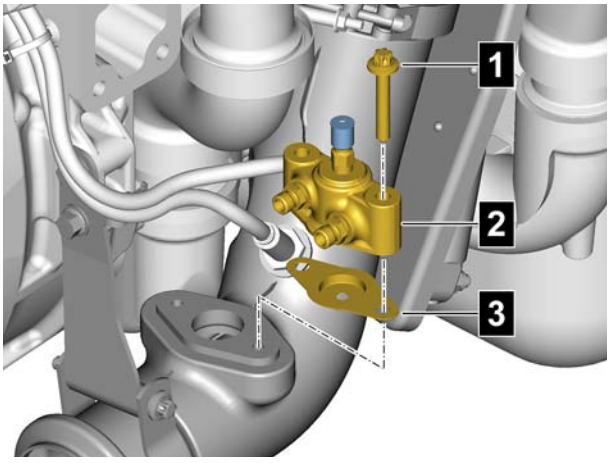
Removing the hydrocarbon injection system pipes

- ► Unscrew the mounting bolts 1 and 5
- ► Remove the fuel line 2
- ► Plug the fuel line 2 with protective sleeve Z 12 x 16 [1]
- ► Remove the coolant lines 3 and 4



Detaching the hydrocarbon injection system

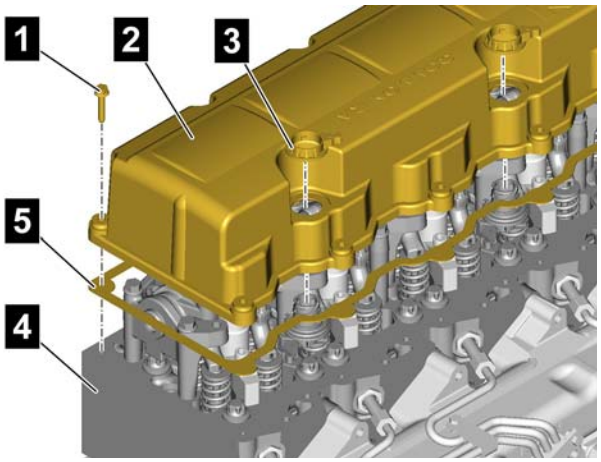
- ► Closing the hydrocarbon injection system 2 with a protective sleeve Z 12 x 16 [1]
- ► Unscrew the mounting bolts 1
- ► Removing the hydrocarbon injection system 2 with seal 3
- ► Clean the sealing surfaces



Installing the cylinder head cover

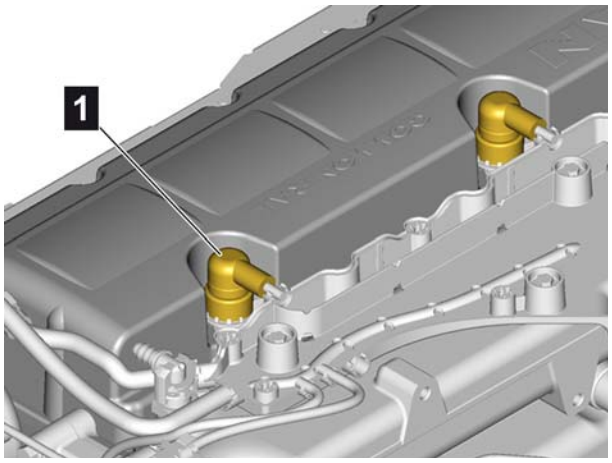
Mounting the cylinder head cover

► Check the plug bracket; renew if necessary.
► Fit the cylinder head cover 2, if necessary with a new gasket 5, over the plug bracket on the cylinder head 4
► Screw in and tighten 1 the mounting bolts
Tightening torque . . . . . 10 Nm
► Connect the bayonet fittings 3 on the plug bracket



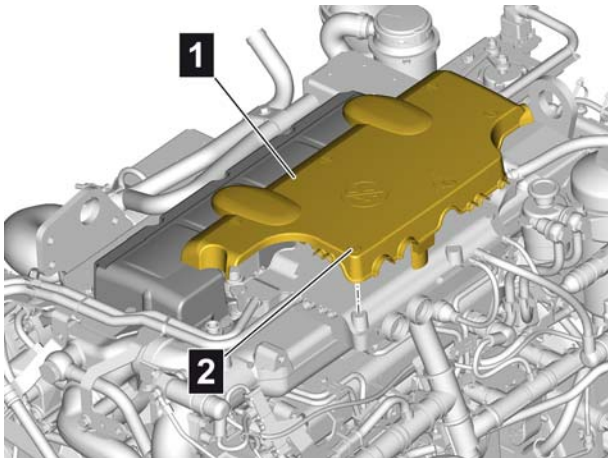
Connecting the plug bracket electrical connections

► Connect the electrical connections 1



Mounting the cable duct cover

► Position the cable duct cover 1
► Tighten the locking pin 2 a quarter turn



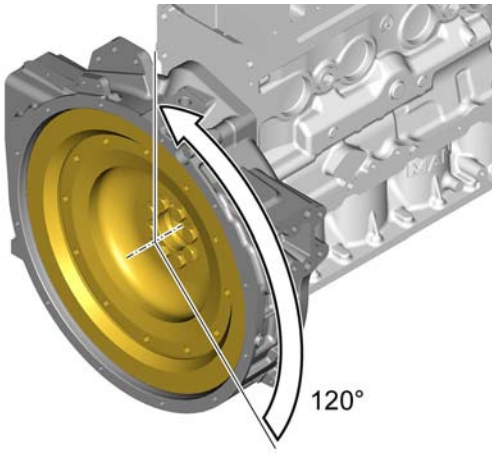
Read the manual thoroughly before starting any work!
This particularly applies to the chapter “General Safety Instructions”
and the respective safety instructions in the chapters.

Moving the engine into the removal and installation position

NOTE

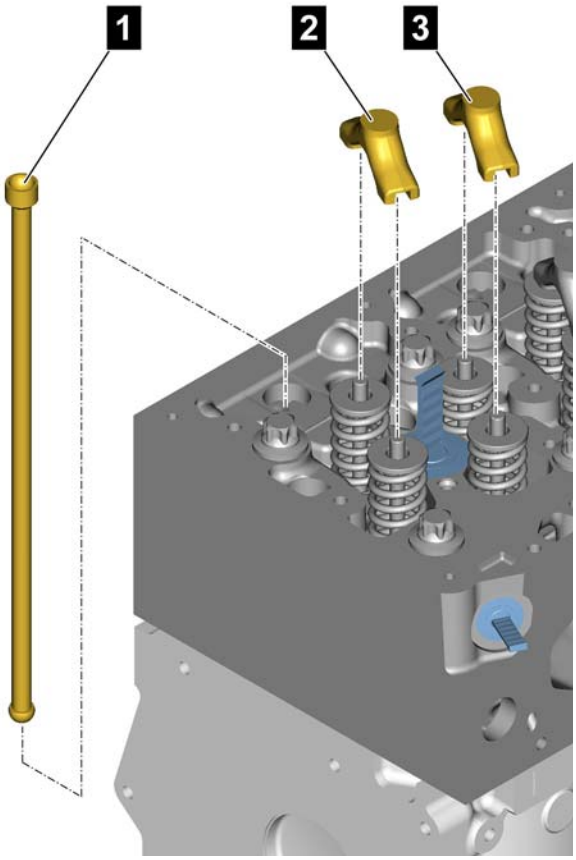
The process described below must be performed in the same way for the remaining cylinders

- ► Rotate the engine in the engine's running direction by a further 120° using the engine cranking unit [1] and the gear ratchet [2]
- ► Removing and installing free valve stem seals according to the table



Install valve crossheads and push rods

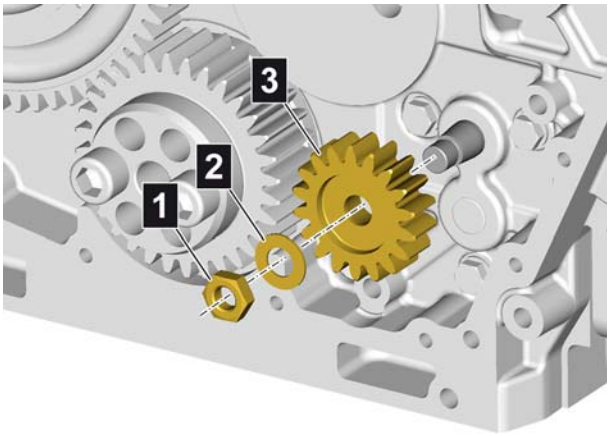
- ► Apply a thin layer of clean engine oil to the balls of the push rods 1
- ► Insert the push rods 1 into the ball cups of the rods
- ► Install the valve crossheads 2 and 3 as marked



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and the respective safety instructions in the chapters.

Detaching the oil pump drive gear

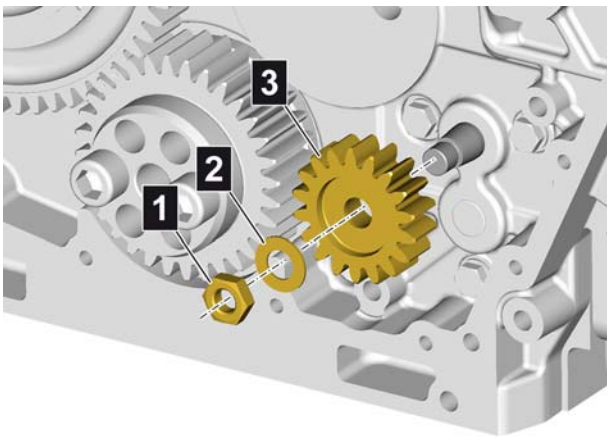
- ► Removing the mounting nut 1 with spring washer 2
- ► Pull the oil pump drive gear 3 off



Install idler

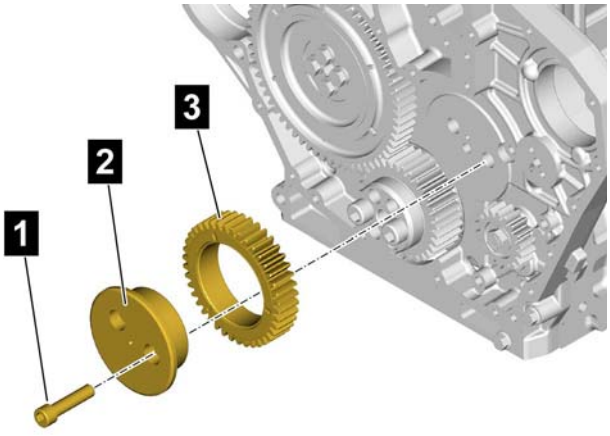
Installing the oil pump drive gear

- ► Covering the cone in the oil pump drive gear 3 and the oil pump thinly with Loctite 648 sealing agent
- ► Positioning the oil pump drive gear 3 with spring washer 2
- ► Screw the mounting nut 1 on



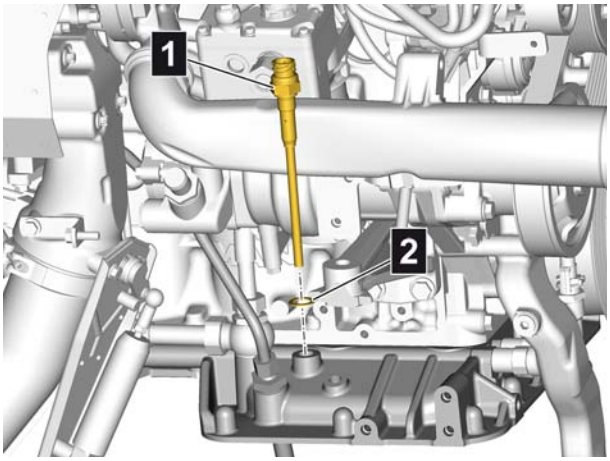
Mounting intermediate gear 1

- ► Apply a thin layer of clean engine oil to the intermediate gear pin 2
- ► Position the intermediate gear pin 2 along with the intermediate gear 3
- ► Screw in and tighten 1 the mounting bolts



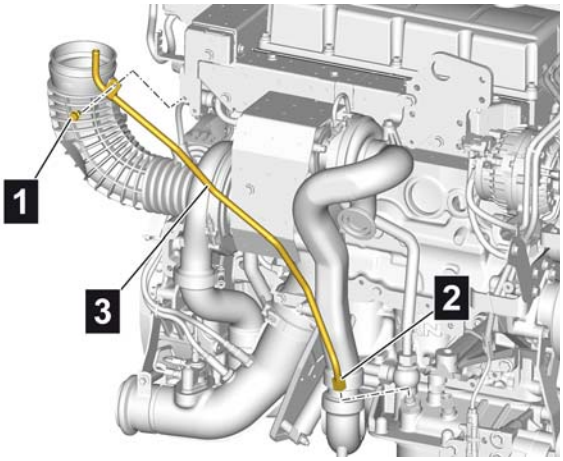
Removing the oil level sensor

► Unscrewing the oil level sensor 1 and removing it together with the sealing ring 2



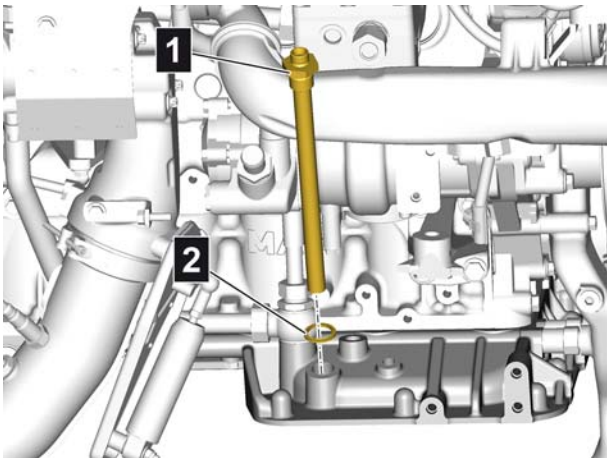
Removing the ventilation pipe

► Unscrew the mounting bolt 1
► Unscrew the union nut 2
► Remove the vent line 3



Removing the oil return line

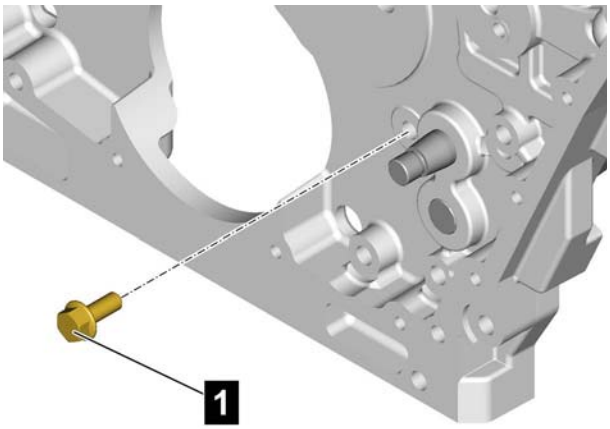
► Turning the screw-in fitting 1 with seal 2 out of the upper part of the oil sump
► Pull out the oil return line



Removing the oil pump

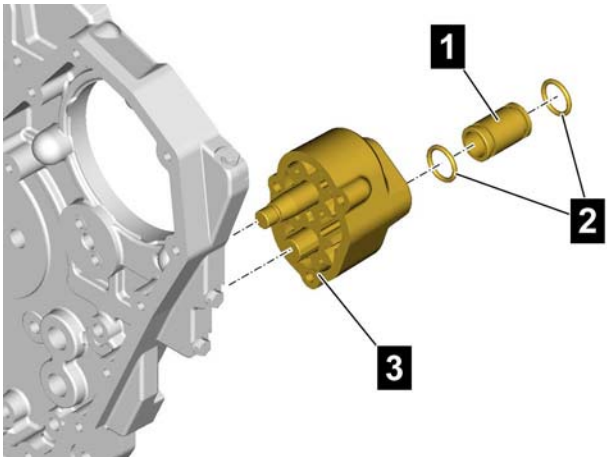
Unscrew the oil pump mounting bolts

► Turning the mounting bolts 1 with washers out of the oil pump housing



Remove oil pump

► Pull the oil pump 3 out of the timing case
► Pull the coupling sleeve 1 out of the oil pump 3
► Removing the O-rings 2 from the coupling sleeve 1

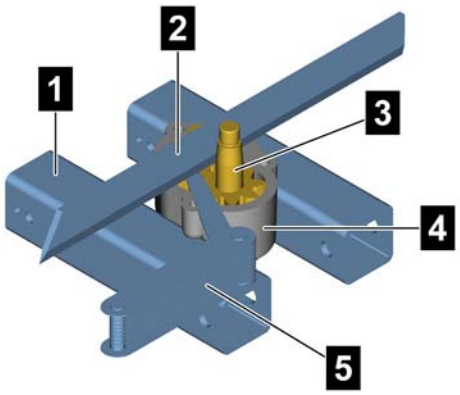


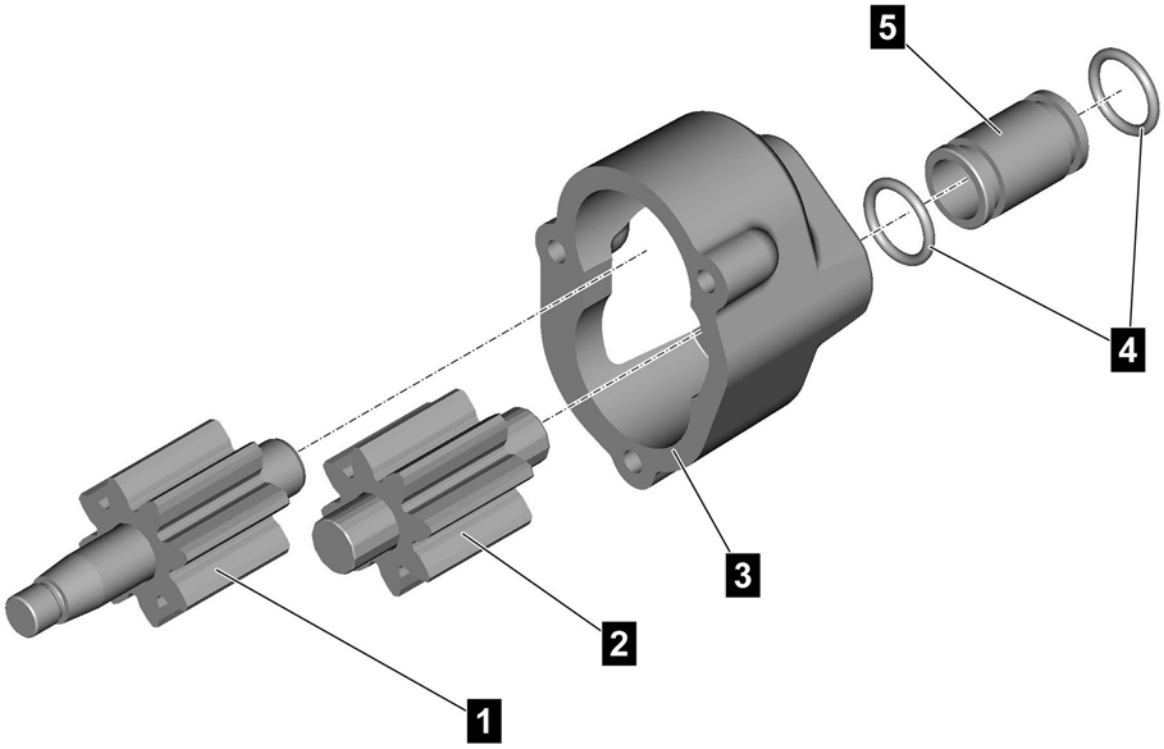
Check the oil pump gear axial clearance

► Place the oil pump on the supports [3] (2x) 1
► Put the straightedge [1] 2 on the oil pump housing with the measuring edge on the oil pump housing 4
► Check the axial play between the oil pump gears 3 and the straightedge [1] 2 with the feeler gauge [2] 5

The permissible axial play is 0.050 - 0.114 mm.

If the axial play is outside the tolerance, the oil pump must be replaced.





1 Oil pump gear
2 Oil pump gear
3 Oil pump housing
4 O-rings
5 Coupling sleeve

NOTE

Risk of material damage from improperly tightened threaded connections
Components will get damaged.

Therefore:
- Use the impact screwdriver with max. 50% of the final torque value specified.
- The final tightening must always be done with the torque wrench.