



Workshop Manual
competence level 3

TCD 2013 2V

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The engine company.



Workshop Manual

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1 Foreword



- Read and observe the information in this documentation. You will avoid accidents, retain the manufacturer's warranty and possess a fully functional and ready to operate engine.
- This engine is built exclusively for purpose according to the scope of delivery - defined by the equipment manufacturer (use for the intended purpose). Any use above and beyond this is considered improper use. The manufacturer will not be liable for damages resulting from this. The user bears the sole risk.
- Use for the intended purpose also includes observance of the operating, maintenance and repair instructions specified by the manufacturer. The engine may only be used, maintained and repaired by persons who are familiar with this and are aware of the risks involved.
- Make sure that this documentation is available to everyone involved in the operation, maintenance and repair and that they have understood the contents.
- Failure to observe this documentation may lead to malfunctions and engine damage as well as injury to persons for which the manufacturer will not accept any liability.
- Prerequisite for proper maintenance and repair is the availability of all the necessary equipment, conventional and special tools and their perfect condition.
- Engine parts such as springs, clamps, elastic retaining rings etc. pose an increased risk of injury when handled incorrectly.
- The pertinent rules for the prevention of accidents and other generally recognised health and safety regulations must be observed.
- Maximum economy, reliability and long life is only guaranteed when using DEUTZ original parts.
- Repair of the engine must correspond to its use for the intended purpose. Only parts released by the manufacturer for the respective purpose may be used for conversion work. Unauthorised modifications to the engine exclude manufacturer liability for resulting damages. Failure to observe this will void the warranty!
- The engines made by DEUTZ are developed for a wide range of applications. A wide range of variants ensures that the respective special requirements are met.
- The engine is equipped according to the installation case, i.e. not all the parts and components described in this documentation are installed in your engine necessarily.
- We have done our best to highlight the differences so that you can easily find the operating, maintenance and repair instructions relevant to your engine.

We are at your service for any questions you may have in this matter.

Your DEUTZ AG





2 General



DEUTZ engines are the product of years of research and development. The profound expertise gained through this, in combination with high demands on quality, attests to the fact that our engines possess all the qualities of long life, high reliability and low fuel consumption. It goes without saying that the high environmental protection requirements are also met.

Maintenance and care are the only way the engine can satisfy the demands you make on it. Compliance with the prescribed maintenance times and the careful execution of maintenance and care work are therefore essential. Difficult operating conditions, deviating from normal operation, must be particularly heeded.

Please consult one of our service representatives responsible for operating faults and spare parts questions. Our trained specialist personnel ensures fast and professional repairs using original DEUTZ spare parts in the event of damage.

Original spare parts from DEUTZ AG are always manufactured according to the state of the art.





3 User notes



3.1 General

The documentation of the workshop manual has been created based on the engine available at the time of going to press.

There may be deviations in the descriptions, illustrations and parts due to further developments.

The maintenance work described in the operation manual and in the workshop manual must be carried out on schedule and completely. The maintenance personnel must have the necessary technical knowledge to perform the work. Safety and protection devices which are removed during maintenance work must be replaced again afterwards.

Caution!

The rules for the prevention of accidents and the safety regulations must be observed during maintenance work.

Reference is made in the workshop manual job cards to the regulations in chapter 3.2. These must be read before working on the engine and must be strictly followed.

The maintenance intervals and the work to be performed are specified in the maintenance schedule of the operation manual. The job cards contain technical documentation on the execution of maintenance work.

3.2 Specifications

3.2.1 Accident prevention and safety regulations

The legally prescribed rules for the prevention of accidents must be observed. These are available from professional associations or from dealers. These are dependent on the application site, operating mode and the operating and auxiliary materials being used.

Special protection measures are specified depending on the work being carried out, and are identified in the job description.

Among other things it generally applies that:

- for the personnel:
 - Only briefed personnel may operate or maintain the engine. Unauthorised persons are prohibited access to the machine room.
 - Wear close-fitting clothing and ear protectors in the machine room when the engine is in operation.
 - Only deploy trained personnel to do repairs and maintenance work.
 - Do not work on the fuel system when the engine is running. The fuel system is under high pressure - danger of death.
 - Go to the workshop immediately in case of leaks in the fuel system.
- for the engine room:
 - Ensure adequate ventilation (do not cover air shafts).
 - Provide first aid kit and suitable fire extinguishers. Check the filling and readiness for operation regularly.
 - Only store inflammable materials in the machine room if they are essential for operation of the system.
 - Smoking and naked flames are prohibited in the machine room.
- for operation, maintenance and repairs on the engine:
 - Wait 30 seconds after switching off the engine before working on the fuel system.
 - After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".
 - Only start the engine when all the protective devices have been fitted. Make sure no-one is standing in the danger area.
 - Cleaning, maintenance and repair work may only be performed with the engine at a standstill and secured against starting.
 - Injection lines and high pressure pipes must not be deformed.

- Damaged injection lines and high-pressure pipes must be renewed.
- Injection lines and high pressure fuel lines must never be connected when the engine is running.
- Do not place hands near to a leak in the high pressure fuel system.
- Also carefully check all high pressure components visually before performing tests on the running engine. Wear suitable protective clothing (for example protective glasses). Leaks are a potential source of danger for workshop personnel.
- Even if no leaks are discernible on the high pressure fuel system, the workshop personnel should avoid the immediate danger zone or wear suitable protective clothing (such as protective glasses) when performing tests on the running engine and during the first trial run.
- Always stay out of range of a fuel jet, as it could cause severe injury.
- Smoking is strictly prohibited when working on the fuel system.
- Do not work near to sparks and flames.
- Never disconnect an injector when the engine is running.

3.2.2 Cleanliness instructions and measures for handling the DEUTZ Common Rail System

The DEUTZ Common Rail system used in the DEUTZ engines consists of high-precision components which are exposed to extreme stress. Great attention must be paid to cleanliness when working on the fuel system due to the high precision technology.

Notes and measures to be observed before starting work on the fuel system

- The fuel system must be closed. Make a visual inspection for leaks / damage to the fuel system.
 - Clean the whole engine and engine room with the system closed before starting work on the fuel system.
 - The engine must be dry when you start working on the fuel system.
 - Blowing (dry) with compressed air is only permissible with the fuel system closed.
 - When using a steam jet, first cover up the control unit, the cable plugs, all other electrical plug connections and the generator. Also, the steam jet may not be pointed directly at them.
 - Electrical plug connections must be plugged when spraying.
- Remove loose parts (for example paint chips from assembly work) with an industrial vacuum cleaner or other suction device. Only suction may be used in assembly work on the open fuel system.
 - Only work on the fuel system in a clean environment (no dust, no grinding or welding). Avoid draughts (dust). Clean the workshop floor regularly. No brake or performance test benches may be kept or operated in the same room.
 - Air currents which kick up dust, such as those caused by brake repairs or the starting of engines, should be avoided.
 - For work such as removal and installation on defective hydraulic components on the Common Rail System it is recommended to partition off a separate workshop area in the factory. This must be separate from other areas in which general vehicle repairs such as brake repairs are carried out.
 - No general machine tools may be operated in this room.
 - Regular cleaning of the workshop area is mandatory. Draughts, ventilation systems and heating fans should be minimised.
 - Areas of the engine room from which particles of dirt could be loosened (for example the bottom part of the tipped driver cab) must be covered with fresh clean film.
 - Working materials and tools must be cleaned before work. Only use tools without damage to the chrome plating or tools which are not chrome-plated.

Notes and measures to be observed during work on the fuel system or with the fuel system open.

- Only work in clean overalls.
- Only lint-free cleaning cloths may be used for work on the fuel system.
- Remove loose parts (for example paint chips from assembly work) with an industrial vacuum cleaner or other suction device. Only suction may be used in assembly work on the open fuel system.
- Working materials and tools must be cleaned before work. Only use tools without damage to the chrome plating or tools which are not chrome-plated.
- Do not use used cleaning fluid or test fluid for cleaning.
- Compressed air must not be used for cleaning on the open fuel system.
- Work on removed components may only be performed at a suitably equipped workbench.

- When removing and installing components, no materials which can leave behind particles or fibres (cardboard, wood, cloths) may be used.
- Removed parts may only be rubbed down with clean, lint-free cloths. No dirt particles may be rubbed into the components.
- Openings on the components and on the engine must be closed immediately with suitable stoppers/caps.
- The stoppers/caps may only be removed immediately before installing.
- Store stoppers/caps free from dust and dirt in the original packaging and dispose of after using once.
- Only remove new parts from the original packaging just before installation.
- Removed components must be kept in new, sealable bags or - if available - in the packaging of the new parts.
- Always use the original packaging of the new part to send back the removed components.

Notes and measures for the vehicle workshop area

- For work such as removal and installation on defective hydraulic components on the Common Rail System it is recommended to partition off a separate workshop area in the factory. This must be separate from other areas in which general vehicle repairs such as brake repairs are carried out.
- The workshop floor is sealed or tiled.
- No welding gear, grinders, general machine tools, brakes or performance test benches may be operated in this room.
- Regular cleaning of the workshop area is mandatory. Draughts, ventilation systems and heating fans should be minimised.

Notes and measures for workbench and tools in the vehicle hall

- A special workbench must be set up for work on removed components.
- Clean the removal and installation tools regularly and keep them in a closed tool cabinet.
- Remove loose parts (for example paint chips from assembly work) with an industrial vacuum cleaner or other suction device.
- Working materials and tools must be cleaned before work. Only use tools without damage to the chrome plating or tools which are not chrome-plated.

3.2.3 Disposal regulations

The work described in the operation manual and workshop manual necessitates renewal of parts and operating materials among other things. The re-

newed parts / operating materials must be stored, transported and disposed of according to regulations. The owner himself is responsible for this.

Disposal includes recycling and the scrapping of parts / operating materials, although recycling has priority.

Details of disposal and their monitoring are governed by regional, national and international laws and directives which the system operator must observe on his own responsibility.

3.3 Operation manual and workshop manual

To structure the information to suit the user, the service documentation is divided into operation manual and workshop manual.

The operation manual contains a general description and instructions for all other maintenance work.

It contains the following chapters:

1. Contents, General
2. Engine description
3. Operation
4. Operating media
5. Maintenance
6. Care and maintenance work
7. Faults, causes and remedies
8. Engine conservation
9. Technical data
10. Service

The workshop manual assumes knowledge of the contents of the operation manual. This applies especially for the safety regulations. The workshop manual describes repairs to the engine and components for which more effort and appropriately qualified technicians are required.

3.4 Job cards

The job cards are divided in the workshop manual into "W" and "I" job cards.

The "W" job card documents standard repairs on the engine and/or its components. The necessary tools and special tools are also specified in the "W" job card.

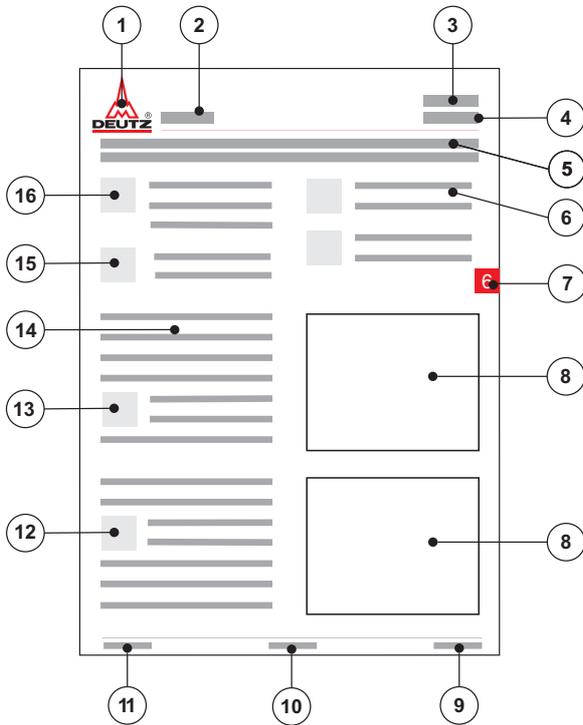
The "I" job card additionally documents the appropriate work procedures for repairing the engine and/or its components. The workshop must satisfy special conditions to perform these work procedures. Special tools and machine tools must be available, for example.

3.4.1 Numbering of job cards

The job card numbering uses the format **W 08-03-01**. The individual parts of this format are explained below:

- **W 08-03-01**: Documentation type
 - **W**.... Workshop manual
 - **I**..... Repair manual
- **W 08-03-01**: Module
 - according to module list
- **W 08-03-01**: Component group
- **W 08-03-01**: Consecutive number

3.4.2 Structure of a job card



1. DEUTZ AG, publisher of service documentation
2. Engine type
3. Module
4. Numbering of the job cards
5. Title of job card
6. Reference to other modules with job cards
7. Chapter
8. Graphic or photo
9. DEUTZ internal creation number
10. Page number
11. Date of issue of job card
12. Note
13. Danger / Important
14. Work sequence
15. Auxiliary materials
16. Conventional tools, special tools

3.5 Explanation of symbols



Danger!

of death or to health. Must be observed!
For example: The incorrect use or conversion of the turbocharger can lead to serious injury.



Caution!

Danger to the component/engine. Non-compliance can lead to destruction of the component/engine. Must be observed!



Note

General notes on assembly, environmental protection etc. No potential danger for man or machine.



Tool

Conventional and special tools required for the work.



Auxiliary materials

Working materials required in addition to the tools for performing the work (e.g. greases, oils, adhesives, sealants)



References

to important documents or job cards for the work process.
For example: Job card W 04-05-05



Reference

to a document or a job card within the work process.



Test and setting data

The necessary values are specified here. If several values are necessary, a cross reference is given to the Test and Setting Values table.
For example:
ID no. P01 61 = valve clearance, inlet



Tightening specification

The necessary values are specified here. If several values are necessary, a cross reference is given to the Tightening Specifications table.
For example:
ID no. A01 001 = cylinder head screws



4 Technical data

4.1 Testing and setting data



ID no.	Name	Information	Series		Value	Unit	
General engine data							
P00 71	Ignition sequence		TCD 2013	L4	2V	1-3-4-2	-
				L6	2V	1-5-3-6-2-4	
Valve guide							
Valve							
P01 31	Valve shaft diameter, inlet	Standard, fit h7	TCD 2013		2V	8,98 ⁰ _{-0,05}	mm
P01 32	Valve shaft diameter, outlet	Standard, fit h7	TCD 2013		2V	8,96 ⁰ _{-0,05}	mm
P01 33	Valve stem clearance, inlet		TCD 2013		2V	0,045 - 0,075	mm
P01 34	Valve stem clearance, outlet		TCD 2013		2V	0,065 - 0,095	mm
P01 35	Valve edge thickness, inlet		TCD 2013		2V	2,62	mm
P01 36	Valve edge thickness, outlet		TCD 2013		2V	2,3	mm
P01 37	Valve head diameter, inlet		TCD 2013		2V	48 ^{+0,1} _{-0,1}	mm
P01 38	Valve head diameter, outlet		TCD 2013		2V	42 ^{+0,1} _{-0,1}	mm
Valve seat							
P01 45	Valve lag dimension, inlet		TCD 2013		2V	0,99 ^{+0,1} _{-0,1}	mm
P01 46	Valve lag dimension, outlet		TCD 2013		2V	1 ^{+0,15} _{-0,1}	mm
Valve spring							
P01 51	Valve spring length	untensioned, normal	TCD 2013		2V	64,7	mm
	Valve spring wire diameter					4,5	mm
Valve clearance							
P01 61	Valve clearance, inlet (on cold engine)	Oil temperature < 80 °C, after a cooling time of at least 0.5 h	TCD 2013		2V	90	°
P01 62	Valve clearance, outlet (on cold engine)	Oil temperature < 80 °C, after a cooling time of at least 0.5 h	TCD 2013		2V	150	°

ID no.	Name	Information	Series			Value	Unit
P01 63	Valve clearance setting	Valve overlap according to setting schematic see: Table T01 63	TCD 2013		2V	-	
P01 64	Clearance between control piston and rocker arm	Oil temperature < 80 °C, after a cooling time of at least 0.5 h	TCD 2013		2V	144	°
Rocker arm/bracket							
P01 72	Rocker arm, bore, diameter, outlet		TCD 2013		2V	21,02 ^{+0,033} ₀	mm
P01 73	Rocker arm, bore, diameter, inlet		TCD 2013		2V	21,02 ^{+0,033} ₀	mm
P01 74	Rocker arm journal	Diameter, fit h7	TCD 2013		2V	21 ⁰ _{-0,021}	mm
Main bearing pin							
P02 03	Main bearing pin	Standard, diameter	TCD 2013		2V	85,00 ⁰ _{-0,02}	mm
P02 04	Crankshaft main bearing pin	Underdimension stage	TCD 2013		2V	0,25	mm
P02 05	Limit for undermeasure step		TCD 2013		2V	84,50 ⁰ _{-0,02}	mm
P02 06	Pin unroundness	Wear limit	TCD 2013		2V	0,01	mm
P02 07	Crankshaft main bearing pin and lifting journal, hardness	Standard HRC	TCD 2013		2V	53 ⁺³ ₃	HRC
Fit bearing pin							
P02 11	Fit bearing pin, width		TCD 2013		2V	38 ^{+0,06}	
P02 12	Fit bearing pin, width	one overmeasure stage	TCD 2013		2V	0,4	mm
P02 13	Limit for overmeasure step		TCD 2013		2V	38,46	mm
Lifting journal							
P02 22	Lifting journal, diameter		TCD 2013		2V	68,00 ⁰ _{-0,02}	mm
P02 23	Lifting journal, diameter	Undermeasure per stage	TCD 2013		2V	0,25	mm
P02 24	Limit for undermeasure step		TCD 20113		2V	67,50 ⁰ _{-0,02}	mm
P02 25	Pin unroundness	Wear limit	TCD 2013		2V	0,01	mm

ID no.	Name	Information	Series			Value	Unit
P02 26	Radial run-out, crankshaft	maximum permissible deviation	TCD 2013	L4	2V	0,07	mm
				L6		0,10	mm
Main bearing							
P02 34	Permissible axial clearance of crankshaft	in installed state	TCD 2013		2V	0,1 - 0,3	mm
P02 35	Thrust ring, thickness	Standard (upper and lower half)	TCD 2013		2V	2,9 ^{+0,05} ₀	mm
P02 36	Thrust ring, oversize	1. Step = 0.2 mm	TCD 2013		2V	3,1 ^{+0,05} ₀	mm
Con-rod							
P02 41	Parallelism of the con rod with respect to the piston bolt	permissible deviation at a distance of 100 mm	TCD 2013		2V	0,05	mm
P02 42	Parallelism of the con rod with respect to the piston bolt	permissible deviation at a distance of 100 mm	TCD 2013		2V	0,05	mm
P02 43	Piston bolt liner, inside diameter	installed, unmachined	TCD 2013		2V	42 ^{+0,05} _{+0,04}	mm
P02 45	Small end bush clearance between piston pin and small end bush		TCD 2013		2V	0,034 - 0,056	mm
Big end bearing							
P02 52	Big end bearing shells, inside diameter	installed	TCD 2013		2V	72,5 ^{+0,02} ₀	mm
P02 55	Big end bearing, bore in con rod	H6	TCD 2013		2V	72,5	mm
P02 56	Theoretical clearance between the big end bearing / lifting journal		TCD 2013		2V	0,036 - 0,095	mm
Piston bolt							
P02 61	Piston pin, diameter		TCD 2013		2V	42 ^{-0,006}	mm
Piston							
P02 70	Piston	Identification of the installation position on the piston base					
P02 71	Piston, diameter, standard	Measuring point 1 = height 12 mm	TCD 2013		2V	107,700	mm
P02 72	Piston, diameter, standard	Measuring point 2 = height 64 mm	TCD 2013		2V	107,800	mm

ID no.	Name	Information	Series			Value	Unit
P02 73	Piston, diameter, standard	Measuring point 3 = height 97 mm	TCD 2013		2V	107,660	mm
P02 75	Piston protrusion	1 hole, cylinder head gasket, 1.42 mm	TCD 2013		2V	0,28 - < 0,54	mm
P02 76	Piston protrusion	2 hole, cylinder head gasket, 1.52 mm	TCD 2013		2V	0,54 - < 0,64	mm
P02 77	Piston protrusion	3 hole, cylinder head gasket, 1.62 mm	TCD 2013		2V	0,64 - 0,75	mm
P02 78	Piston bolt, bore		TCD 2013		2V	42 ^{+0,017} _{+0,01}	mm
Piston rings							
P02 84	Joint clearance, piston ring 1	Identification (TOP) in direction of combustion chamber	TCD 2013		2V	0,3 - 0,55	mm
P02 85	Joint clearance, piston ring 2	Identification (TOP) in direction of combustion chamber	TCD 2013		2V	1,5 - 2,0	mm
P02 86	Joint clearance, piston ring 3	Identification (TOP) in direction of combustion chamber	TCD 2013		2V	0,3 - 0,6	mm
P02 87	Axial clearance, 1st ring (double-sided keystone ring)	Wear limit	TCD 2013		2V	Measure with trapezoidal groove wear gauge	-
P02 88	Axial clearance, 2nd ring (taper-faced ring)		TCD 2013		2V	0,09 - 0,13	mm
P02 89	Axial clearance, 3rd ring , (bevelland-edge oil control ring)		TCD 2013		2V	0,03 - 0,075	mm
Crankcase							
Cylinder liners							
P03 31	Cylinder bore, inside diameter	Standard	TCD 2013		2V	108 ^{+0,02}	mm
P03 35	Fit depth of collar rest and sealing surface for cylinder liner		TCD 2013		2V	8,92 ^{+0,03}	mm
P03 36	Cylinder liners, collar height		TCD 2013		2V	9 _{-0,02}	mm
P03 39	Cylinder liner, overhang		TCD 2013		2V	max. 0.080	mm
						at least 0.030	mm

ID no.	Name	Information	Series			Value	Unit
Engine control							
Camshaft							
P04 31	Camshaft bearing pin diameter	Standard	TCD 2013		2V	64,2 ^{+0,2} _{-0,2}	mm
P05 91	Gap dimension speed governor (crankshaft)		TCD 2013		2V	0,6 ^{+0,1} _{-0,1}	mm
Lubricating oil system							
P08 44	Length of compression spring for the oil pressure control valve		TCD 2013		2V	62	mm
Cooling system							
P09 11	Coolant thermostat start of opening		TCD 2013		2V	83 °C	mm
P09 13	Coolant thermostat stroke		TCD 2013		2V	at least 8	mm
Other components							
P12 11	Tension of the V-belt (generator/coolant pump)	First assembly	TCD 2013		2V	650	N
P12 21	Tension of the V-belt (generator/coolant pump)	Check after 15 minutes running under load	TCD 2013		2V	400 ⁺⁵⁰ ₋₅₀	N

T01 63

Setting of valve and control piston clearance

4-cylinder

ignition sequence: 1 - 3 - 4 - 2

Valves	Cylinder			
overlap	1	3	4	2
Set to	4	2	1	3



Valve overlap: Outlet valve is not yet closed, inlet valve begins opening.

The inlet valve opens briefly by 2 mm when the outlet valve is fully open. This is not the valve overlap!

T01 63

Setting valve and control piston clearance

6-cylinder

ignition sequence: 1 - 5 - 3 - 6 - 2 - 4

Valves	Cylinder					
overlap	1	5	3	6	2	4
Set to	6	2	4	1	5	3



Valve overlap: Outlet valve is not yet closed, inlet valve begins to open.

When the inlet valve is fully open, the outlet valve opens briefly by about 2 mm. This is not the valve overlap!

4.2 Tightening specifications



ID no.	Name	Screw type	Notes / Remarks	Series			Pre-tensioning value	Post-clamping value
A00 001	Clamping holder on crankcase	Screw		TCD 2013		2V	90 Nm	
		Nut						
A00 002	Clamping bracket on adapter for assembly block			TCD 2013		2V	90 Nm	
A00 003	Feet/engine mounting on crankcase and gear case	Screws M12x35-10.9 M12x40-10.9 M12x60-10.9 M12x75-10.9 M12x85-10.9 M12x90-10.9 M12x220-10.9		TCD 2013		2V	95 Nm	
		Nut						
A00 005	Holder, engine mounting on crankcase	M16x40-10.9 M16x45-10.9 M16x75-10.9 M16x85-10.9 M16x110-10.9 M16x140-10.9 M16x155-10.9 M16x220-10.9		TCD 2013		2V	260 Nm	
A00 006	Mounting bracket on holder/crankcase	M12x40-10.9		TCD 2013		2V	90 Nm	
A01 001	Cylinder head on crankcase		Observe order of tightening. Screws oiled Sealing surfaces free from oil	TCD 2013		2V	50 Nm	130 Nm +90°
A01 002	Rocker arm support on the cylinder head		Assembly note: Rocker arm symmetrical to the valve centre axes, see A01 001	TCD 2013		2V	30 Nm	
A01 003	Locking nut valve clearance setting screw	Hexagonal socket		TCD 2013		2V	20 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series			Pre-tensioning value	Post-clamping value
A01 004	Cylinder head cowling on cylinder head		Hood must be free from grease and lubricant.	TCD 2013		2V	13 Nm	
A01 011	Exhaust gas return module on cylinder head		Observe tightening sequence.	TCD 2013		2V	10 Nm	30 Nm
A01 012	Locking nut setting screw exhaust gas return module			TCD 2013		2V	20 Nm	
A01 013	Solenoid valve (exhaust gas return) on cylinder head			TCD 2013		2V	24 Nm	
A02 010	Main bearing on crankcase		Can be used 3 times if documented in writing otherwise use new screws every time they are loosened.	TCD 2013		2V	50 Nm	+60° +60°
A02 020	Big end bearing cap on con rod		Observe assembly specification. Use new screws every time they are loosened. Screws oiled	TCD 2013		2V	30 Nm	+60° +60°
A03 020	Front cover on crankcase		Observe tightening sequence. Observe assembly specification. Wet rotors with engine oil before assembly.	TCD 2013		2V	3 Nm	21 Nm
A03 030	Oil pan on crankcase		Observe tightening sequence. Note different screw lengths.	TCD 2013		2V	30 Nm	
A03 031	Screw cap on oil pan	M18x1.5	Cu sealing ring	TCD 2013		2V	55 Nm	
A03 060	Crankcase breather on cylinder head			TCD 2013		2V	20 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series			Pre-tensioning value	Post-clamping value
A03 080	Connection housing on crankcase/gear case	M16x85-10.9	Observe tightening sequence.	TCD 2013		2V	99 Nm	243 Nm
		M16x150-10.9					99 Nm	
		M12x85-10.9					99 Nm	
		M12x160-10.9						
A03 085	Cover plate to connection housing		Observe assembly specification.	TCD 2013		2V	9 Nm	
A03 092	Gear case on crankcase	M8x35-10.9	Observe tightening sequence.	TCD 2013		2V	30 Nm	
	Gear case on crankcase	M8x55-10.9 M8x80-10.9					30 Nm	
	Gear case on crankcase	M16x60					70 Nm	
A04 022	Locking cap on gear case	M8x55-10.9 M8x60-10.9		TCD 2013		2V	21 Nm	
A04 025	Holder on gear case/crankcase	M8x80-10.9		TCD 2013		2V	30 Nm	
A05 011	Speed governor (crankshaft) front cover	M6x12	Observe assembly specification. Insert with DEUTZ DW72 locking agent.	TCD 2013		2V	9 Nm	
A05 012	Speed governor (camshaft) on gear case		Speed governor is installed by pressing in, not knocking in. Insert with locking agent DEUTZ DW72.	TCD 2013		2V	9 Nm	
A05 013	Holder speed governor (crankshaft) on front cover			TCD 2013		2V	20 Nm	
A05 014	Toothed disc on V-belt pulley			TCD 2013		2V	60 Nm	
A06 001	Exhaust pipe at cylinder head		Observe order of tightening. Start assembly with fit bore 10.1 mm.	TCD 2013		2V	25 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series		Pre-tensioning value	Post-clamping value
A06 020	Turbocharger on exhaust pipe	Nut M10	Insert with DEUTZ S1 mounting compound	TCD 2013	2V	42 Nm	
A06 022	Pin bolt on exhaust pipe		Insert with DEUTZ S1 mounting compound	TCD 2013	2V	10 Nm	
A06 030	Charge air pipe on cylinder head			TCD 2013	2V	11 Nm	
A06 042	Heating flange on charge air manifold	M8x100-10.9	Stage 1:	TCD 2013	2V	3 Nm	
A06 042	Heating flange on charge air manifold	M8x100-10.9	Stage 2:	TCD 2013	2V	30°	
A06 046	Charge air manifold on charge air pipe			TCD 2013	2V	30 Nm	
A07 001	Clamping claw injector on cylinder head		Observe order of assembly. Install injector without tension.	TCD 2013	2V	hand tight	27 Nm
A07 003	Injection lines on rail and pressure pipe nozzle High pressure pipe at high pressure pump	Union nut	Stage 1: Observe assembly specification. Use new pipe.	TCD 2013	2V	10 Nm	
A07 003	Injection lines on rail and pressure pipe nozzle High pressure pipe at high pressure pump	Union nut	Stage 2:	TCD 2013	2V	60° +15°	
A07 024	Fuel supply pump on holder			TCD 2013	2V	20 Nm	
A07 031	High pressure pump to crankcase	M10x30-10.9	Screws oiled	TCD 2013	2V	10 Nm	50 Nm
A07 032	Control block to crankcase	M8x75 M8x85	Observe tightening sequence	TCD 2013	2V	20 Nm	
A07 034	Fuel line to high pressure pump			TCD 2013	2V	26 Nm	
A07 035	Fuel line to control block			TCD 2013	2V	34 Nm	
A07 038	Rail to cylinder head		Stage 1: Observe assembly specification.	TCD 2013	2V	hand tight	
A07 038	Rail to cylinder head		Stage 2:	TCD 2013	2V	30 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series			Pre-tensioning value	Post-clamping value
A07 039	Pressure limiting valve to rail		Insert with mounting grease.	TCD 2013		2V	100 Nm	
A07 040	Rail pressure sensor to rail		Insert with mounting grease.	TCD 2013		2V	70 Nm	
A07 045	Fuel line (feed) to control block	Hollow screw		TCD 2013		2V	49 Nm	
	Fuel line (return) to rail						39 Nm	
A07 046	Fuel line (return) to control block	Hollow screw		TCD 2013		2V	49 Nm	
A07 047	Fuel line (return) to cylinder head	Hollow screw		TCD 2013		2V	29 Nm	
A07 087	Fuel filter console on oil cooler housing			TCD 2013		2V	30 Nm	
A07 090	Fuel pressure sensor to fuel filter console			TCD 2013		2V	30 Nm	
A07 099	Fuel filter to fuel filter console		Wet gasket with clean diesel fuel.				hand tight	approx.10 Nm
A08 001	Oil filter/interchangeable filter		Oil gasket lightly.	TCD 2013		2V	hand tight	approx.10 Nm
A08 015	Oil suction intake pipe/holder on oil pump			TCD 2013		2V	22 Nm	
A08 040	Lubricating oil pipe on exhaust turbocharger/ crankcase	Hollow screw		TCD 2013		2V	39 Nm	
A08 044	Pipe nozzle (oil return) to turbocharger			TCD 2013		2V	20 Nm	
A08 046	Holding bracket (oil return) on crankcase			TCD 2013		2V	20 Nm	
	Connection holder of the oil return line						20 Nm	
A08 051	Oil cooler housing on crankcase	M8x50 M8x80	Observe tightening sequence.	TCD 2013		2V	3 Nm	30 Nm
A08 052	Oil cooler on oil cooler housing	Collar screw	Oil sealing ring lightly.	TCD 2013		2V	80 Nm	160 Nm
A08 058	Locking screw on oil cooler housing		with sealing ring	TCD 2013		2V	80 Nm	
A08 091	Oil pressure switch on oil cooler housing			TCD 2013		2V	30 Nm	
A09 001	Coolant thermostat housing on cylinder head			TCD 2013		2V	30 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series			Pre-tensioning value	Post-clamping value
A09 002	Outlet nozzle on coolant thermostat housing			TCD 2013		2V	30 Nm	
A09 010	Coolant pump on fan console		Observe tightening sequence.	TCD 2013		2V	30 Nm	
A09 015	V-belt pulley on coolant pump			TCD 2013		2V	30 Nm	
	V-belt pulley on V-belt pulley			TCD 2013		2V	30 Nm	
A09 031	Coolant temperature sensor on cylinder head			TCD 2013		2V	22 Nm	
A09 045	Fan console on crankcase			TCD 2013		2V	30 Nm	
A09 046	Fan drive on fan console			TCD 2013		2V	60 Nm	
A09 047	V-rib disc on fan drive		Stage 1:	TCD 2013		2V	30 Nm	
A09 047	V-rib disc on fan drive		Stage 2:	TCD 2013		2V	90 °	
A09 048	Adapter on V-belt pulley			TCD 2013		2V	30 Nm	
A12 001	Flywheel on crankshaft	M10x1x85	Observe tightening specification. Use new screws. Renew screws every time they are loosened.	TCD 2013	2V	30 Nm	+60° +60°	
		M10x1x80						
		M10x1x75						
		M10x1x70						
		M10x1x55						
		M10x1x50						
		M10x1x45						
		M10x1x40						
		M10x1x35						
	M10x1x30						+60° +30°	
A12 030	Hub torsional vibration damper on crankshaft		Use new screws. Observe assembly specification.	TCD 2013		2V	30 Nm	+60° +60°

ID no.	Name	Screw type	Notes / Remarks	Series		Pre-tensioning value	Post-clamping value
A12 031	V-belt pulley on torsional vibration damper	M10x70-10.9		TCD 2013	2V	70 Nm	
A12 035	Belt tensioner on front cover			TCD 2013	2V	80 Nm	
A12 041	Clamping strap on coolant pump	M8x25-8.8		TCD 2013	2V	30 Nm	
A12 091	Hollow screw pipe union	Hollow screw	Ring piece pipe 6 mm	TCD 2013	2V	18 Nm	
		Union nut				20 Nm	
A12 092	Pipe union, pipe diameter 8 mm, ring piece	Hollow screw M12x1.5		TCD 2013	2V	29 Nm	
A12 093	Pipe union, pipe diameter 10 mm, ring piece	Hollow screw M14x1.5		TCD 2013	2V	39 Nm	
A12 094	Pipe union, pipe diameter 12 mm, ring piece	Hollow screw M16x1.5		TCD 2013	2V	49 Nm	
A12 095	Pipe clip, fastening	M6		TCD 2013	2V	13 Nm	
	Pipe clip for return pipe	M8				20 Nm	
A13 001	Starter on crankcase/gear case			TCD 2013	2V	60 Nm	
A13 012	Generator on holder	M8x75		TCD 2013	2V	30 Nm	
A13 015	Generator on clamping strap	M8x75		TCD 2013	2V	30 Nm	
A13 017	V-belt clamping strap on console	M8x25		TCD 2013	2V	30 Nm	
A13 018	Generator console on cylinder head			TCD 2013	2V	70 Nm	
A13 030	Cable shoe on connection bolt	M6		TCD 2013	2V	3 Nm	
A13 032	Heating plug / screw cap on cylinder head			TCD 2013	2V	20 Nm	
A13 041	Cable rail on cylinder head	M6x16	self-tapping	TCD 2013	2V	8.5 Nm	
A13 046	Pressure/temperature transmitter on charge air line	Screw M6	maximum	TCD 2013	2V	4.5 Nm	
		M5	lightly oiled, maximum			3.3 Nm	
A13 051	Cable connection on injector			TCD 2013	2V	1.5 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series			Pre-tensioning value	Post-clamping value
A13 065	Cable connection on heater flange		Hexagonal, pole screw locked	TCD 2013		2V	20 Nm	
A49 001	Connection piece on cylinder head, clamping shoe			TCD 2013		2V	25 Nm	



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

- 5 Job card overview
- 5.1 Sorted alphabetically



Activity	Job card	Maintenance group
Assembling/disassembling shaft sleeve on the crankshaft (opposite side to flywheel)	W 01-02-02	Front cover
Check alignment of connection housing	W 52-01-02	Connection housing
Checking collar contact for cylinder liner	W 01-13-01	Crankcase
Checking piston overhang	W 08-03-02	Cylinder head
Checking the axial clearance of the crankshaft	W 05-05-03	Crankshaft
Checking the camshaft	W 10-02-02	Camshaft
Checking the compression pressure	W 08-00-01	Cylinder head
Checking the con rod	W 06-01-02	Connecting rod
Checking the crankshaft	W 05-05-02	Crankshaft
Checking the overhang of the cylinder liner	W 01-05-01	Crankcase
Checking the piston	W 07-01-02	Piston
Checking the piston rings and piston ring grooves	W 07-02-02	Piston
Checking the thermostat (in the removed state)	W 38-01-02	Thermostat housing
Checking the valve guide	W 08-04-03	Cylinder head
Checking the valve lag	W 08-04-04	Cylinder head
Checking the valves	W 08-04-02	Cylinder head
Disassembling, assembling and checking the rocker arm and rocker arm bracket	W 11-02-02	Control parts
Dismantling and assembling the fan drive	W 39-02-03	Fan drive
Installing and removing turning gear	W 49-02-01	Tools
Installing and removing turning gear (Torsional vibration damper)	W 49-02-02	Tools
Mounting engine on assembly block and demounting	W 46-00-01	Engine mounting
Removing and install the charge air line	W 22-01-01	Charge air line
Removing and install the heating flange	W 63-01-01	Start aid
Removing and installing cylinder head	W 08-03-01	Cylinder head
Removing and installing temperature transmitter (coolant)	W 48-05-01	Electrical equipment
Removing and installing the belt tensioner (V-rib belt)	W 39-01-01	Fan drive
Removing and installing the cable harness	W 48-01-01	Cable harness
Removing and installing the camshaft	W 10-02-01	Camshaft
Removing and installing the connection housing	W 52-01-01	Connection housing
Removing and installing the control block	W 17-01-01	High-pressure pump

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Activity	Job card	Maintenance group
Removing and installing the coolant pump (V-belt drive)	W 37-03-01	Coolant pump
Removing and installing the crankcase bleeding	W 01-01-01	Crankcase
Removing and installing the crankshaft	W 05-05-01	Crankshaft
Removing and installing the cylinder head cover	W 08-01-01	Cylinder head
Removing and installing the cylinder liner	W 04-01-01	Cylinder liner
Removing and installing the engine mounting (elastic mounting)	W 47-01-01	Engine mounting
Removing and installing the exhaust line	W 41-01-01	Exhaust pipe
Removing and installing the exhaust return module	W 08-02-01	Cylinder head
Removing and installing the fan console (V-rib belt drive)	W 39-04-03	Fan console
Removing and installing the fan drive	W 39-02-01	Fan drive
Removing and installing the flywheel	W 05-03-01	Flywheel
Removing and installing the front cover (opposite side to flywheel)	W 01-03-01	Front cover
Removing and installing the fuel filter console	W 20-01-01	Fuel filter
Removing and installing the fuel pressure sensor	W 48-06-01	Electrical equipment
Removing and installing the fuel supply pump (V-belt drive)	W 20-02-01	Fuel pump
Removing and installing the gearcase cover	W 09-02-02	Gearcase
Removing and installing the generator (V-belt drive)	W 44-02-01	Generator
Removing and installing the glow plugs	W 63-02-01	Start aid
Removing and installing the high-pressure pump (Installation position A)	W 17-01-04	High-pressure pump
Removing and installing the high-pressure pump (Installation position B)	W 17-01-05	High-pressure pump
Removing and installing the impulse transmitter (camshaft)	W 48-02-03	Electrical equipment
Removing and installing the impulse transmitter (crankshaft)	W 48-02-01	Electrical equipment
Removing and installing the injector	W 19-01-01	Injector
Removing and installing the lubricating oil cooler	W 15-02-01	Lubricating oil cooler
Removing and installing the lubricating oil cooler housing	W 15-02-02	Lubricating oil cooler
Removing and installing the lubricating oil pan (metal sheet lubricating oil pan)	W 02-01-01	Lubricating oil sump
Removing and installing the oil pressure switch	W 48-04-01	Electrical equipment
Removing and installing the oil suction pipe	W 16-01-01	Oil suction pipe
Removing and installing the piston and con rod	W 06-01-01	Connecting rod

Activity	Job card	Maintenance group
Removing and installing the piston cooling nozzles	W 01-08-01	Crankcase
Removing and installing the pressure holding valve	W 01-07-03	Crankcase
Removing and installing the pressure limiting valve	W 21-02-03	Fuel pipes
Removing and installing the pressure/temperature sensor (charge air)	W 48-03-01	Electrical equipment
Removing and installing the rail	W 21-02-01	Fuel pipes
Removing and installing the rail pressure sensor	W 21-02-05	Fuel pipes
Removing and installing the rocker arm and rocker arm bracket	W 11-02-01	Control parts
Removing and installing the solenoid valve (exhaust gas return)	W 08-02-02	Cylinder head
Removing and installing the starter	W 44-03-01	Starter
Removing and installing the thermostat	W 38-01-01	Thermostat housing
Removing and installing the thermostat housing	W 38-02-01	Thermostat housing
Removing and installing the turbocharger	W 43-01-01	Exhaust gas turbocharger
Removing and installing the valves	W 08-04-01	Cylinder head
Removing and installing the V-belt, V-belt pulley	W 05-01-01	V-belt pulley add-on
Removing and installing torsional vibration damper (V-belt drive)	W 05-02-01	Torsional vibration damper
Renewing the crankshaft sealing ring (flywheel side)	W 09-01-01	Gearcase
Renewing the crankshaft sealing ring (opposite side to flywheel)	W 01-02-01	Front cover
Setting valve clearance (with exhaust return module installed)	W 11-01-01	Control parts
Setting valve clearance (with or without removal of exhaust return module)	W 11-01-01	Control parts
Testing the cylinder liner	W 04-01-02	Cylinder liner



5.2 Sorted numerically



Job card	Activity	Maintenance group
W 01-01-01	Removing and installing the crankcase bleeding	Crankcase
W 01-02-01	Renewing the crankshaft sealing ring (opposite side to flywheel)	Front cover
W 01-02-02	Assembling/disassembling shaft sleeve on the crankshaft (opposite side to flywheel)	Front cover
W 01-03-01	Removing and installing the front cover (opposite side to flywheel)	Front cover
W 01-05-01	Checking the overhang of the cylinder liner	Crankcase
W 01-07-03	Removing and installing the pressure holding valve	Crankcase
W 01-08-01	Removing and installing the piston cooling nozzles	Crankcase
W 01-13-01	Checking collar contact for cylinder liner	Crankcase
W 02-01-01	Removing and installing the lubricating oil pan (metal sheet lubricating oil pan)	Lubricating oil sump
W 04-01-01	Removing and installing the cylinder liner	Cylinder liner
W 04-01-02	Testing the cylinder liner	Cylinder liner
W 05-01-01	Removing and installing the V-belt, V-belt pulley	V-belt pulley add-on
W 05-02-01	Removing and installing torsional vibration damper (V-belt drive)	Torsional vibration damper
W 05-03-01	Removing and installing the flywheel	Flywheel
W 05-05-01	Removing and installing the crankshaft	Crankshaft
W 05-05-02	Checking the crankshaft	Crankshaft
W 05-05-03	Checking the axial clearance of the crankshaft	Crankshaft
W 06-01-01	Removing and installing the piston and con rod	Connecting rod
W 06-01-02	Checking the con rod	Connecting rod
W 07-01-02	Checking the piston	Piston
W 07-02-02	Checking the piston rings and piston ring grooves	Piston
W 08-00-01	Checking the compression pressure	Cylinder head
W 08-01-01	Removing and installing the cylinder head cover	Cylinder head
W 08-02-01	Removing and installing the exhaust return module	Cylinder head
W 08-02-02	Removing and installing the solenoid valve (exhaust gas return)	Cylinder head
W 08-03-01	Removing and installing cylinder head	Cylinder head
W 08-03-02	Checking piston overhang	Cylinder head
W 08-04-01	Removing and installing the valves	Cylinder head
W 08-04-02	Checking the valves	Cylinder head
W 08-04-03	Checking the valve guide	Cylinder head
W 08-04-04	Checking the valve lag	Cylinder head
W 09-01-01	Renewing the crankshaft sealing ring (flywheel side)	Gearcase

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Job card	Activity	Maintenance group
W 09-02-02	Removing and installing the gearcase cover	Gearcase
W 10-02-01	Removing and installing the camshaft	Camshaft
W 10-02-02	Checking the camshaft	Camshaft
W 11-01-01	Setting valve clearance (with exhaust return module installed)	Control parts
W 11-01-01	Setting valve clearance (with or without removal of exhaust return module)	Control parts
W 11-02-01	Removing and installing the rocker arm and rocker arm bracket	Control parts
W 11-02-02	Disassembling, assembling and checking the rocker arm and rocker arm bracket	Control parts
W 15-02-01	Removing and installing the lubricating oil cooler	Lubricating oil cooler
W 15-02-02	Removing and installing the lubricating oil cooler housing	Lubricating oil cooler
W 16-01-01	Removing and installing the oil suction pipe	Oil suction pipe
W 17-01-01	Removing and installing the control block	High-pressure pump
W 17-01-04	Removing and installing the high-pressure pump (Installation position A)	High-pressure pump
W 17-01-05	Removing and installing the high-pressure pump (Installation position B)	High-pressure pump
W 19-01-01	Removing and installing the injector	Injector
W 20-01-01	Removing and installing the fuel filter console	Fuel filter
W 20-02-01	Removing and installing the fuel supply pump (V-belt drive)	Fuel pump
W 21-02-01	Removing and installing the rail	Fuel pipes
W 21-02-03	Removing and installing the pressure limiting valve	Fuel pipes
W 21-02-05	Removing and installing the rail pressure sensor	Fuel pipes
W 22-01-01	Removing and install the charge air line	Charge air line
W 37-03-01	Removing and installing the coolant pump (V-belt drive)	Coolant pump
W 38-01-01	Removing and installing the thermostat	Thermostat housing
W 38-01-02	Checking the thermostat (in the removed state)	Thermostat housing
W 38-02-01	Removing and installing the thermostat housing	Thermostat housing
W 39-01-01	Removing and installing the belt tensioner (V-rib belt)	Fan drive
W 39-02-01	Removing and installing the fan drive	Fan drive
W 39-02-03	Dismantling and assembling the fan drive	Fan drive
W 39-04-03	Removing and installing the fan console (V-rib belt drive)	Fan console

Job card	Activity	Maintenance group
W 41-01-01	Removing and installing the exhaust line	Exhaust pipe
W 43-01-01	Removing and installing the turbocharger	Exhaust gas turbocharger
W 44-02-01	Removing and installing the generator (V-belt drive)	Generator
W 44-03-01	Removing and installing the starter	Starter
W 46-00-01	Mounting engine on assembly block and demounting	Engine mounting
W 47-01-01	Removing and installing the engine mounting (elastic mounting)	Engine mounting
W 48-01-01	Removing and installing the cable harness	Cable harness
W 48-02-01	Removing and installing the impulse transmitter (crankshaft)	Electrical equipment
W 48-02-03	Removing and installing the impulse transmitter (camshaft)	Electrical equipment
W 48-03-01	Removing and installing the pressure/temperature sensor (charge air)	Electrical equipment
W 48-04-01	Removing and installing the oil pressure switch	Electrical equipment
W 48-05-01	Removing and installing temperature transmitter (coolant)	Electrical equipment
W 48-06-01	Removing and installing the fuel pressure sensor	Electrical equipment
W 49-02-01	Installing and removing turning gear	Tools
W 49-02-02	Installing and removing turning gear (Torsional vibration damper)	Tools
W 52-01-01	Removing and installing the connection housing	Connection housing
W 52-01-02	Check alignment of connection housing	Connection housing
W 63-01-01	Removing and install the heating flange	Start aid
W 63-02-01	Removing and installing the glow plugs	Start aid





6 Job cards



Removing and installing the crankcase bleeding

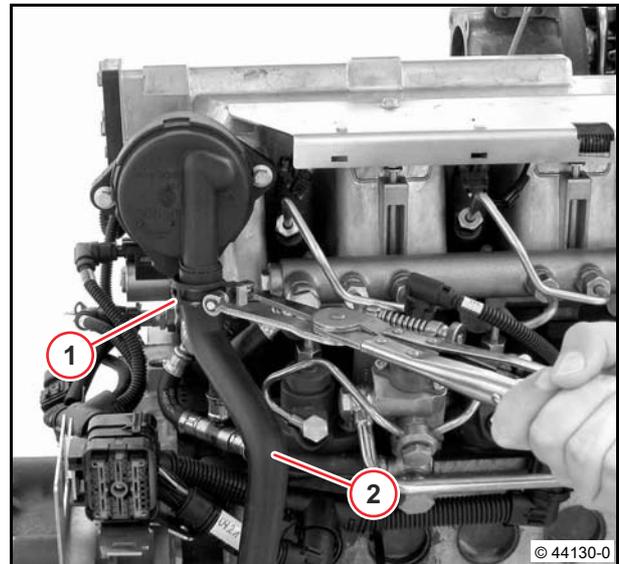


Standard tools:

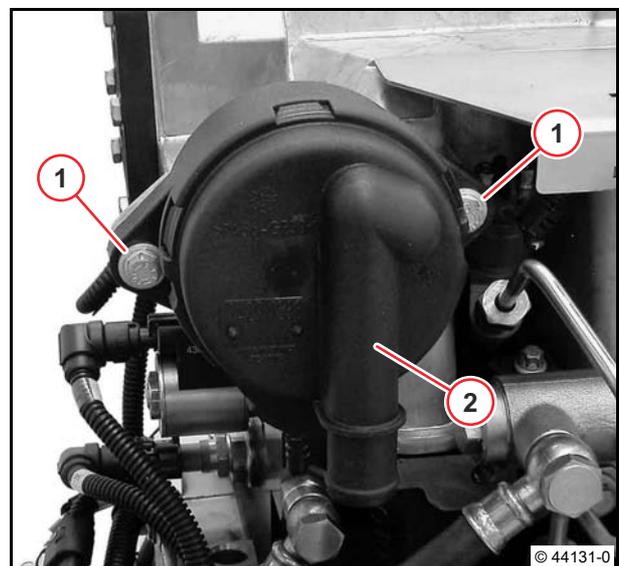
- Hose clip pliers 8011
- Spring band pliers 9090

Removing the crankcase bleeding

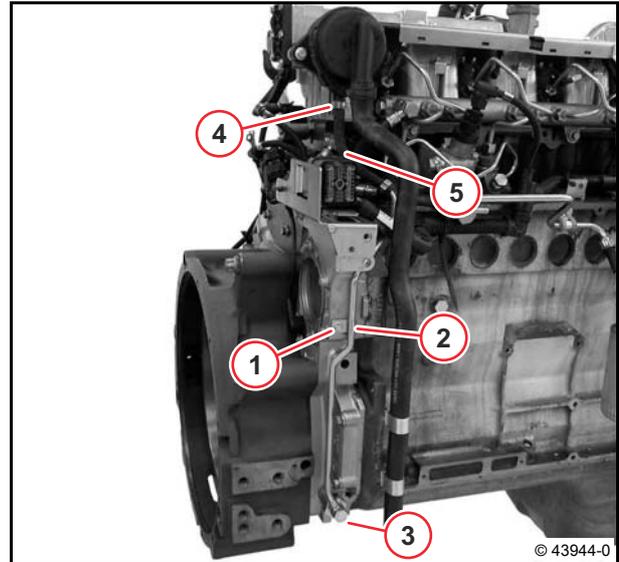
- Loosen spring band clip (1) with spring band pliers.
- Pull off bleeding hose (2).



- Unscrew screws (1).
- Remove crankcase bleeding (2).



- Unscrew screw (1).
- Loosen pipe clip (2).
- Unscrew hollow screw (3).
- Remove sealing ring.
- Loosen hose clip (4).
- Pull off oil return line (5).
- Remove bleed line.



- Visually inspect the components.



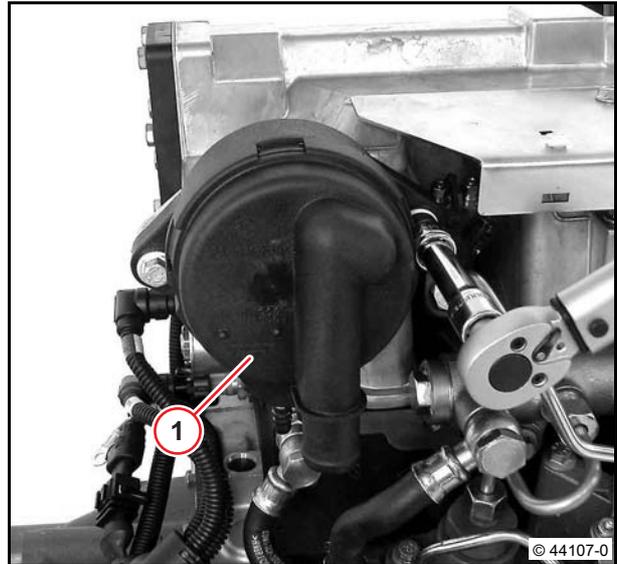
Install crankcase bleeding

- Clean sealing surface on crankcase bleeding.
- Clean cylinder head cover.
- Insert new seal (1).



- Mount crankcase bleeding (1).
- Tighten screws .

 20 Nm



- Mount the bleed line.
- Plug in oil return line (5).
- Tighten hollow screw (3).

 29 Nm



Use new sealing rings.

- Position pipe clamp (2).
- Tighten screw (1).

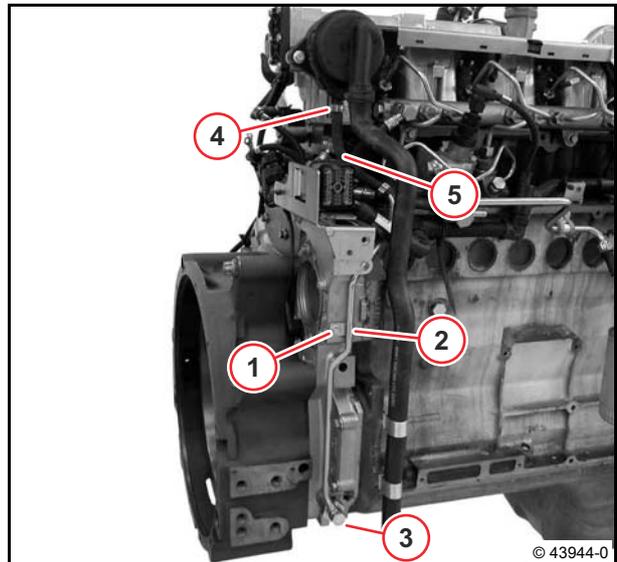
– M8

 30 Nm

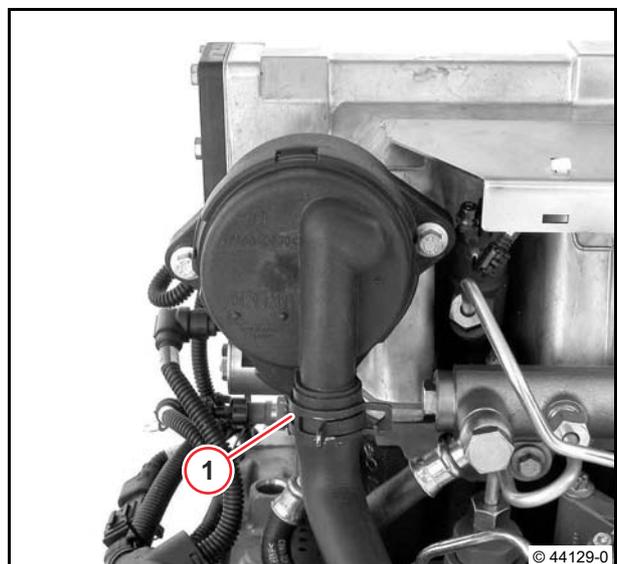
– M6

 13 Nm

- Fix the hose clip (4) with the hose clip pliers.



- Plug on bleeding hose.
- Position the spring band clip (1) with the spring band pliers.





Renewing the crankshaft sealing ring (opposite side to flywheel)



Standard tools:

- Pricker 8198
- Assembly lever 9017

Special tools:

- Assembly tool 142820



- Self-tapping screw
- Washer



- W 05-01-01

Removing the crankshaft sealing ring

- Remove the V-belt, V-belt pulley.

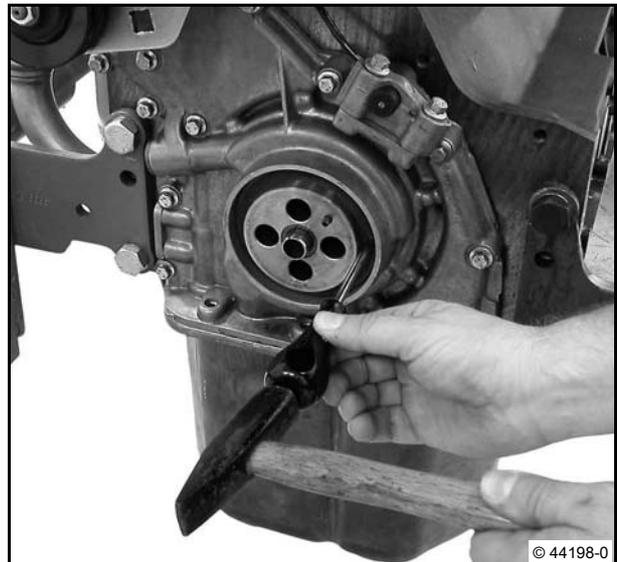
W 05-01-01

- Make a hole of approximately 3 mm in the crankshaft sealing ring with a pricker.

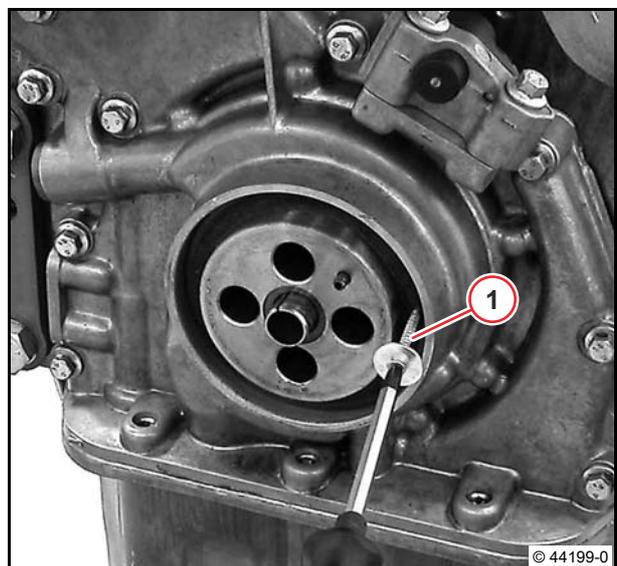


Attention!

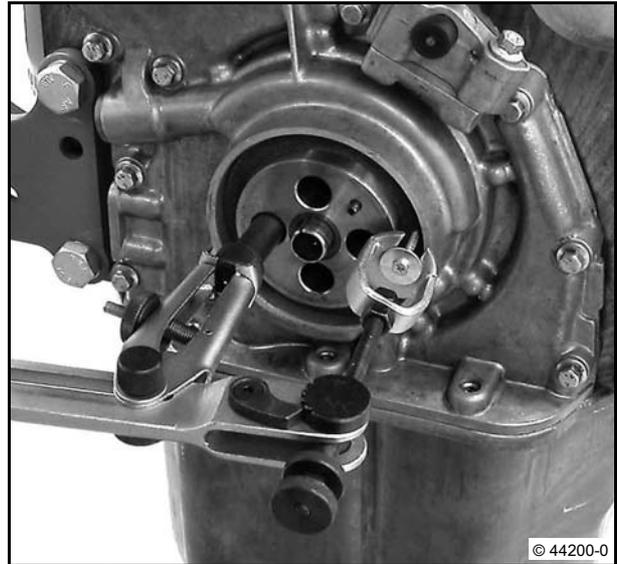
Do not damage the front cover or crankshaft.



- Turn in a self-tapping screw with washer.



- Pull out the crankshaft sealing ring with assembly lever.

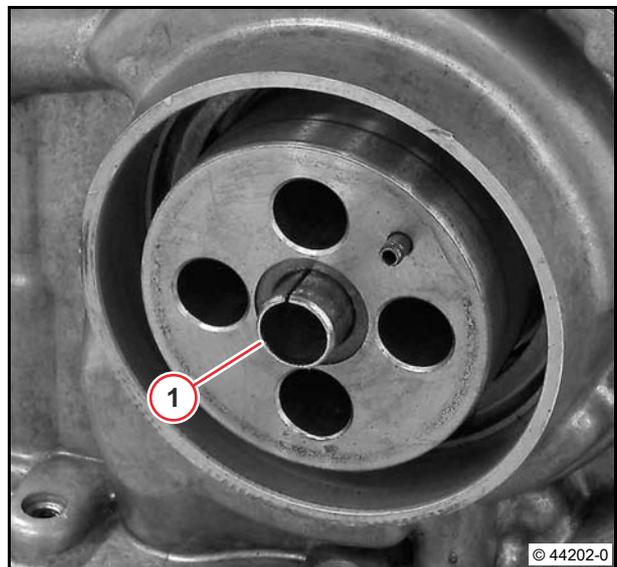


- Visually inspect all running surfaces.



Installing the crankshaft sealing ring

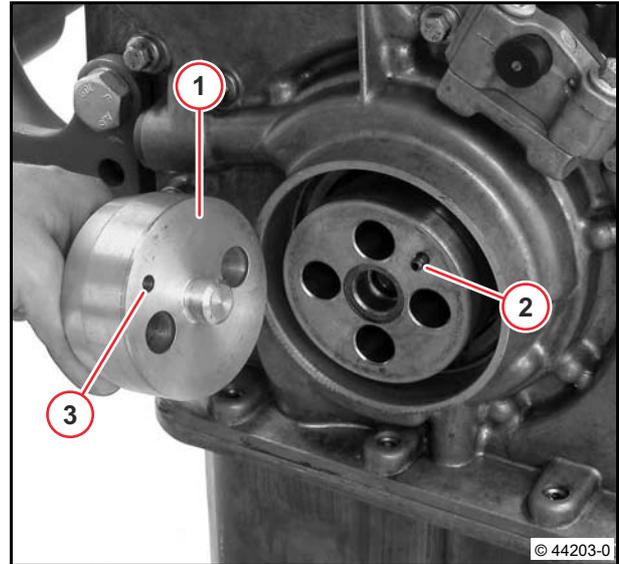
- Remove clamping bushing (1).



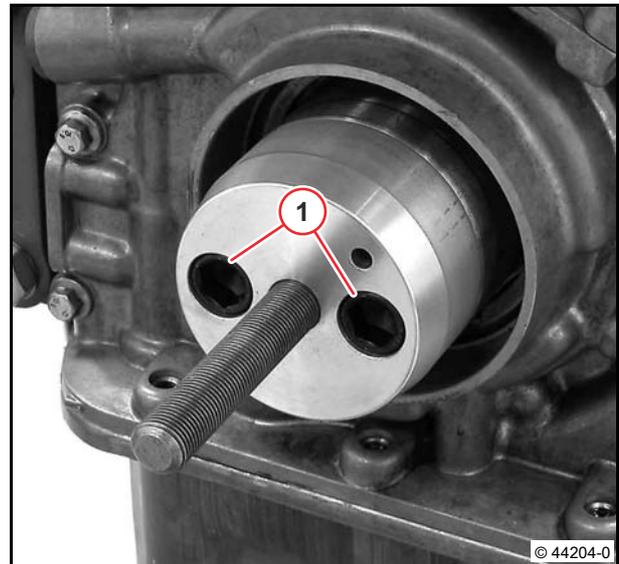
- Mount guide sleeve (1).



Make sure the clamping bushing (2) is in line with the bore (3).



- Tighten screws (1).



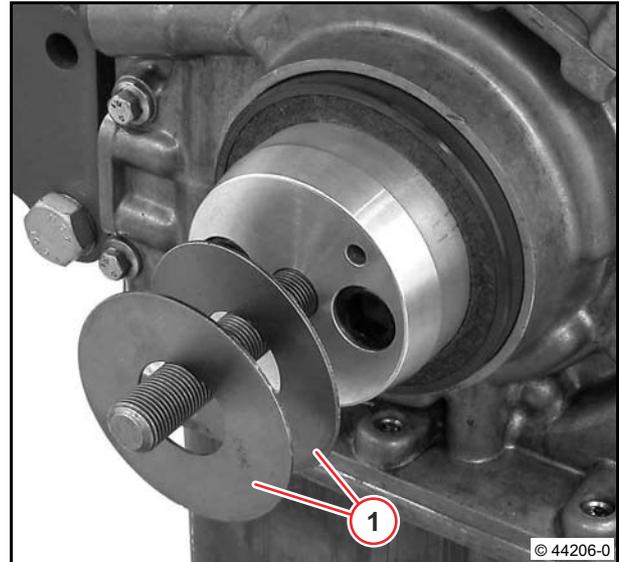
- Oil the sealing lip of the crankshaft sealing ring lightly.
- Push the crankshaft sealing ring carefully onto the guide sleeve.



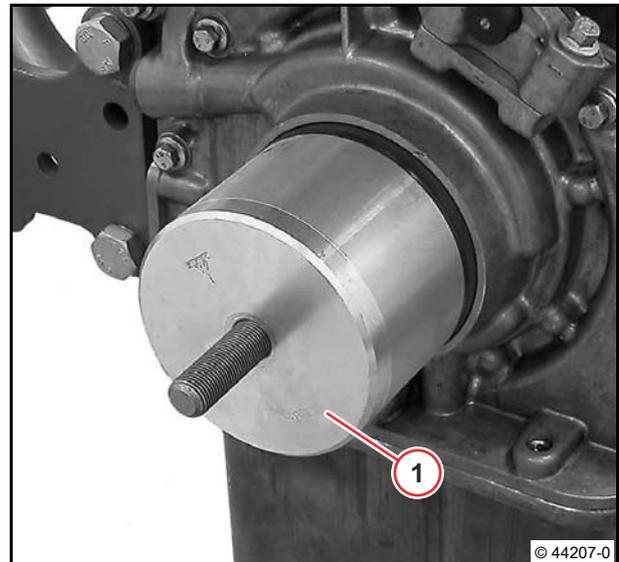
Use new crankshaft sealing ring.
The sealing lip faces the crankcase.



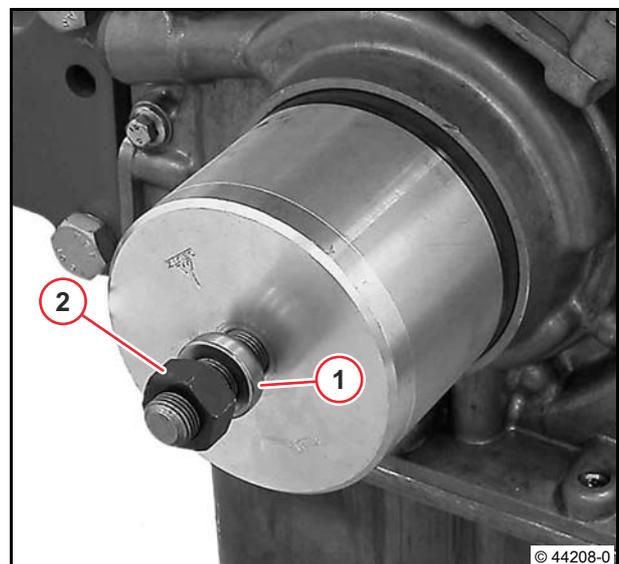
- Mount shims (1).
- Pay attention to installation depth of crankshaft sealing ring and select shim accordingly.
 - First assembly = 2 shims
 - 1. Repair installation depth = 1 shim
 - Maximum installation depth = without washers



- Mount assembly sleeve (1).
- Press on the crankshaft sealing ring to the stop.



- Plug in the bearing (1).
- Screw on nut (2).

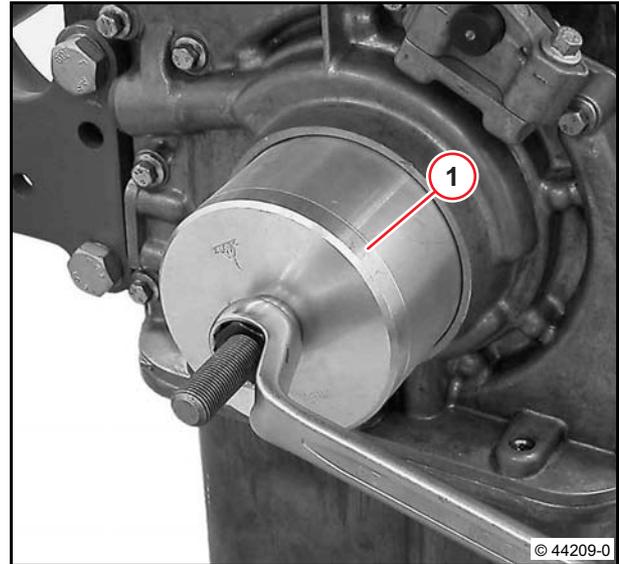


- Tighten nut to the stop of the assembly sleeve (1).



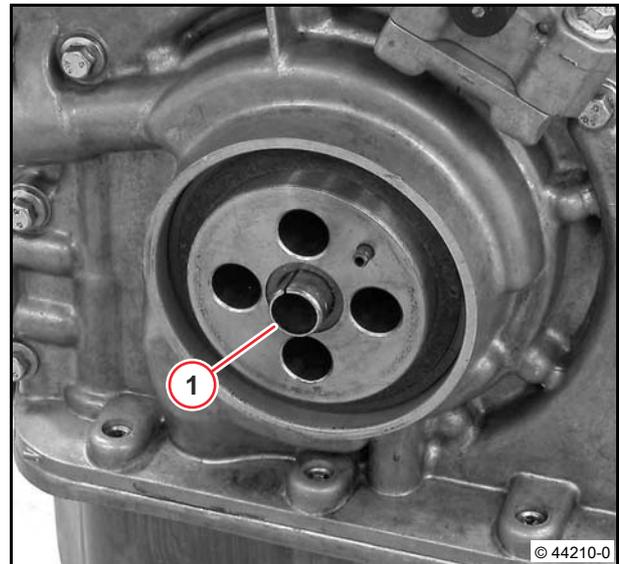
The crankshaft sealing ring is now at the pre-selected installation depth.

- Remove assembly tool.



- Insert clamping bushing (1).
- Mount V-belt, V-belt pulley.

 [W 05-01-01](#)





Assembling/disassembling shaft sleeve on the crankshaft (opposite side to flywheel)



Standard tools



– Packing compound
DEUTZ DW 74



– W 01-02-01
– W 01-03-01
– W 16-01-01

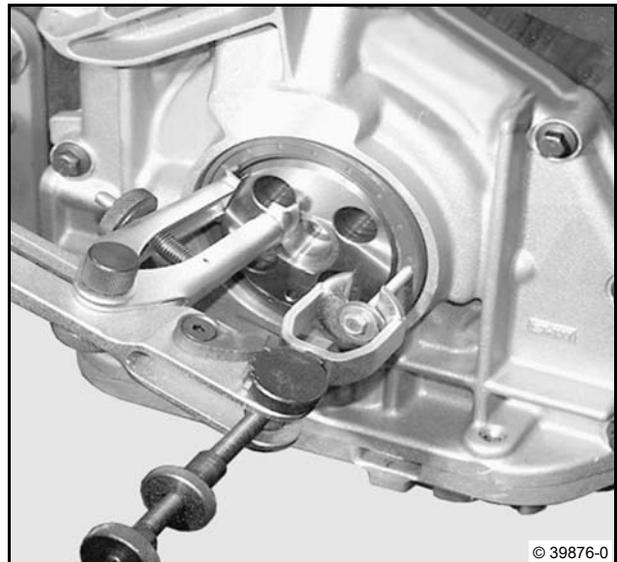


The following work procedure is described for series 2012 as an example. The procedure for the other engines listed above is the same.

Installing the shaft sleeve

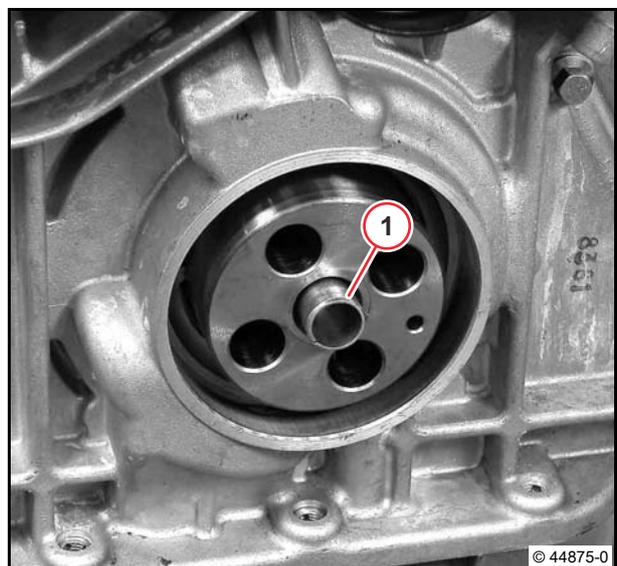
- Remove the crankshaft sealing ring.

 W 01-02-01



- Visually inspect the crankshaft journal.
 - Clean the crankshaft journal carefully.
-  Unevenness such as running marks, notches or very rough surfaces can cause lubricating oil leaks between the crankshaft and the shaft sleeve.

- Repair unevenness with packing compound.
- Remove clamping bushing (1).

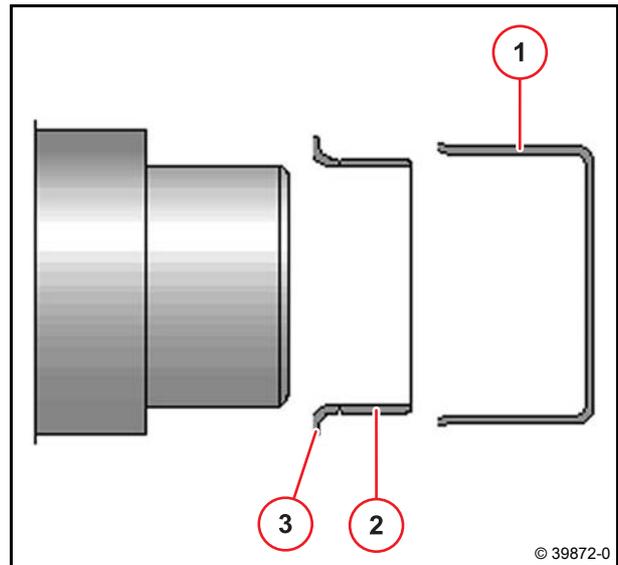




Attention!

Do not damage the peripheral surfaces and the sealing surfaces.

- Join the impact sleeve (1) and the shaft sleeve (2).
- Place the shaft sleeve with impact sleeve centrally on the crankshaft with the collar (3) facing the crankshaft.



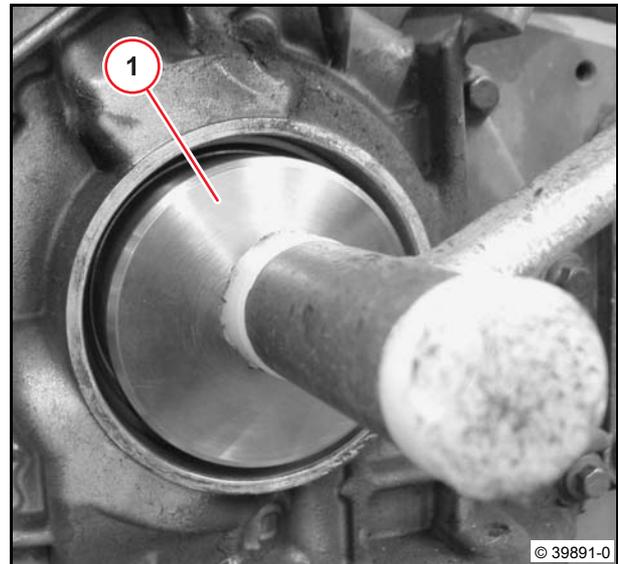
6

- Knock the shaft sleeve onto the crankshaft up to the stop by hitting the impact sleeve (1) lightly in the centre.
- Knock on the shaft sleeve evenly all round.



The installation depth of the shaft sleeve is determined by the impact sleeve.

The shaft sleeve must cover the running marks.



After installing the shaft sleeve, check that there is no burr on the surface of the crankshaft.

- Oil the crankshaft journal lightly.



To avoid dust and dirt deposits, do **not** wet the crankshaft sealing ring and fleece ring with lubricating oil.

The manufacturer has already coated the sealing lip with a lubricating wax.

- Install a new crankshaft sealing ring.

 [W 01-02-01](#)



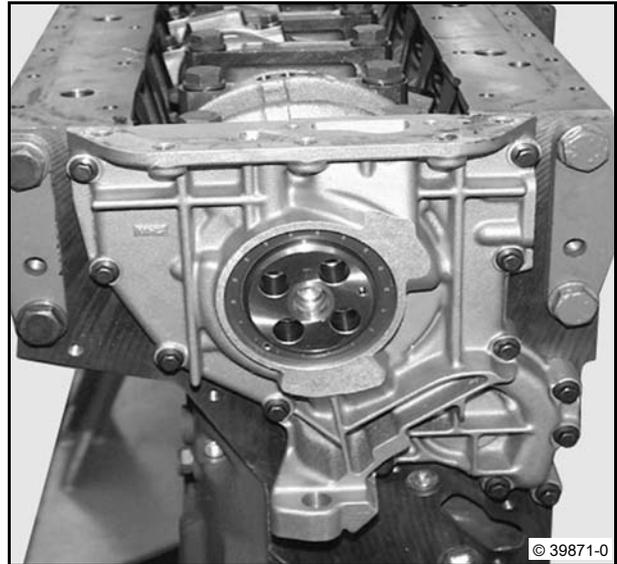
Removing the shaft sleeve

- Remove the crankshaft sealing ring.

 W 01-02-01

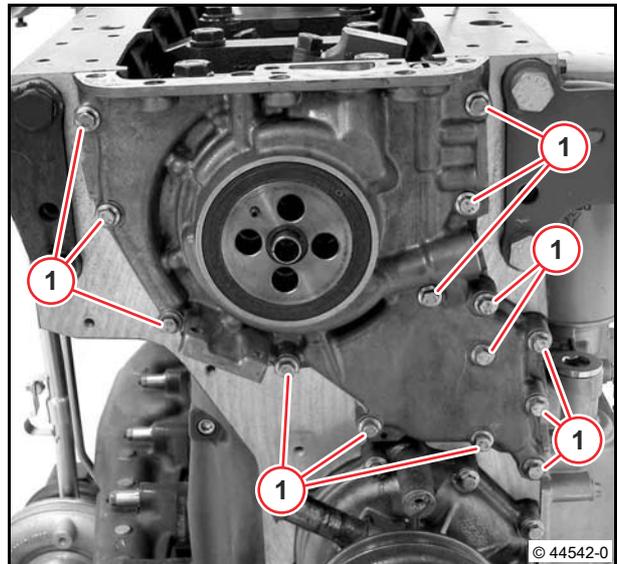
- Remove oil suction pipe

 W 16-01-01



6

- Unscrew screws (1).
- Remove front cover.

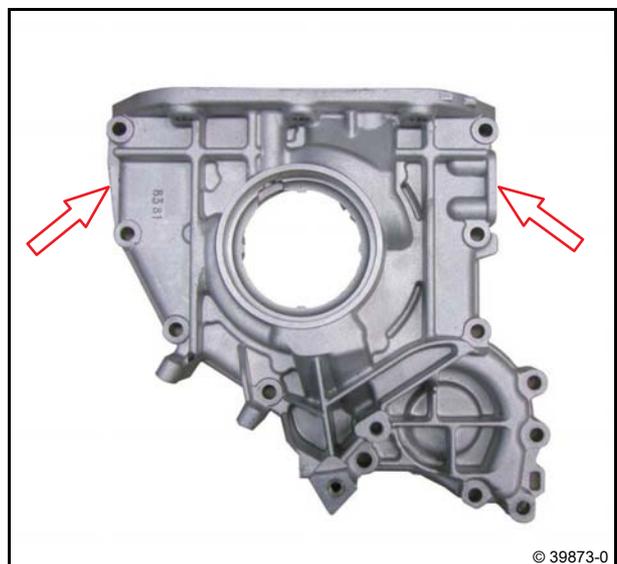


- Place two mounting levers on the gate of the front cover (arrows).



Attention!

Do not damage the sealing surfaces.

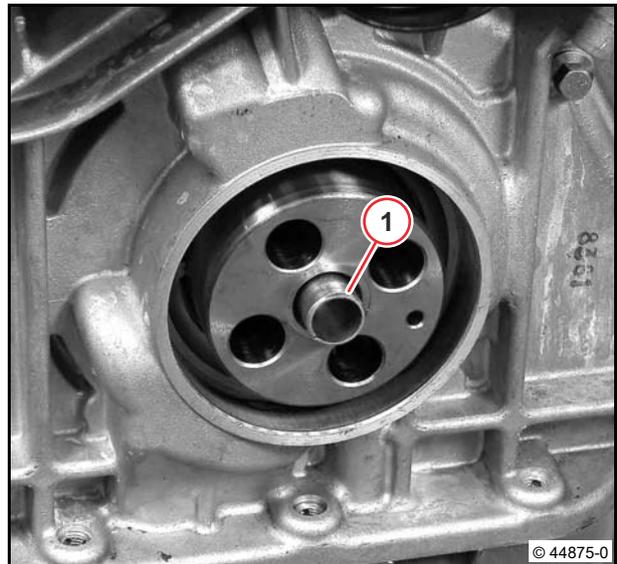


- Pull off the shaft sleeve.
- Remove front cover.



6

- Install front cover.
 [W 01-03-01](#)
- Install new shaft sleeve.
 [Installing the shaft sleeve](#)
- Install oil suction pipe.
 [W 16-01-01](#)
- Install a new crankshaft sealing ring.
 [W 01-02-01](#)
- Insert clamping bushing (1).



Removing and installing the front cover (opposite side to flywheel)



Standard tools:
– Feeler gauges



– Locking agent
DEUTZ DW 72



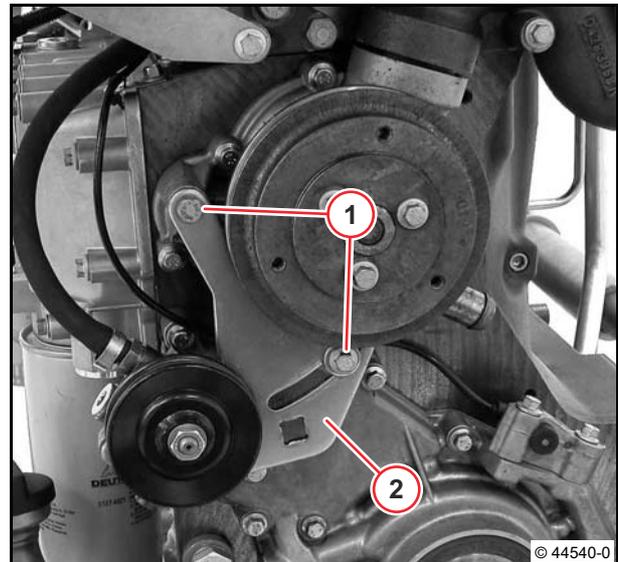
– W 01-02-01
– W 05-01-01
– W 16-01-01

Remove the front cover

- Remove V-belt pulley.

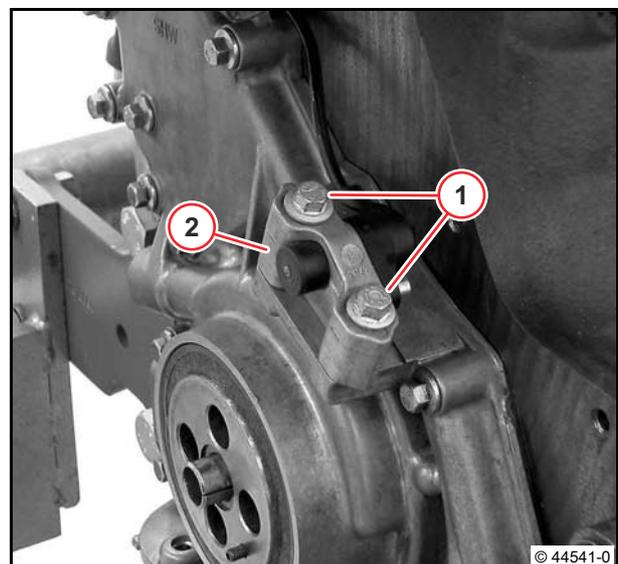
W 05-01-01

- Unscrew screws (1).
- Remove clamping strap (2) and fuel supply pump.
- Unhook the fuel supply pump at the side.

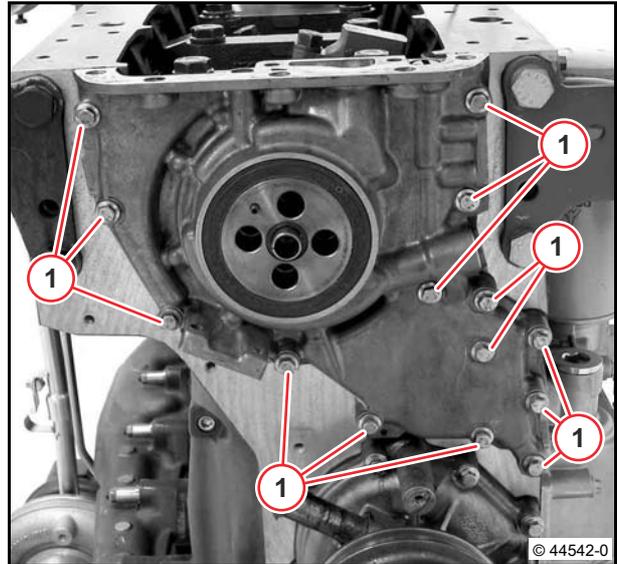


- Unscrew screws (1).
- Remove holder with impulse transmitter (2).
- Remove oil suction pipe

W 16-01-01



- Unscrew screws (1).
- Remove front cover.



- Visually inspect the components.



Install front cover

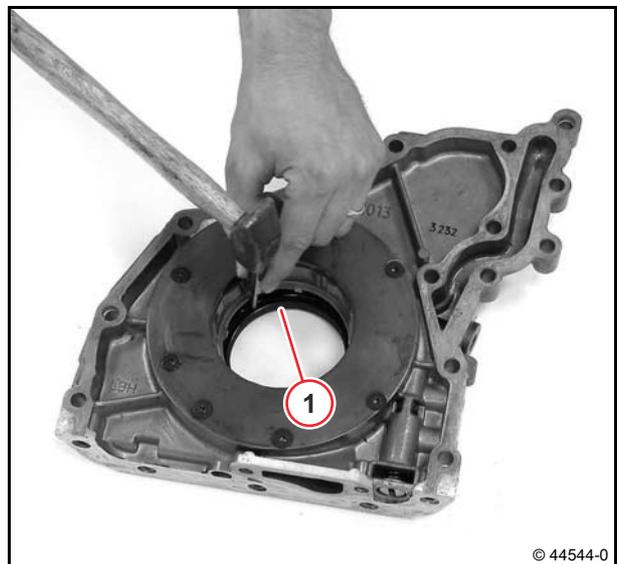
- Knock out crankshaft sealing ring (1).



Attention!

Do not damage sealing surface when knocking out.

- Clean sealing surfaces.

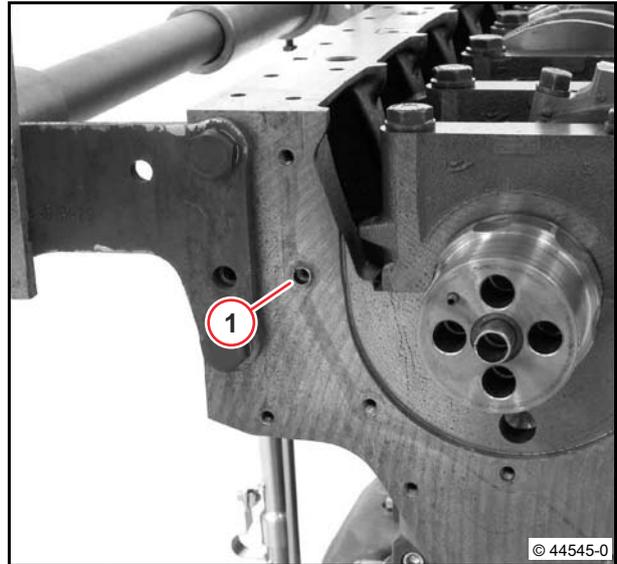


- Fix the new gasket to the crankcase with a little grease.



Note installation position.

Make sure the clamping bushing (1) is in place.



6

- Oil oil pump with lubricating oil.

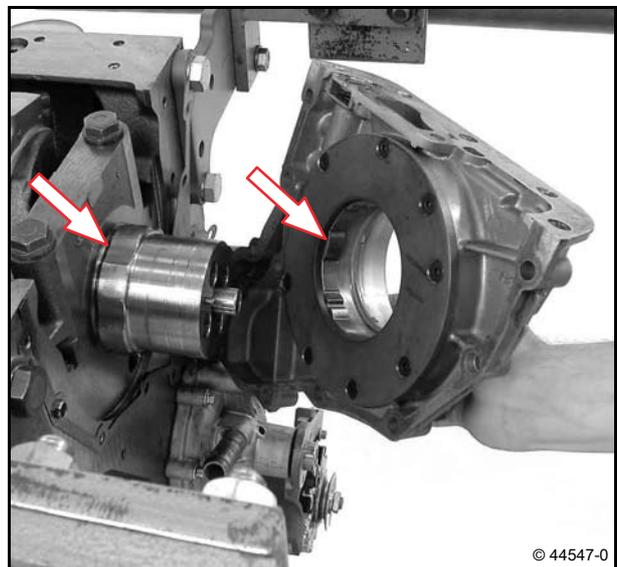


- Position the inner rotor on the crankshaft.



The countersinks on the crankshaft and the guides on the inner rotor must match (arrows).

The inner rotor and crankshaft only match up in one position.

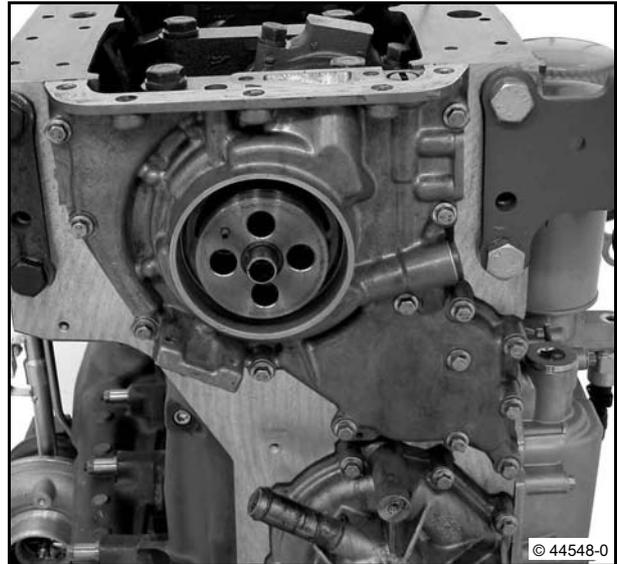


- Mount front cover.
- Fasten screws.



Do not tighten screws.

- Align front cover flush with the oil tray sealing surface.



© 44548-0

6

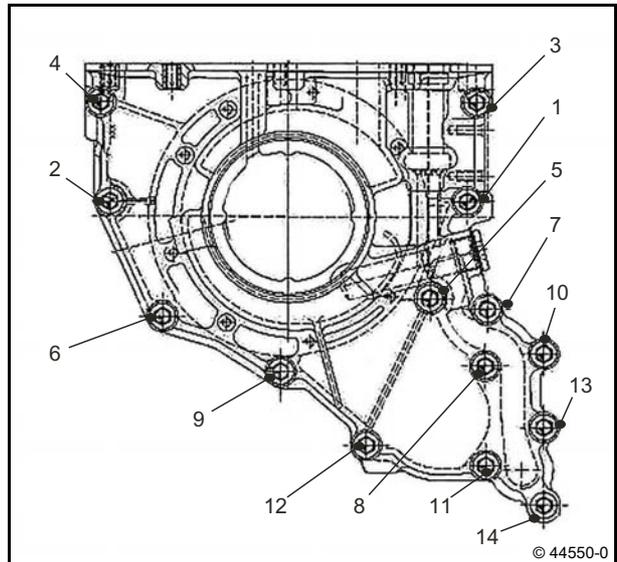
- Tighten the screws according to the tightening sequence.

– Stage 1:

 3 Nm

– Stage 2:

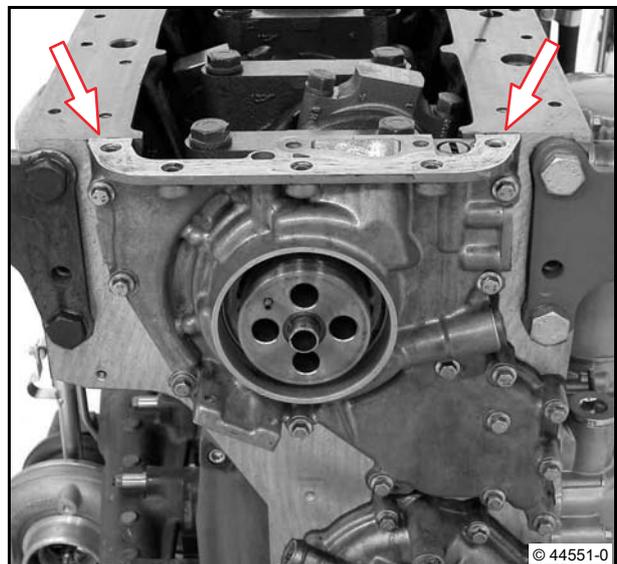
 21 Nm



© 44550-0

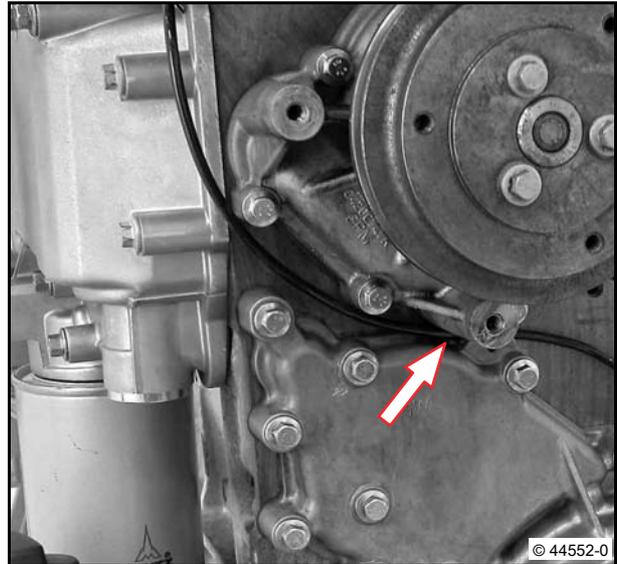
- Cut off overhanging gasket (arrows) flush with the sealing surface of the oil tray.
- Install oil suction pipe.

 [W 16-01-01](#)



© 44551-0

- Turn engine 180°.
- Lay cable between front cover and coolant pump (arrow).



- Mount clamping strap.
- Tighten screws (1).

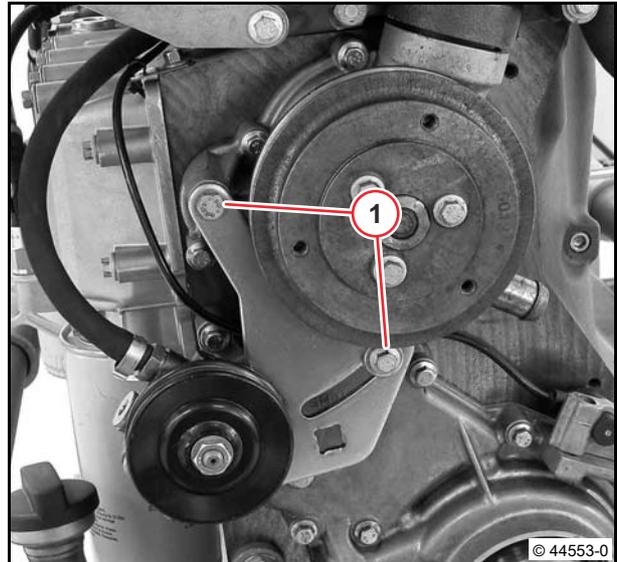
 30 Nm

- Install crankshaft sealing ring (opposite side to flywheel)

 W 01-02-01

- Install V-belt pulley.

 W 05-01-01



- Mount holder with impulse transmitter.
- Fasten screws.



Clean the threads of the screws and holes.

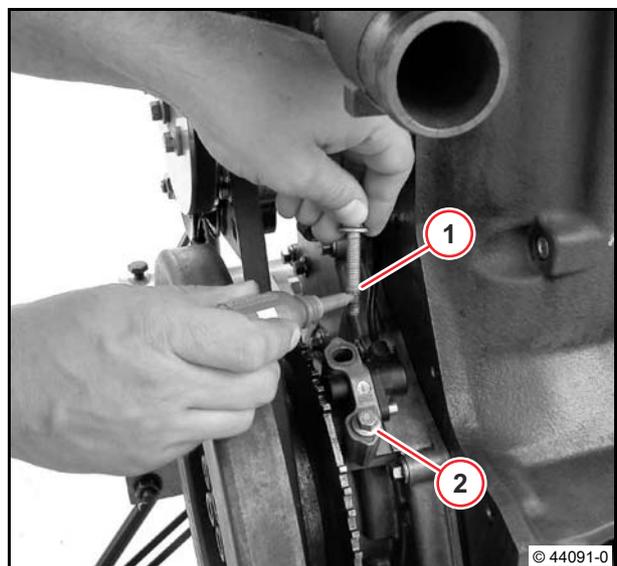
Pay attention to different screws:

Screws M8 x 45 mm (1)

Screws M8 x 40 mm (2)

Insert screws with locking agent.

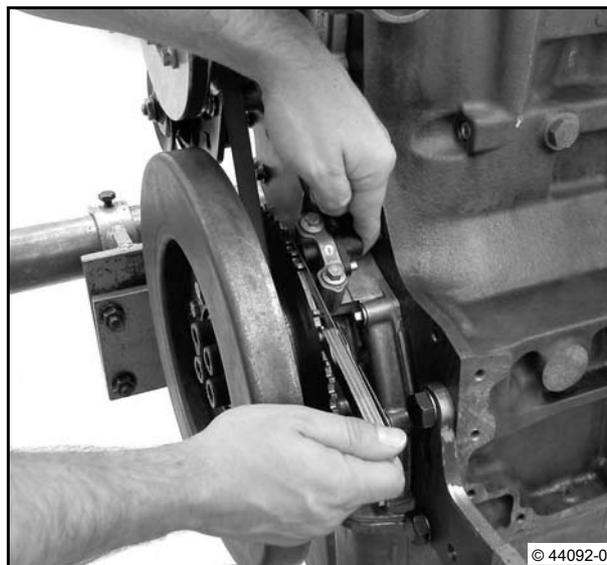
Do not tighten screws.



Set gap dimension for impulse transmitter (crankshaft)

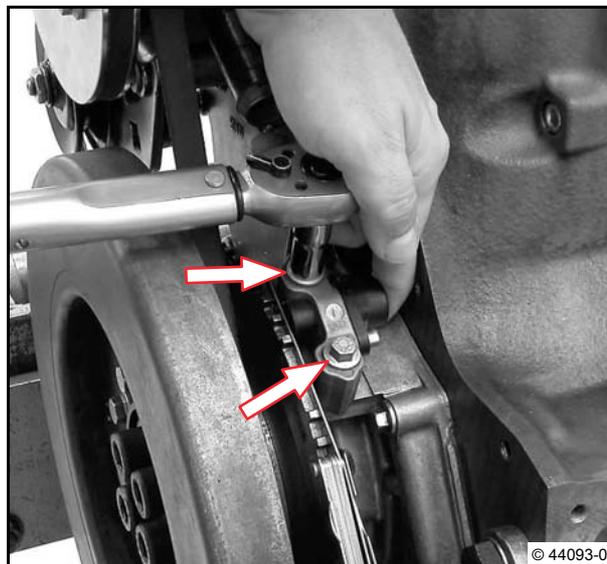
- Push feeler gauge blade between tooth lock washer and impulse transmitter.
- Press the impulse transmitter lightly against the feeler gauge blade.

 0,6^{+0.1}_{-0.1} mm



- Press the impulse transmitter lightly against the feeler gauge blade.
- Tighten screws (arrows).

 20 Nm

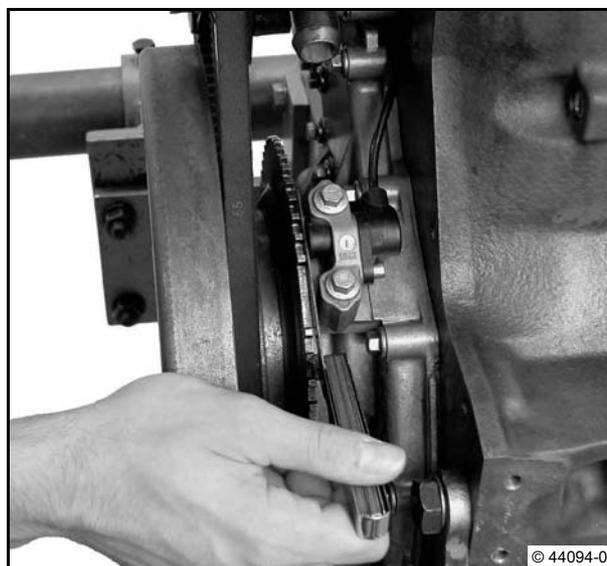


- Check gap dimension with feeler gauge blade.

 0,6^{+0.1}_{-0.1} mm



The feeler gauge blade must fit between the tooth lock washer and impulse transmitter (crankshaft) with low resistance.



Checking the overhang of the cylinder liner



Standard tools

Special tools:

- Dial gauge 100400
- Measuring device 100750



- W 08-03-01

Checking the overhang of the cylinder liner

- Remove cylinder head.

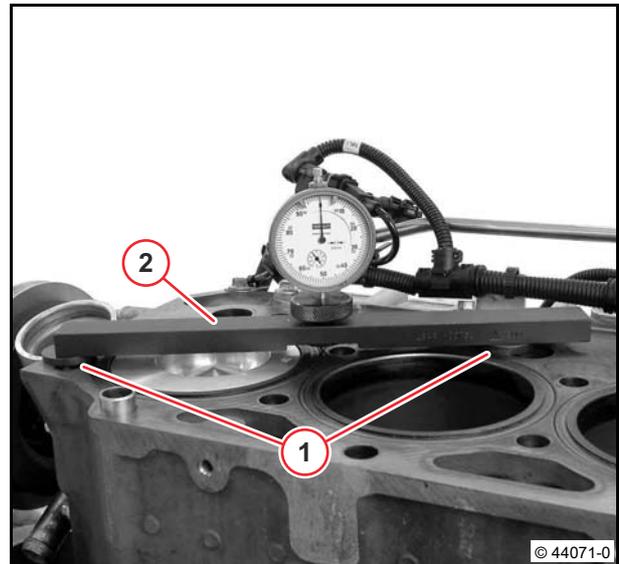


W 08-03-01



The cylinder liner must be pressed in the crankcase to the stop.

- Place shims (1) and measuring beam (2) on the sealing surface of the crankcase.
- Insert dial gauge into measuring beam.
- Fix dial gauge with knurled nut.



- Apply stylus of the dial gauge to the crankcase sealing surface with pre-tension (arrow).
- Adjust dial gauge to "0".



- Move the measuring beam and spacing washers until the stylus (arrow) is touching the sealing surface of the cylinder liner.

 0,03 - 0,08 mm



Make measurements at at least 3 other points on the cylinder liner.

When the wear limit is reached, the cylinder liner must be renewed.

- Install cylinder head.

 [W 08-03-01](#)



Removing and installing the pressure holding valve



Standard tools

Special tools:

– Slide hammer

150800



– Locking agent
DEUTZ DW 71



– W 16-01-01



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing the pressure holding valve

- Remove oil suction pipe

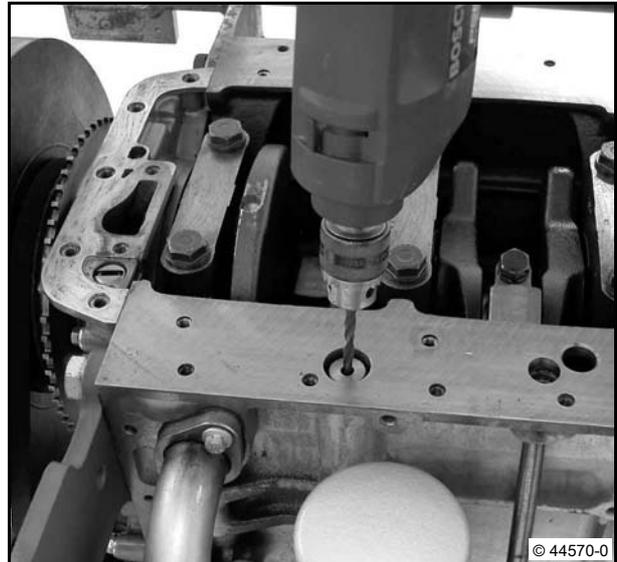


W 16-01-01

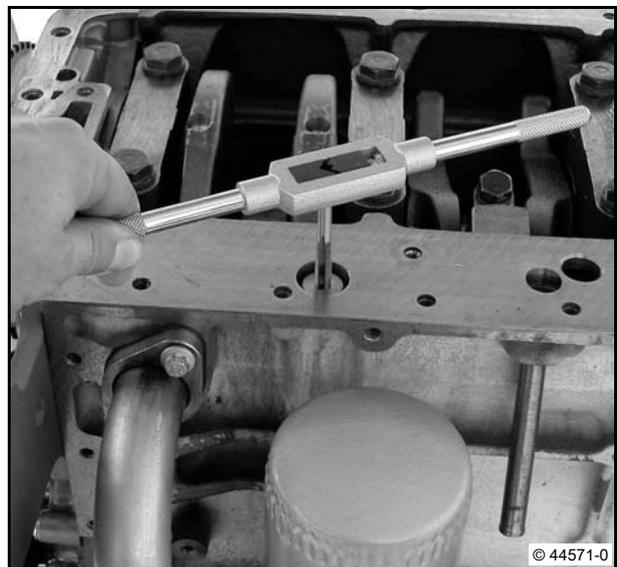
- Pull out oil dipstick.
- Drill out hole with a 6.7 mm Ø drill.



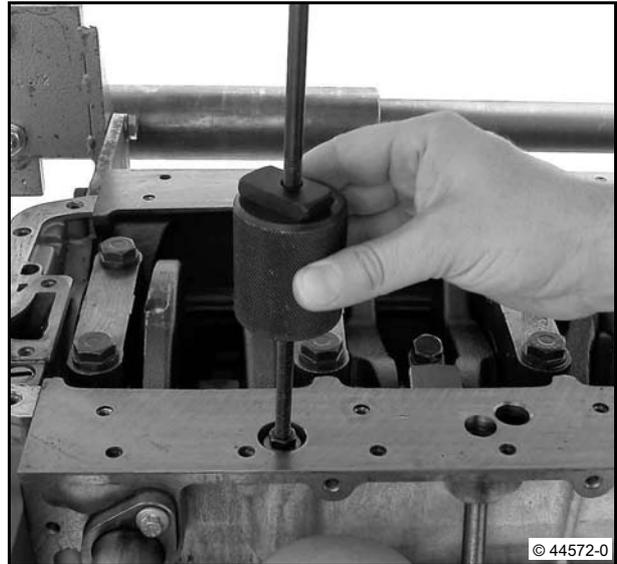
Make sure no chips get into the crankcase.
Coat spiral drill thickly with grease, so that no drill shavings fall into the crankcase.



- Cut thread M8 x 1.25.



- Turn slide hammer into thread.
- Pull out pressure holding valve.
- Remove any drill shavings carefully.



Install pressure holding valve.

- Apply locking agent to the collar of the new pressure holding valve.



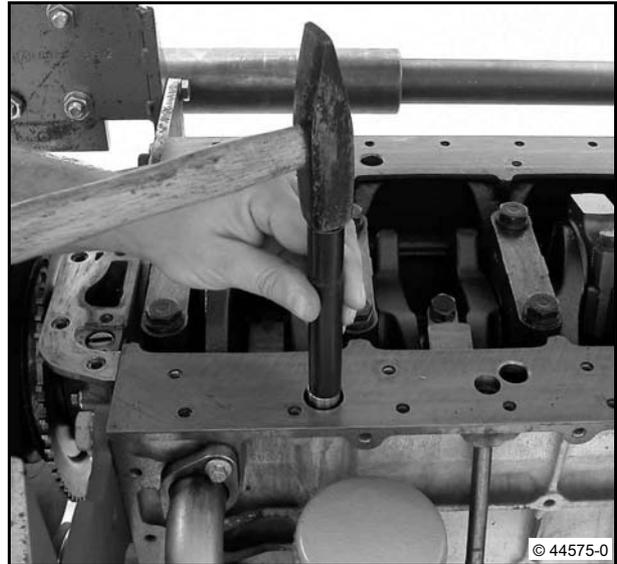
- Insert new pressure holding valve in the crankcase.



- Knock in pressure holding valve to the stop with a suitable tool.
- Install oil suction pipe.

 [W 16-01-01](#)

- Insert oil dipstick.





Removing and installing the piston cooling nozzles



Standard tools



– W 05-05-01

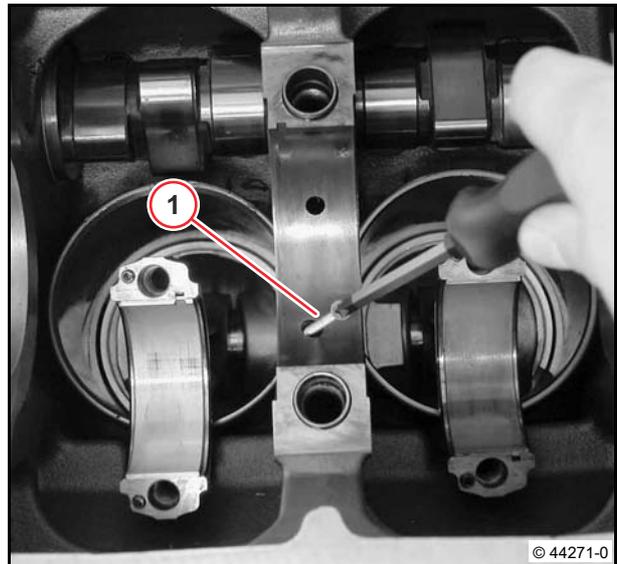
Removing the piston cooling nozzles

- Remove crankshaft.

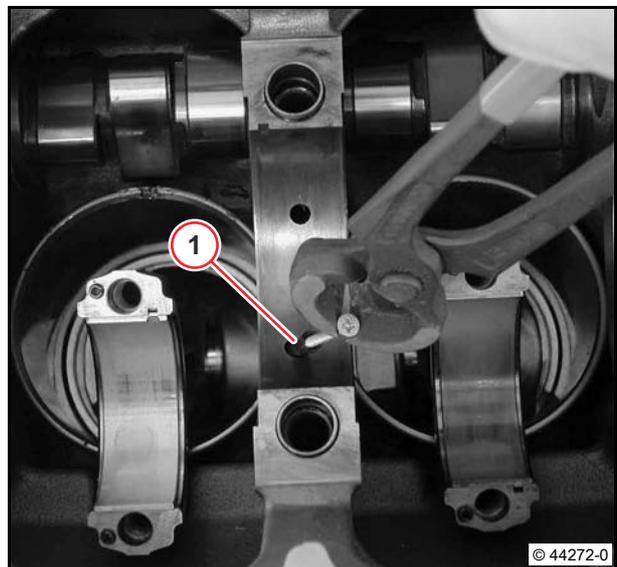


W 05-05-01

- Screw self-tapping screw (1) carefully into the piston cooling nozzle.



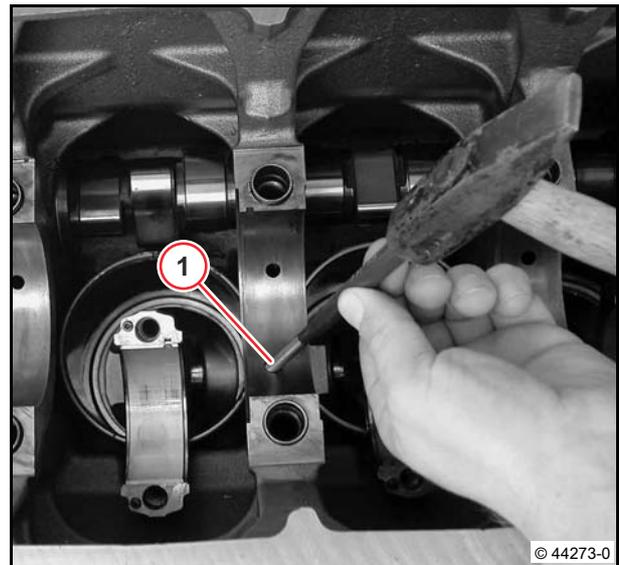
- Pull out piston cooling nozzle (1) with pliers.



Installing the piston cooling nozzles

- Clean the bores for the piston cooling nozzles in the crankcase.
- Knock in new piston cooling nozzle (1) with pin to the stop.
- Install crankshaft.

 [W 05-05-01](#)



Checking collar contact for cylinder liner



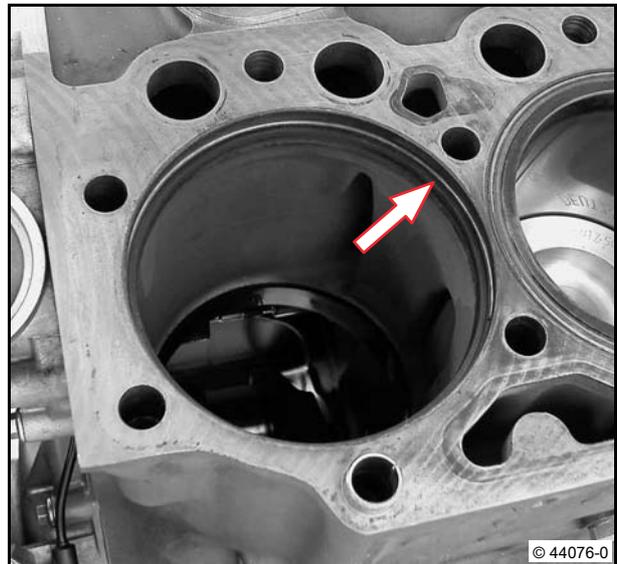
- Standard tools:
- Micrometer gauge
 - Depth-measuring appliance



- W 04-01-01

Checking the collar rest for the cylinder liner

- Remove cylinder liner.
- W 04-01-01
- Visually inspect collar rest (arrow).
 - Visually inspect sealing surface.



- Measure collar rest with depth measuring appliance.

8,92^{+0.03}₋₀ mm



Measure collar rest at several points.





Removing and installing the lubricating oil pan (metal sheet lubricating oil pan)



Standard tools:

- Wire brush
- 4 pin bolts M8x70

Special tools:

- Separating tool 151500



- Packing compound
DEUTZ DW 74



Attention!

Make sure that no gasket residue falls into the crankcase.
Seal all openings.

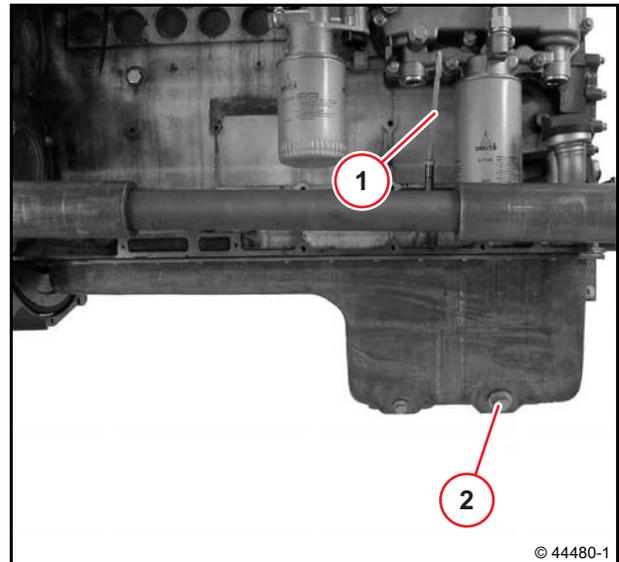


Collect leaking operating substances in suitable vessels and dispose of according to regulations.

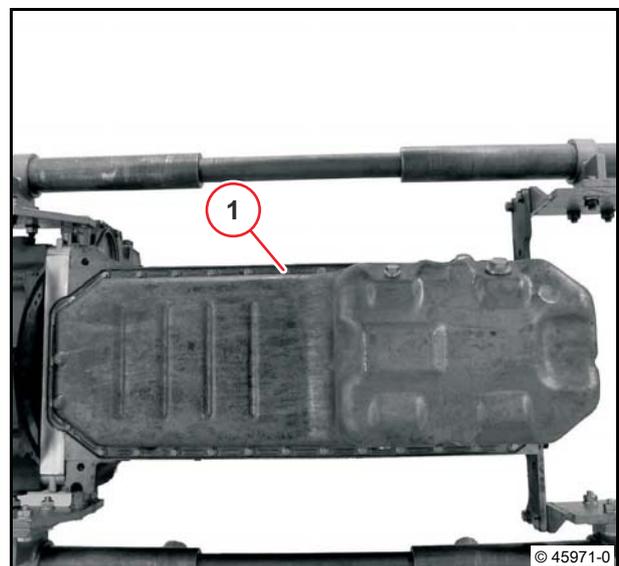
Emptying and filling the engine with operating media must be carried out according to the operating manual and the appropriate documentation of the vehicle/equipment manufacturer.

Removing the lubricating oil pan

- Pull out oil dipstick (1).
- Unscrew locking screw (2).
- Remove sealing ring.
- Drain lubricating oil, collect and dispose of according to regulations.



- Unscrew all screws (1).

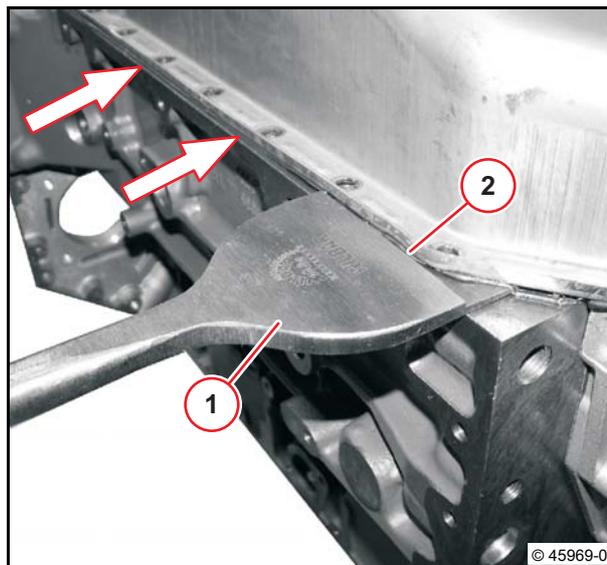


- Drive in separating tool (1) to the stop (2).



Attention!

The tool can only be driven in in the area of the crankcase.
Separation in the area of aluminium parts is not allowed.
Do not damage the sealing surfaces.

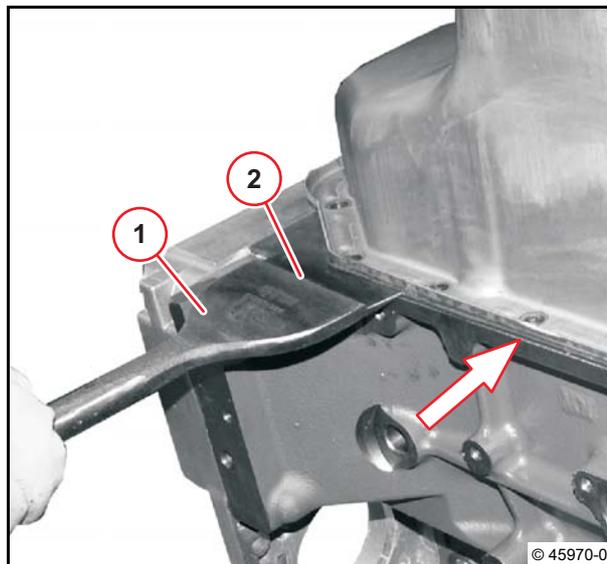


- Drive in second separating tool (1) to the stop (2).



Attention!

The tool can only be driven in in the area of the crankcase.
Separation in the area of aluminium parts is not allowed.
Do not damage the sealing surfaces.



- Lever out lubricating oil pan.
- Remove lubricating oil pan.



- Visually inspect the component.



Installing the lubricating oil pan

- Scrape off sealing compound with separating tool.



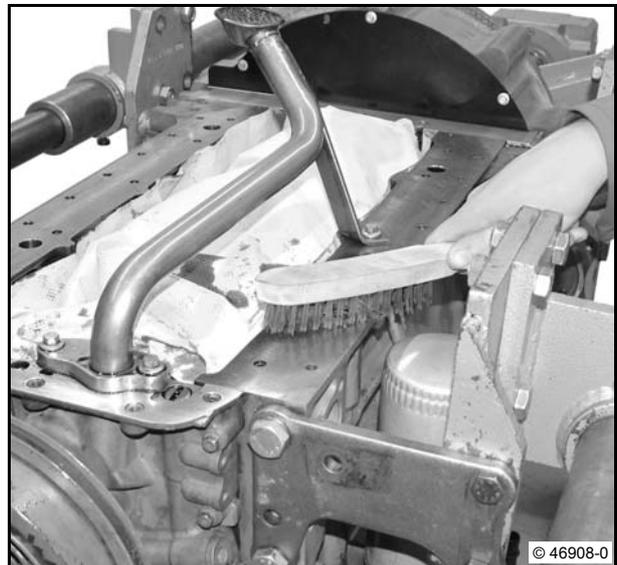
Attention!

Wear protective glasses.

- Clean the sealing surface on the crankcase with a wire brush.



The sealing surfaces must be dry and free from grease and dirt.





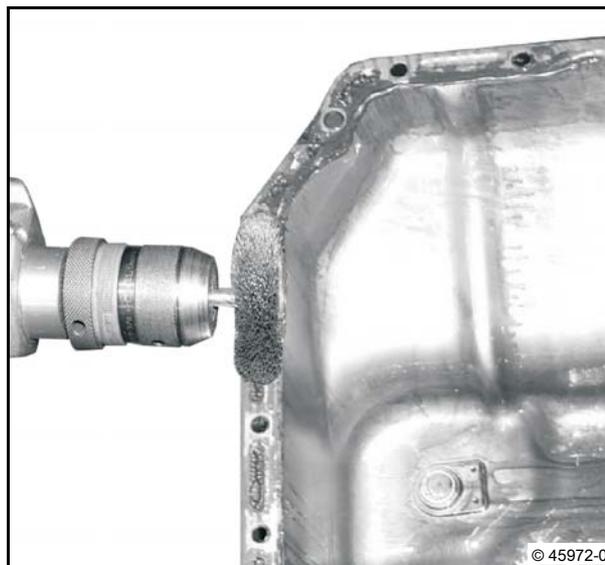
Attention!

Wear protective glasses.

- Clean the sealing surface on the lubricating oil pan with a wire brush.



The sealing surfaces must be dry and free from grease and dirt.



- Apply packing compound evenly to the sealing surface and in the beading of the lube oil tray.



Apply the packing compound in an even bead (thickness approx. 3.5 mm). The position of the packing compound is only partly illustrated.



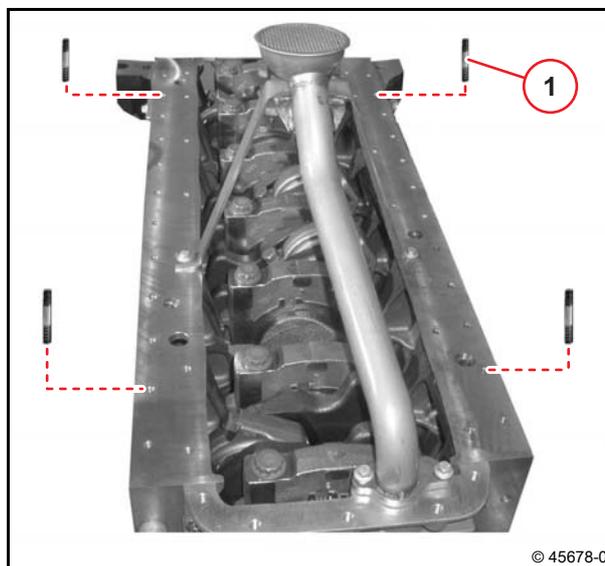
- To align the lubricating oil pan, screw four pin bolts (1) diagonally opposed into the crankcase.
- Align the lubricating oil pan in the appropriate installation position with the pin bolts.
- Mount lubricating oil pan.



Attention!

Do not move the lubricating oil pan any more. Observe the drying time for the packing compound.

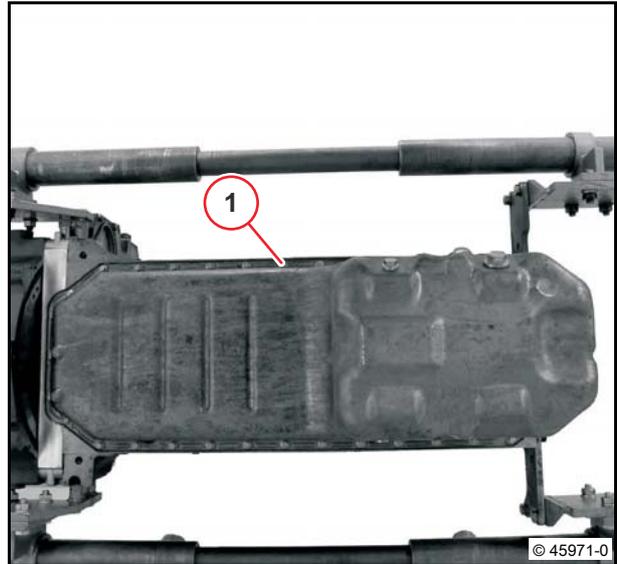
- Unscrew the pin bolts.



- Fasten all screws (1).



Note different screw lengths.

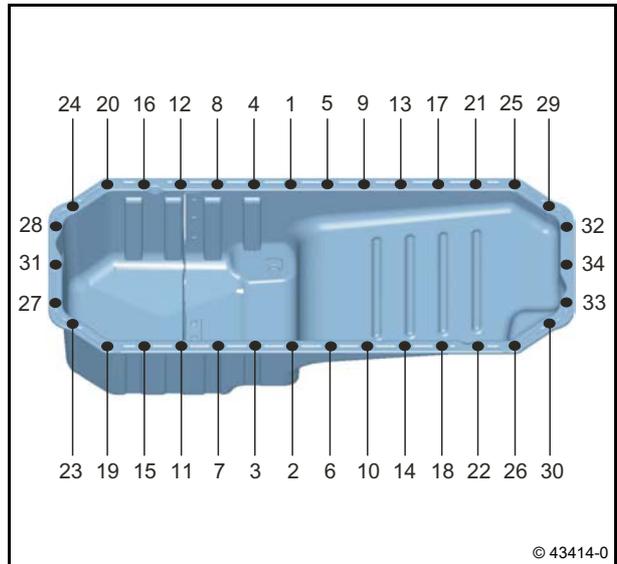


- Tighten the screws according to the tightening sequence.

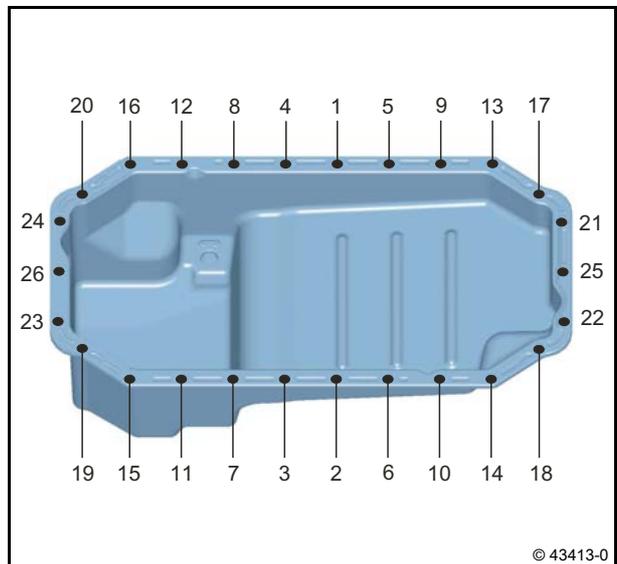
30 Nm



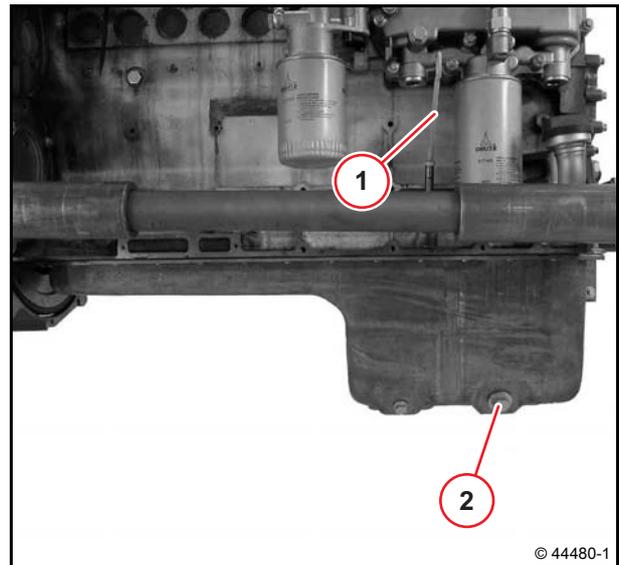
Representation: Tightening sequence 6-cylinder



Representation: Tightening sequence 4-cylinder



- Insert new sealing ring.
- Tighten screw plug (2).
 55 Nm (M18x1,5)
- Insert oil dipstick (1).
- Fill in lubricating oil according to operating manual.



© 44480-1

Removing and installing the cylinder liner



Standard tools

Special tools:

- Extraction tool, universal 150170
- Tension plate 150171
- Assembly lever 150190
- Washer 150191



- Fitting compound
DEUTZ AP1908



- W 01-05-01
- W 01-13-01
- W 04-01-02
- W 06-01-01



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

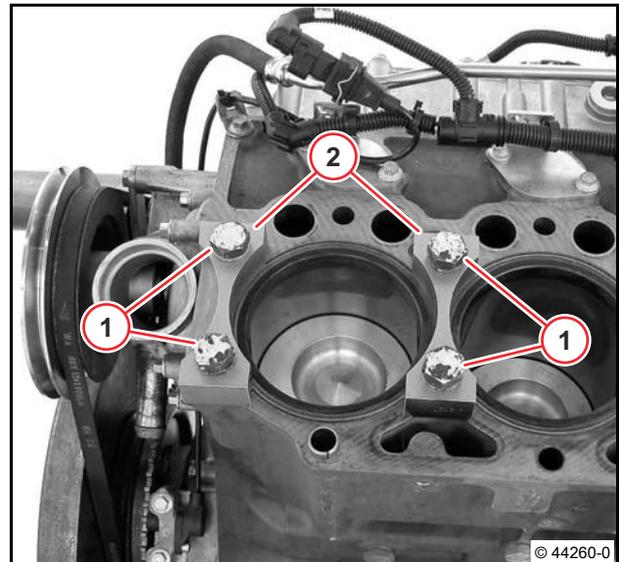
Lubricating oil and coolant must be filled according to the instructions in the operating manual.

Removing the cylinder liner

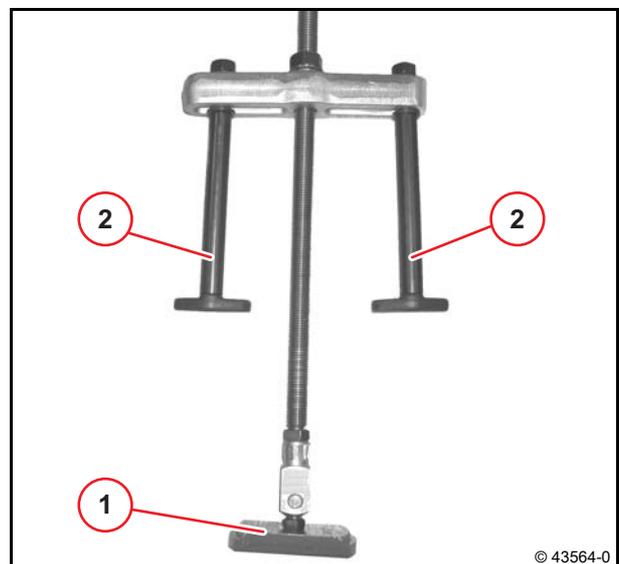
- Remove piston and connecting rod.

 W 06-01-01

- Unscrew screws (1).
- Remove the liner holder (2).



- Pre-mount the disassembly device
 - Mount the plate (1) on the disassembly device
 - Adapt the counter support (2) according to the diameter of the cylinder liner.

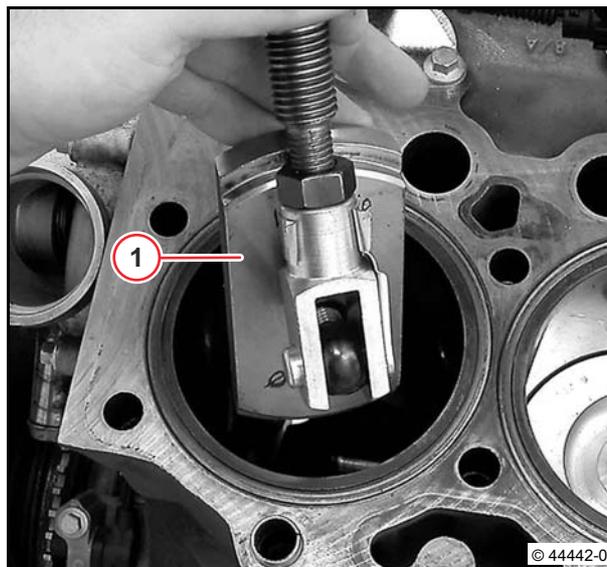


- Fold the plate (1) to the side and insert the disassembly device in the cylinder liner.



Attention!

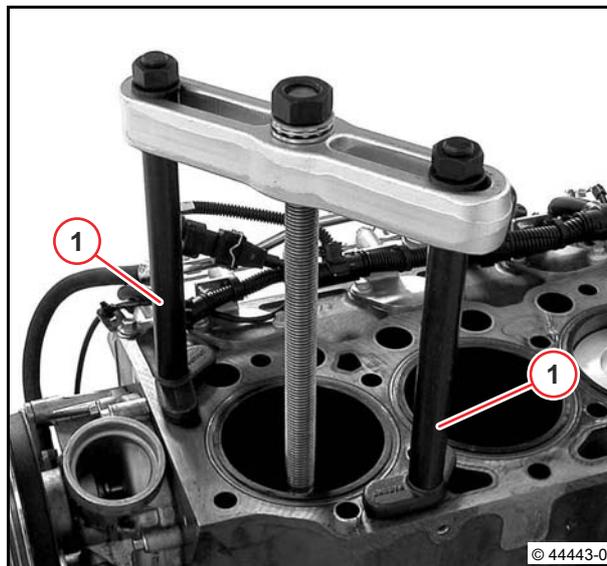
Do not damage the running surfaces and the sealing surfaces.



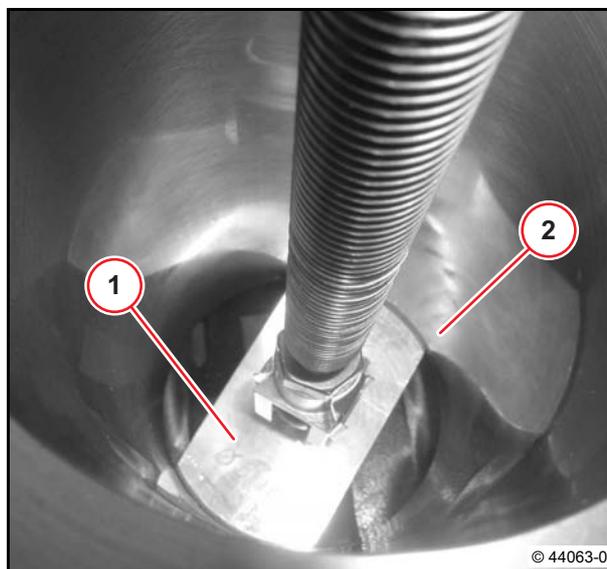
- Mount the counter holder (1) on the crankcase.



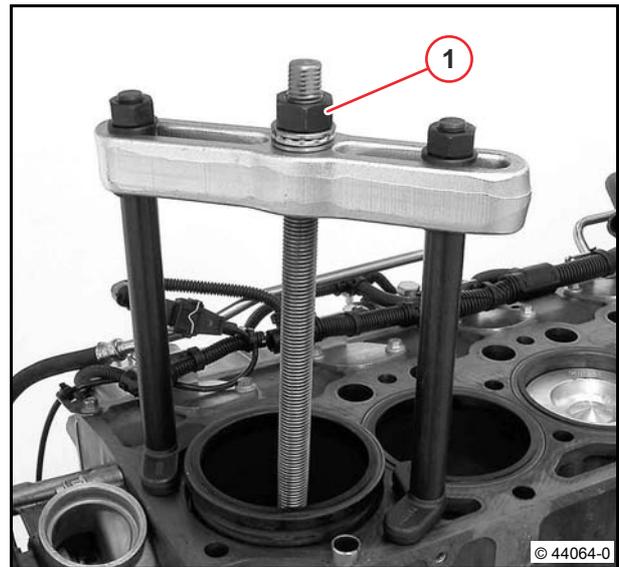
Do not mount the counter holders on the cylinder liner's sealing surface.



- Place the plate (1) with the lay-on surfaces against the cylinder liner (2) and hold them together.



- Turn the nut (1) clockwise.
- Remove the disassembly device.



- Pull the cylinder liner up and out.



- Remove O-rings.
- Visually inspect the components.
- Testing the cylinder liner.

 [W 04-01-02](#)



Install cylinder liner

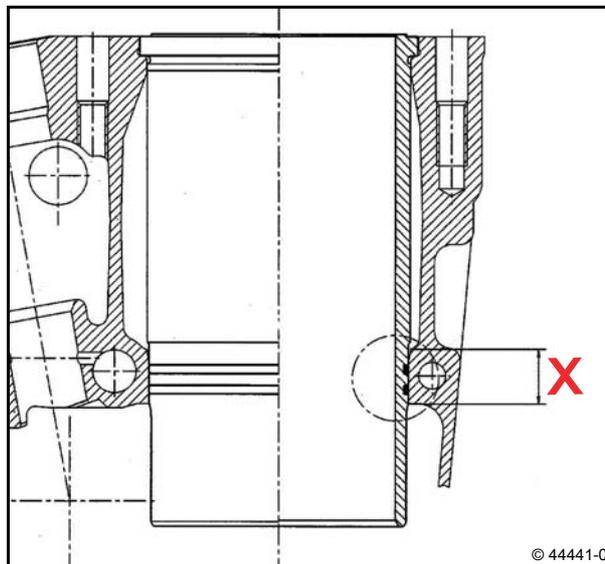
- Check collar contact for cylinder liner.

 W 01-13-01

- Clean cylinder liner.
- Insert new O-rings.



- Coat the crankcase and the cylinder liner in area (X) with lubricating oil.



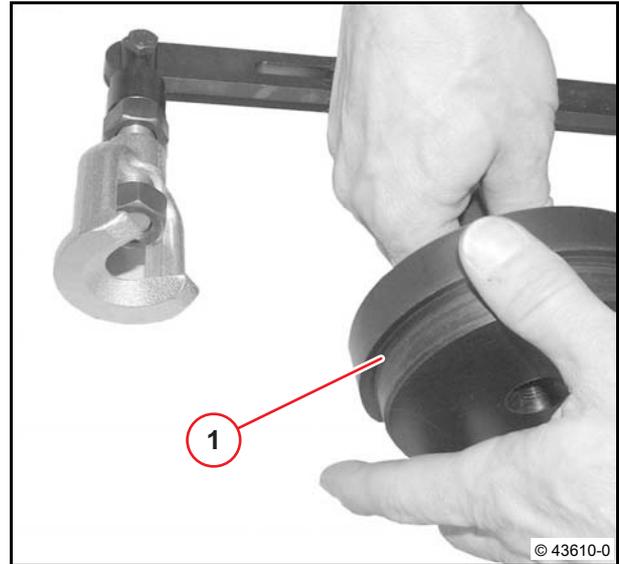
- Insert the cylinder liner in the crankcase.



Make sure that the liner surface and the crankcase are absolutely clean before installing the cylinder liner.



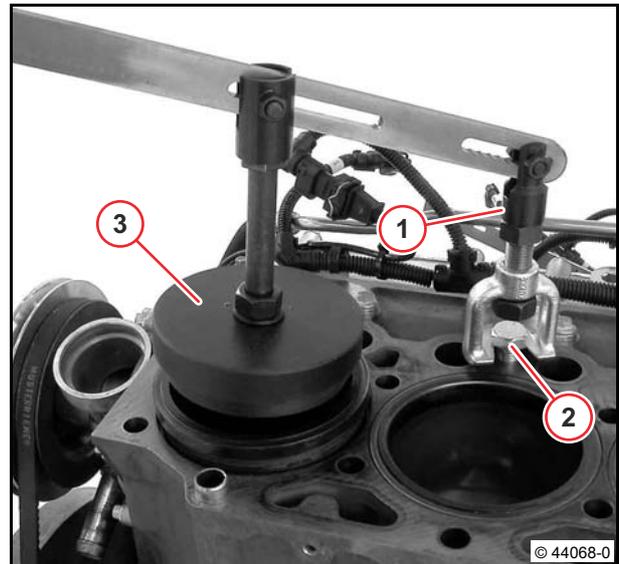
- Select the pressing disc (1) according to the diameter of the cylinder liner and screw to the assembly lever.



- Fasten screw (2).
- Hook assembly lever (1) to screw.
- Mount disc (3) on cylinder liner.



Ensure that the installation location is free from faults.



- Press in the cylinder liner to the stop with the assembly lever.



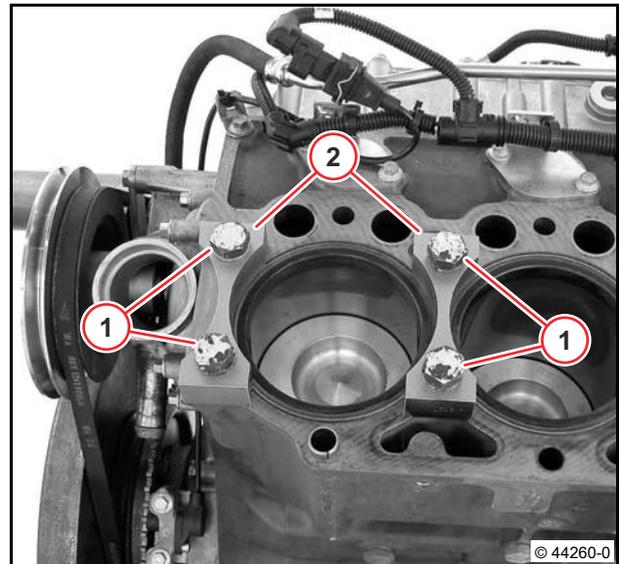
- Remove assembly lever.
- Check the overhang of the cylinder liner.

 [W 01-05-01](#)



- Mount liner holder (2).
- Tighten screws (1).
- Install piston and connecting rod.

 [W 06-01-01](#)



Testing the cylinder liner



Standard tools:

- Micrometer gauge
- Internal measuring device

Special tools:

- Dial gauge 100400



- W 04-01-01
- W 06-01-01
- W 08-03-01



The crankshaft bearing covers must be mounted properly for measuring the cylinders.

Testing the cylinder liner

- Remove cylinder head.

 W 08-03-01

- Check cylinder liner for visible signs of wear.
- Remove piston and connecting rod.

 W 06-01-01



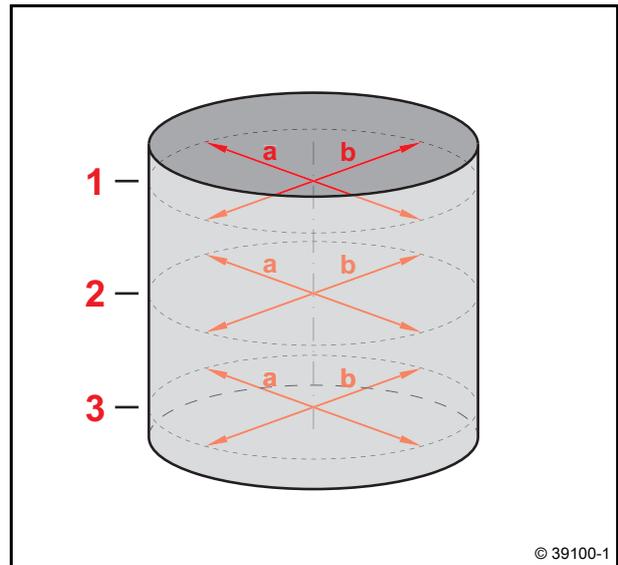
- Prepare internal measuring device:

- Mount probe bolt for the appropriate measuring range in the internal measuring device.
- Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
- Set micrometer gauge to 108 mm.
- Balance the internal measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to "0".





Diagram for measuring the cylinder running surface at the points "a" and "b" in the levels "1" - "3".



© 39100-1

6

- Insert internal measuring device in cylinder.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.
- Compare actual value with setpoint value.

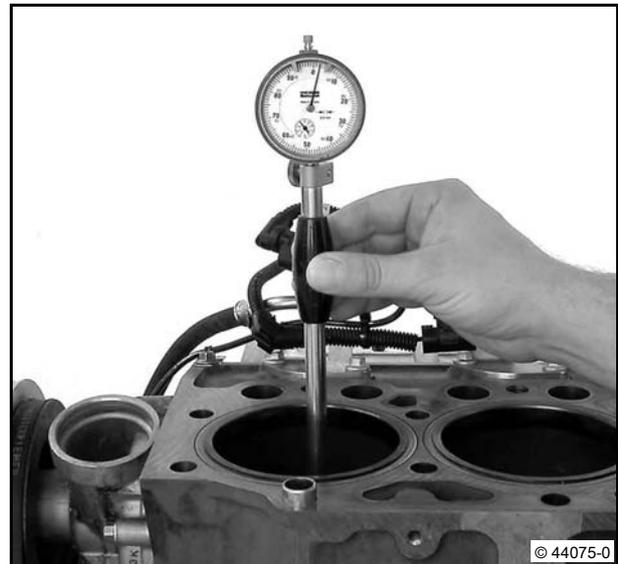
 108^{+0.02}₋₀ mm



When the wear limit is reached, the cylinder liner must be renewed.

- Remove cylinder liner.

 [W 04-01-01](#)



© 44075-0

- Visually inspect sealing surfaces (arrows).



© 44078-0

- Measure collar height in area (X) with micrometer gauge.

 $9^{+0}_{-0.02}$ mm



Measure collar height at several points.



- Install cylinder liner.

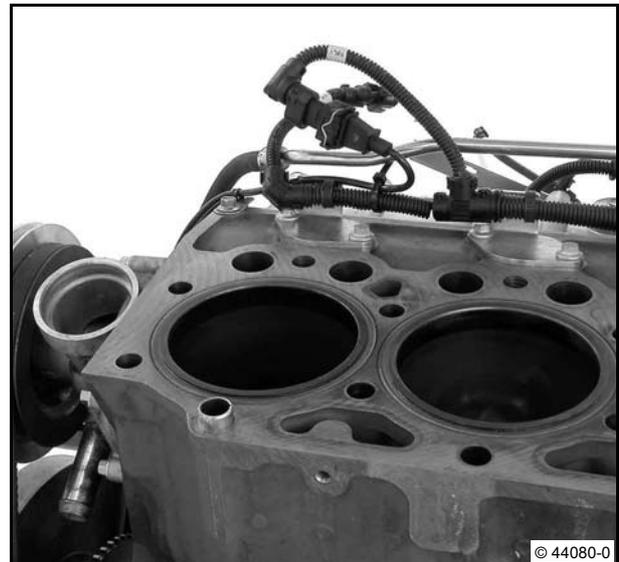
 [W 04-01-01](#)

- Install piston and connecting rod.

 [W 06-01-01](#)

- Install cylinder head.

 [W 08-03-01](#)





Removing and installing the V-belt, V-belt pulley



Standard tools:

- Feeler gauges
- V-belt tension measuring device

8115



- Locking agent DEUTZ DW 72



- Operation manual
- [W 01-03-01](#)



Attention!

Only test / tighten / renew V-belts when the engine is not running.



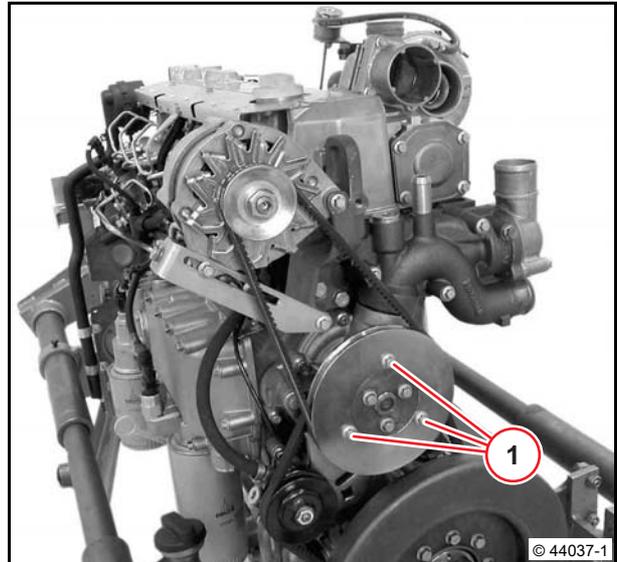
The V-belt tension of new V-belts must be checked after they have been running for 15 minutes.

Removing the V-belt, V-belt pulley

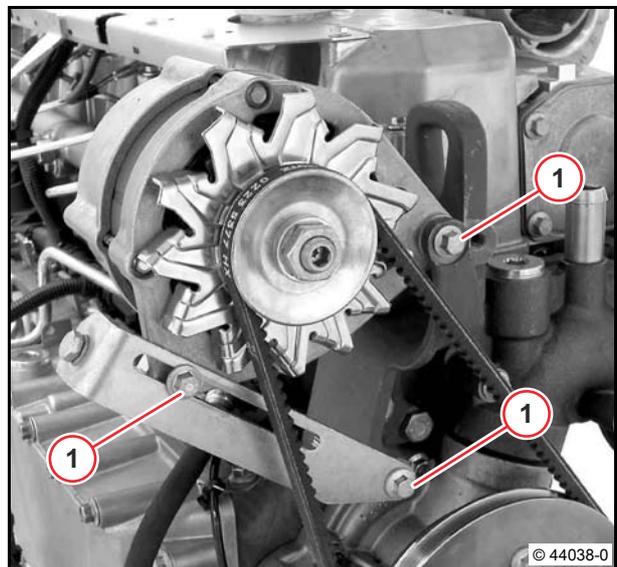
- Loosen screws (1).



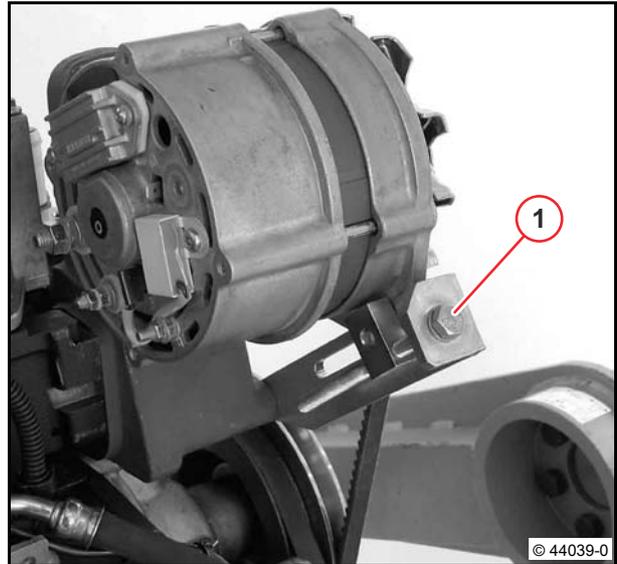
Do not unscrew screws.



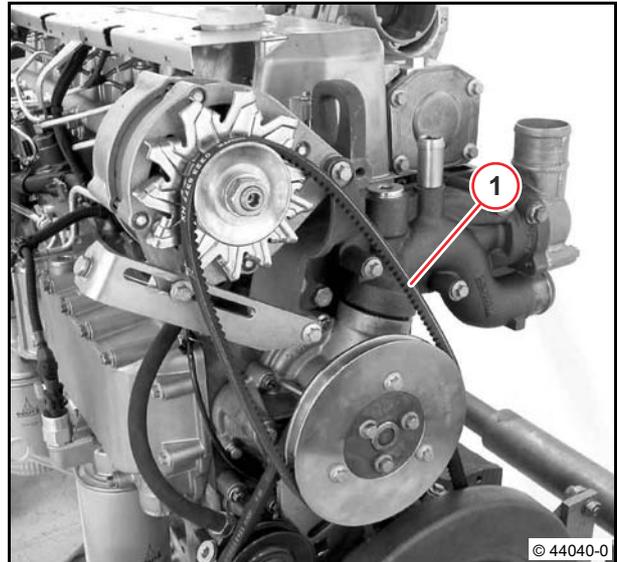
- Loosen screws (1).



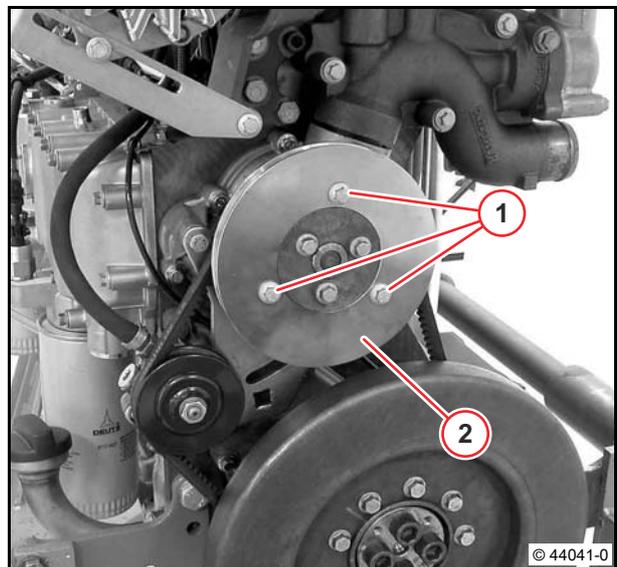
- Loosen V-belt by unscrewing the clamping screw (1).



- Remove V-belt (1).



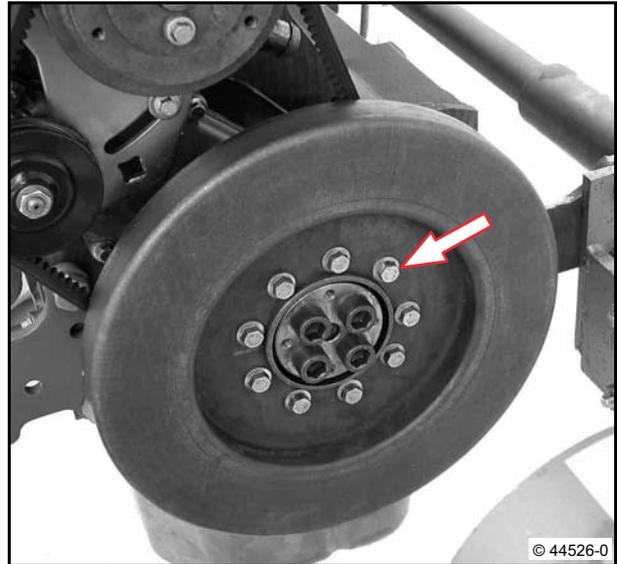
- Unscrew screws (1).
- Remove V-belt pulley (2).



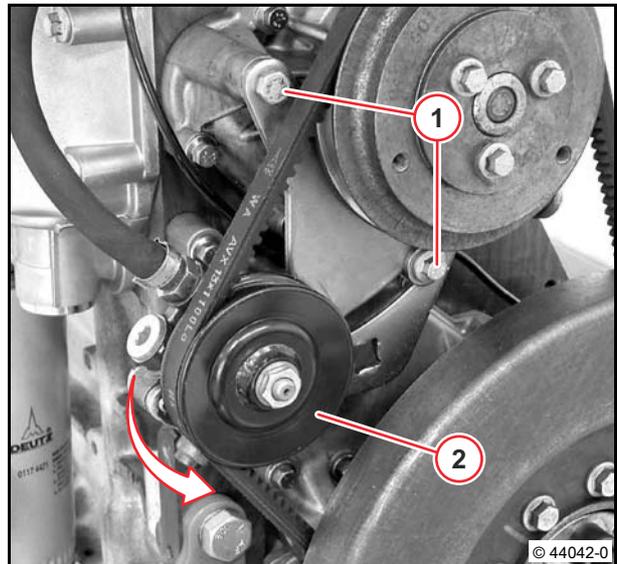
- Loosen all screws (arrow).



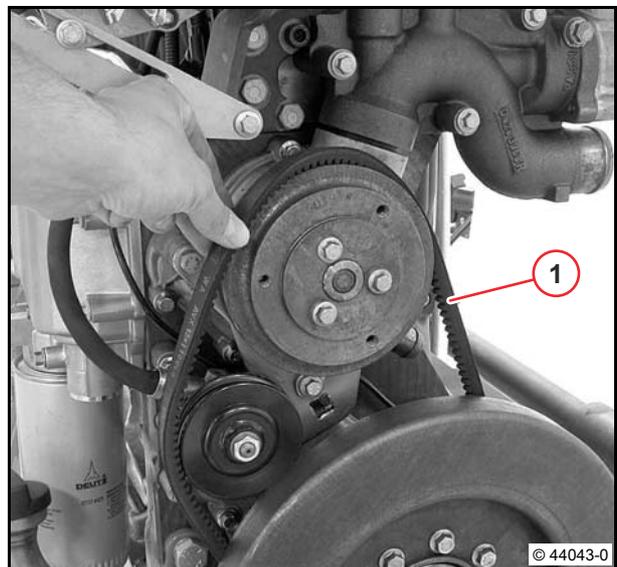
Do not unscrew screws.



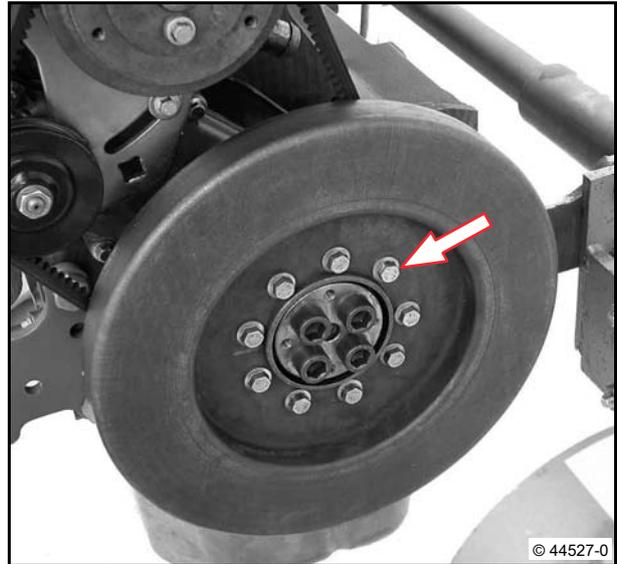
- Loosen screws (1).
- Swing the fuel supply pump (2) to the side (arrow).



- Remove V-belt (1).



- Unscrew all screws (arrow).
- Remove the torsional vibration damper.

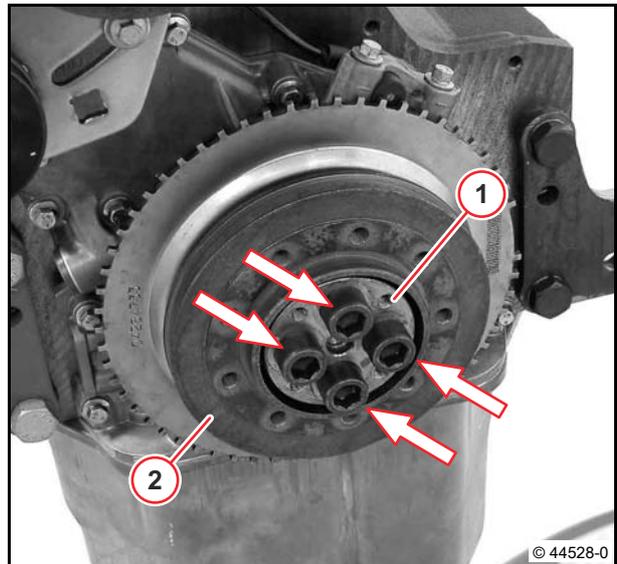


6

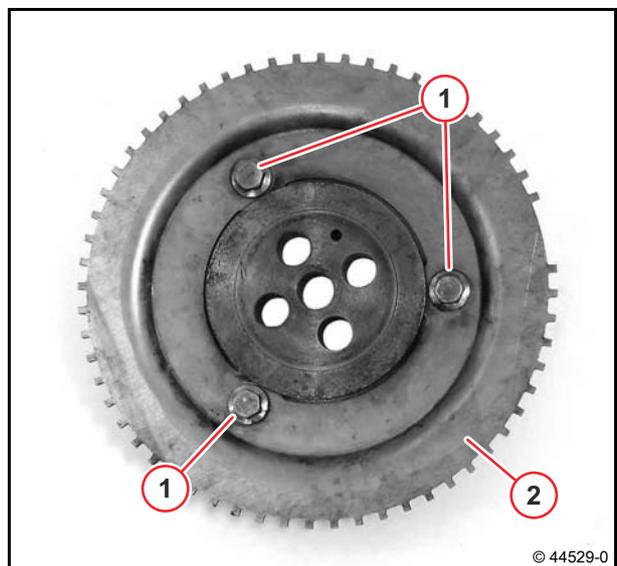
- Unscrew screws (arrows).
- Remove adapter (1).
- Remove V-belt pulley (2).



Block flywheel with suitable tool.



- Unscrew screws (1).
- Remove tooth lock washer (2).



- Visually inspect the components.



Installing the V-belt, V-belt pulley

- Make sure the clamping bushing (arrow) is in place.



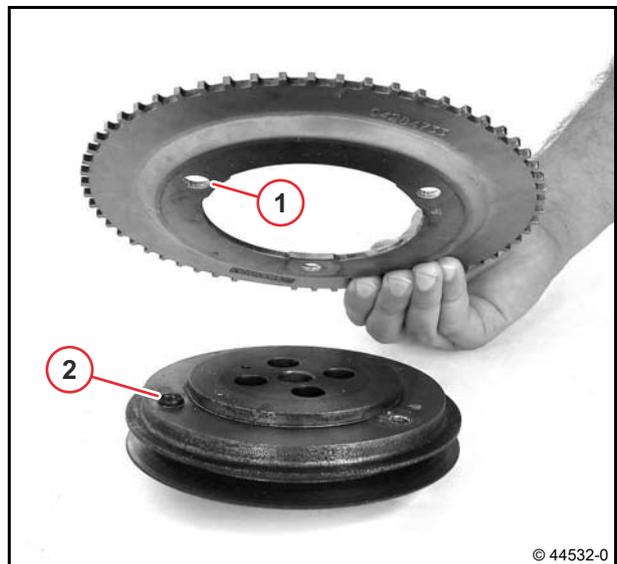
Clean the threads of the screws and holes.



- Fix the tooth lock washer with the largest hole (1) to the V-belt pulley with clamping bushing (2).



Note installation position of the tooth lock washer.

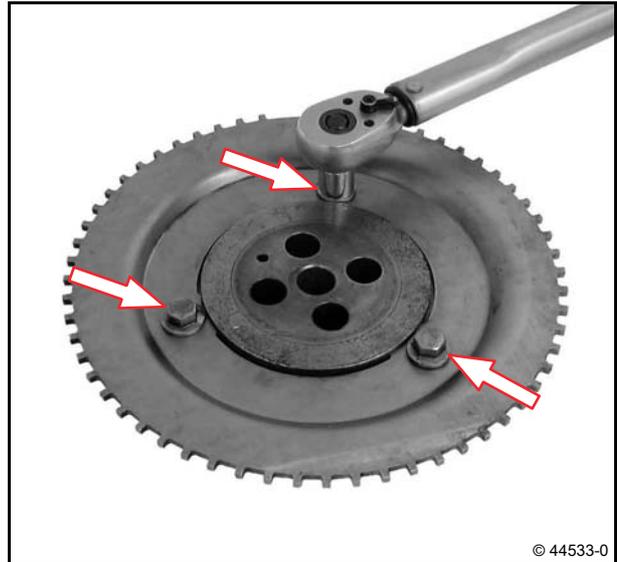


- Tighten screws (arrows).

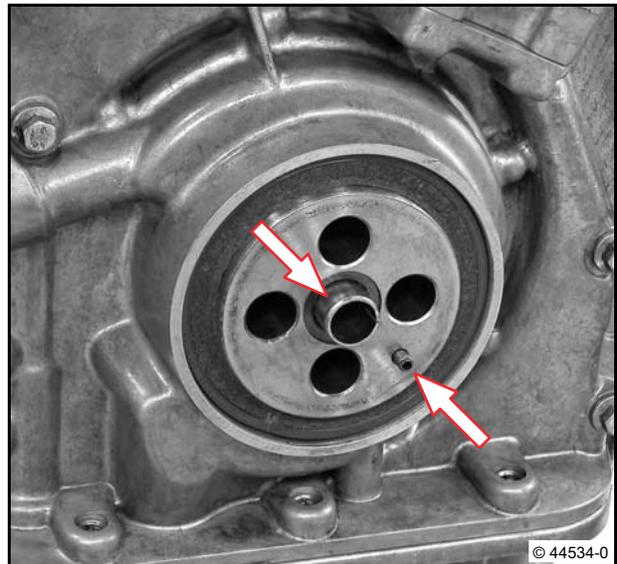
 60 Nm



Insert screw with locking agent.



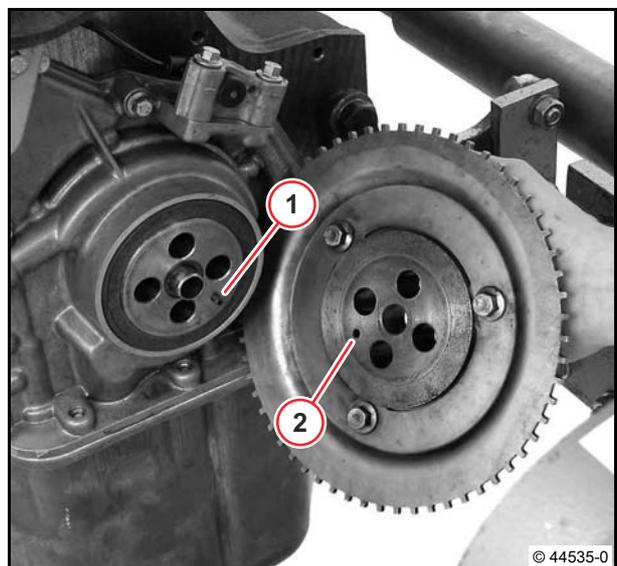
- Make sure the clamping bushings (arrows) are in place.



- Mount V-belt pulley.



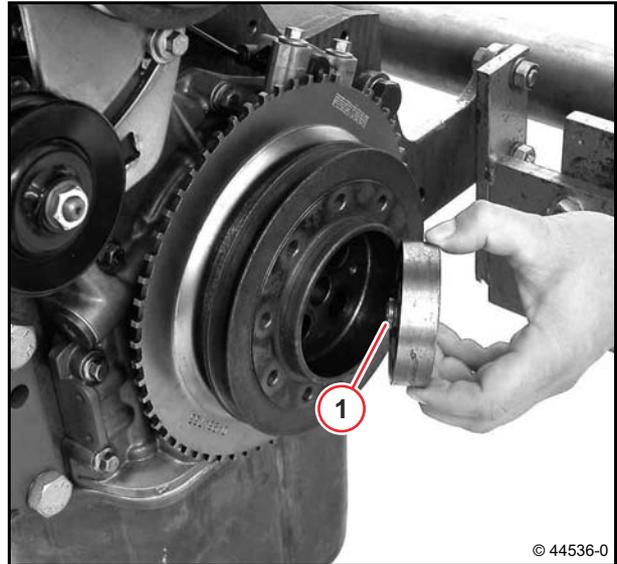
The clamping bushing (1) must grip in the hole (2).



- Mount adapter.
- Fasten screws.



The centring bolt (1) must face the V-belt pulley.



© 44536-0

- Tighten new screws (1) with rotation angle disc.

– Stage 1:

 30 Nm

– Stage 2:

 60°

– Stage 3:

 60°

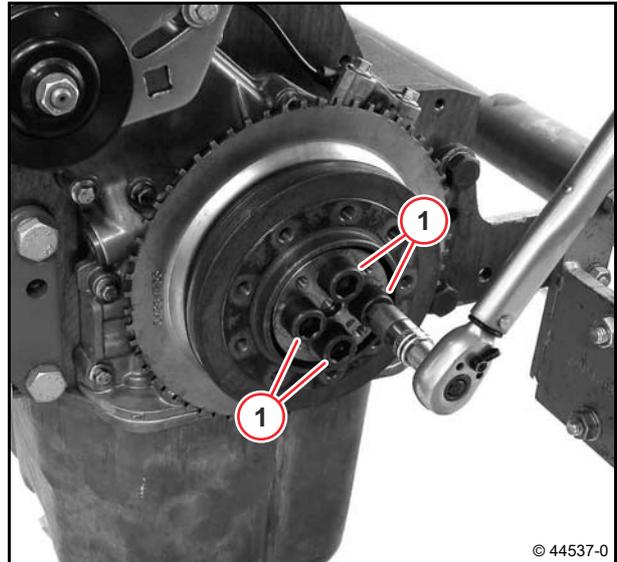


Attention!

Renew screws every time they are loosened.



Block flywheel with suitable tool.



© 44537-0

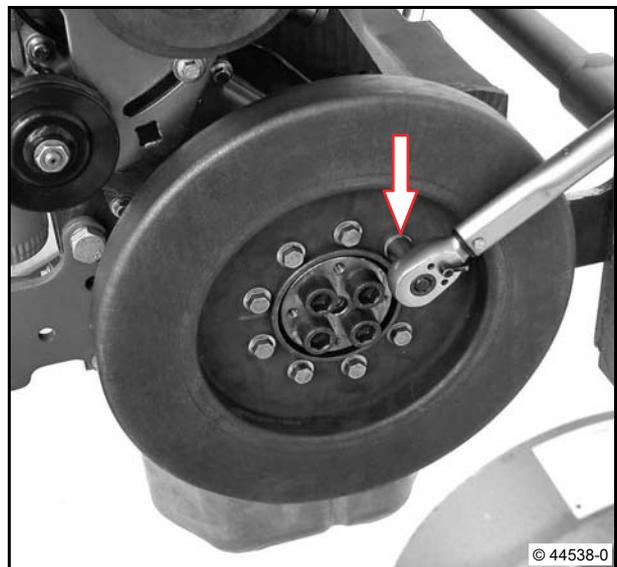
- Mount the torsional vibration damper.
- Tighten the screws (arrow) alternately.

 70 Nm



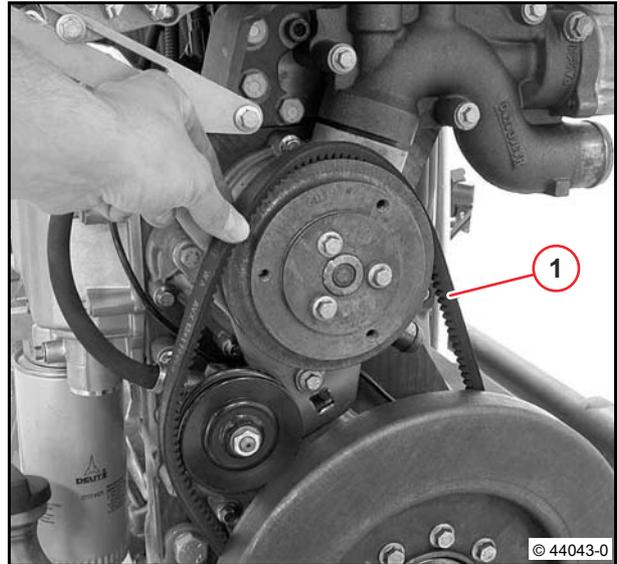
Note installation position of the torsional vibration damper.

The holes in the torsional vibration damper must match the threaded holes in the V-belt pulley.



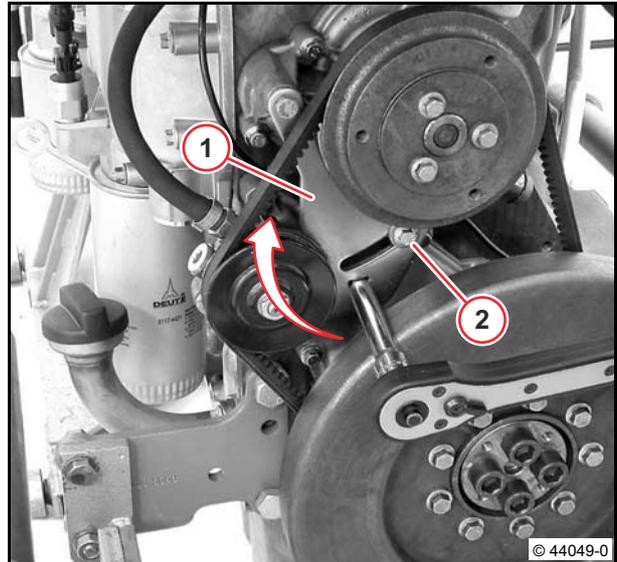
© 44538-0

- Mount V-belt (1) for coolant pump.



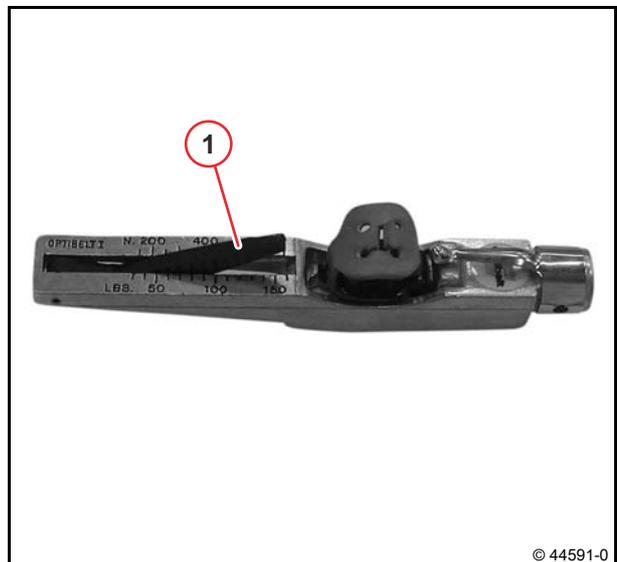
- Press clamping strap (1) in direction of arrow with a suitable tool.
- Tighten screw (2).

 30 Nm



Check V-belt tension with V-belt tension measuring device

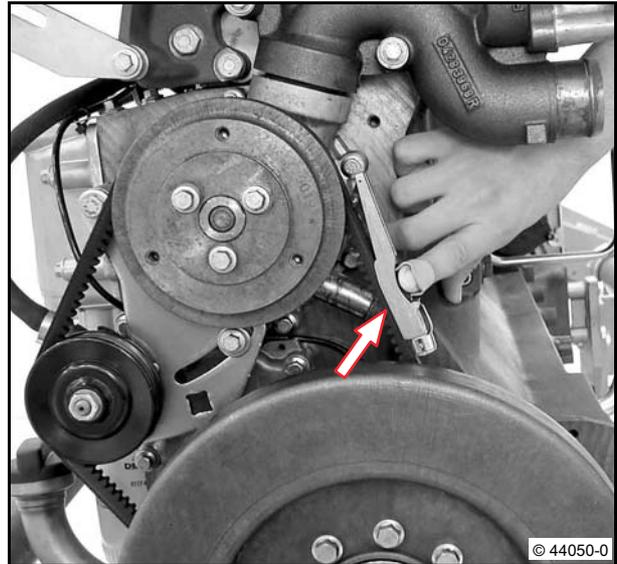
- Lower indicator arm (1) into V-belt tension measuring device.



- Mount V-belt tension measuring device on V-belt.



The V-belt must be between the guides (arrow).



6

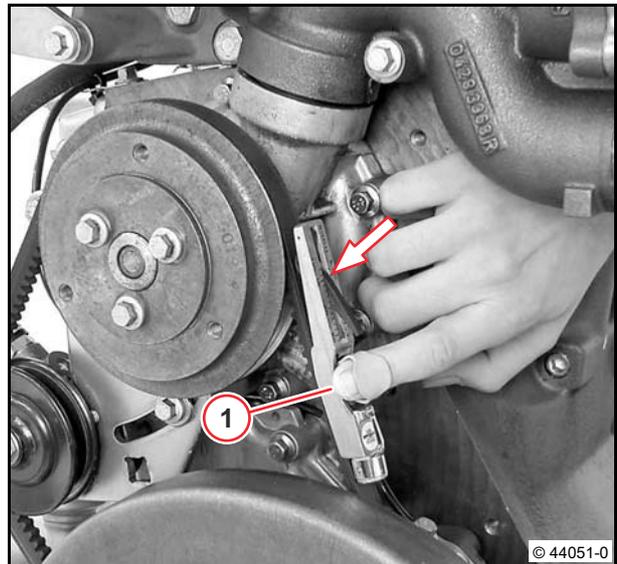
- Press the V-belt measuring device against the V-belt with the button (1) until you hear it click.
- Read measured value at the intersection (arrow) of the indicator arm and scale.

 Operation manual



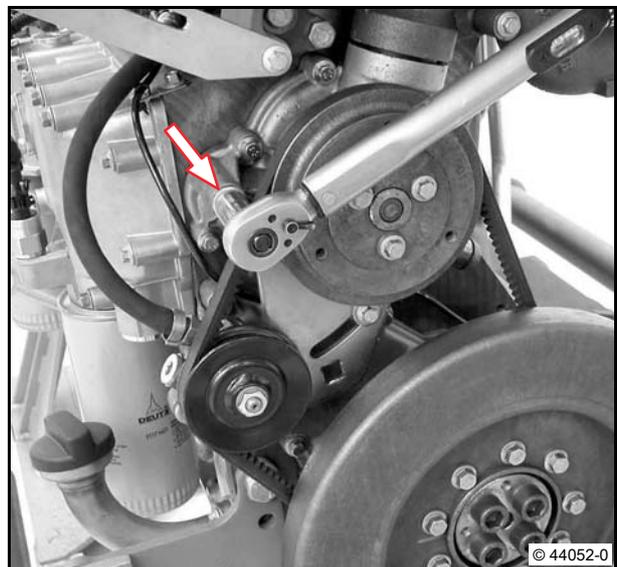
Note different units on the scale.

- If the nominal value is not reached, the tensioning process must be repeated.

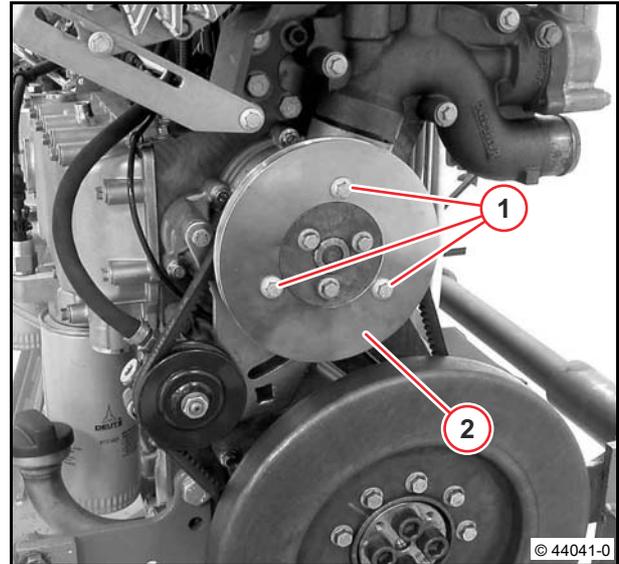


- Tighten screw (arrow).

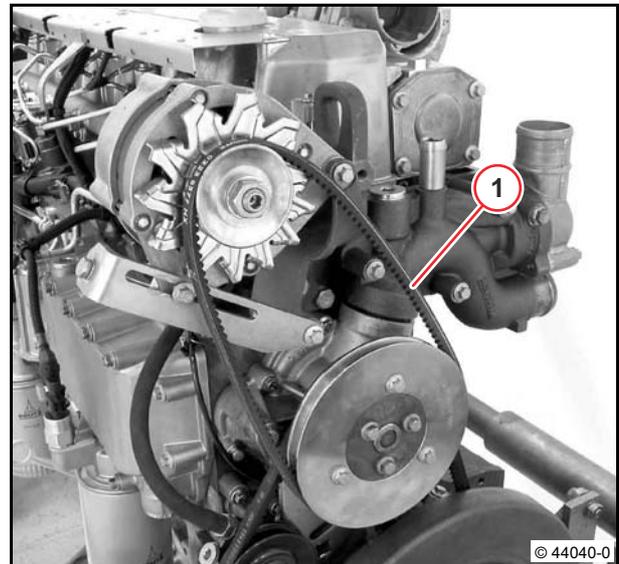
 30 Nm



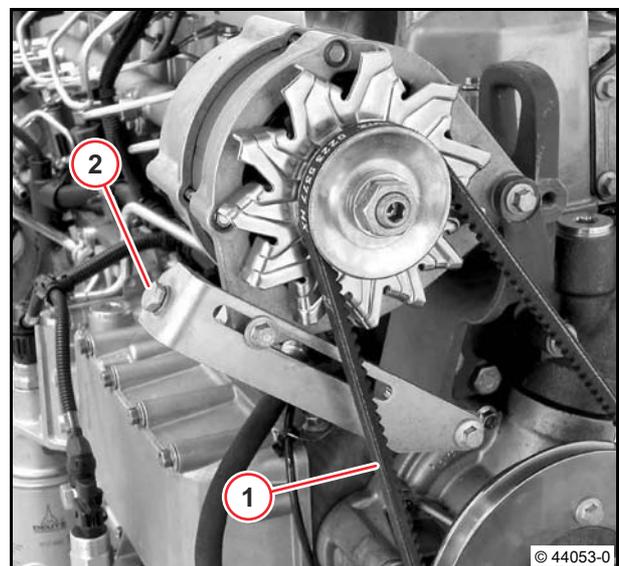
- Mount V-belt pulley (2).
- Tighten screws (1).



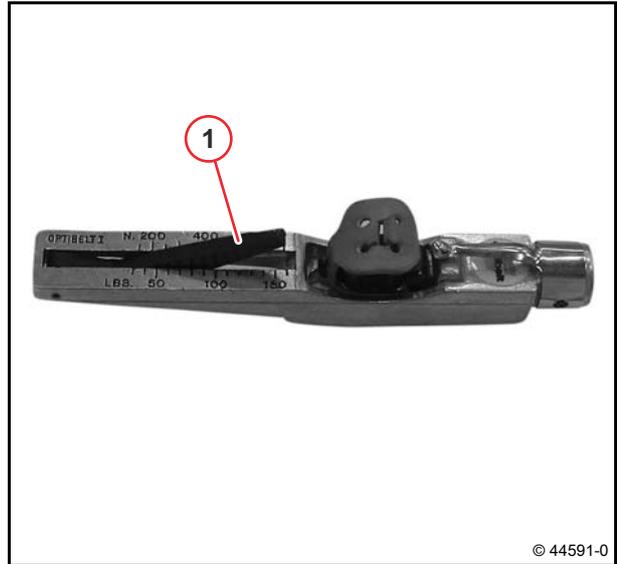
- Mount V-belt (1) for generator.



- Tighten V-belt (1) by turning the clamping screw (2).



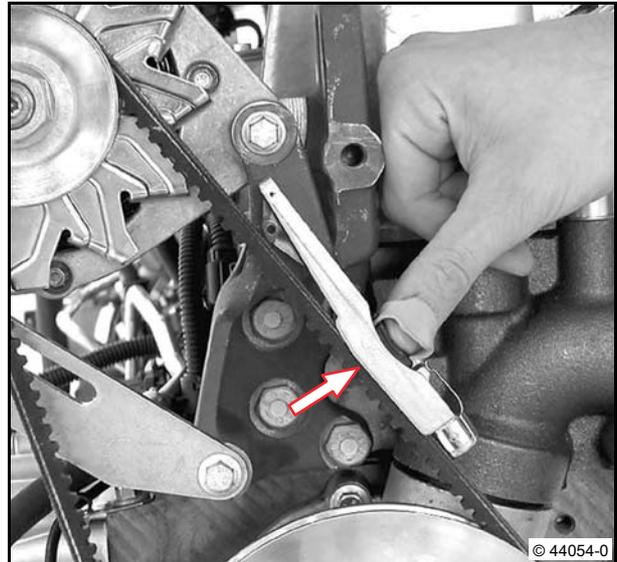
- Lower indicator arm (1) into V-belt tension measuring device.



- Mount V-belt tension measuring device on V-belt.



The V-belt must be between the guides (arrow).



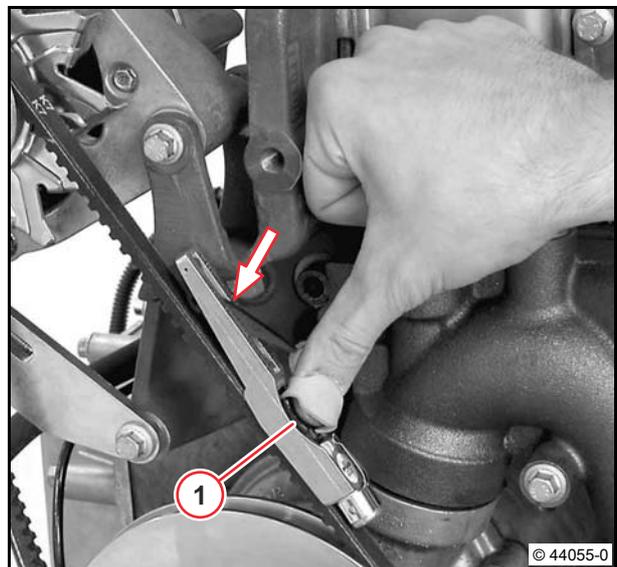
- Press the V-belt measuring device against the V-belt with the button (1) until you hear it click.
- Read measured value at the intersection (arrow) of the indicator arm and scale.

Operation manual



Note different units on the scale.

- If the nominal value is not reached, the tensioning process must be repeated.



- Tighten screw (1).

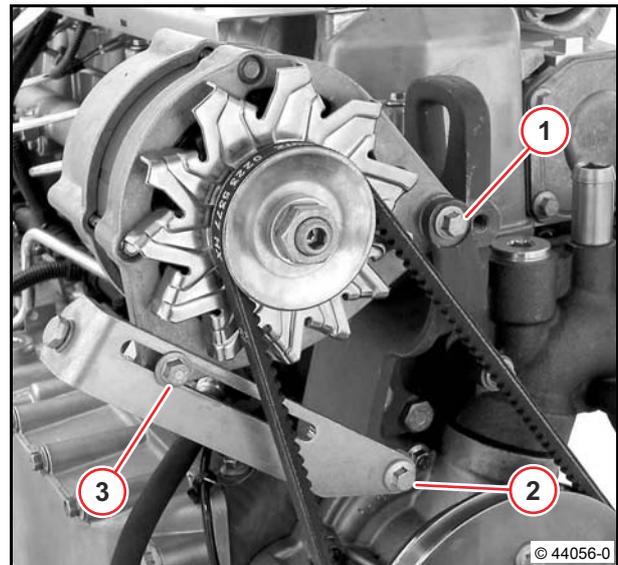
 30 Nm

- Tighten screw (2).

 30 Nm

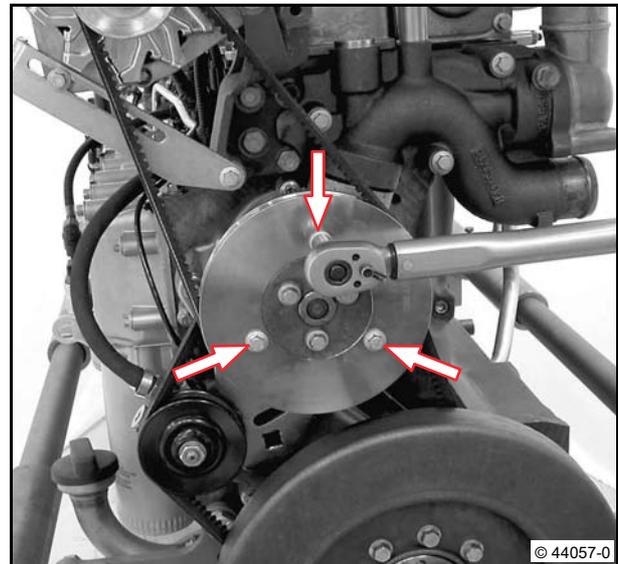
- Tighten screw (3).

 30 Nm



- Tighten screws (arrows).

 30 Nm



Set gap dimension for impulse transmitter (crankshaft).

- Check gap dimension with feeler gauge blade.

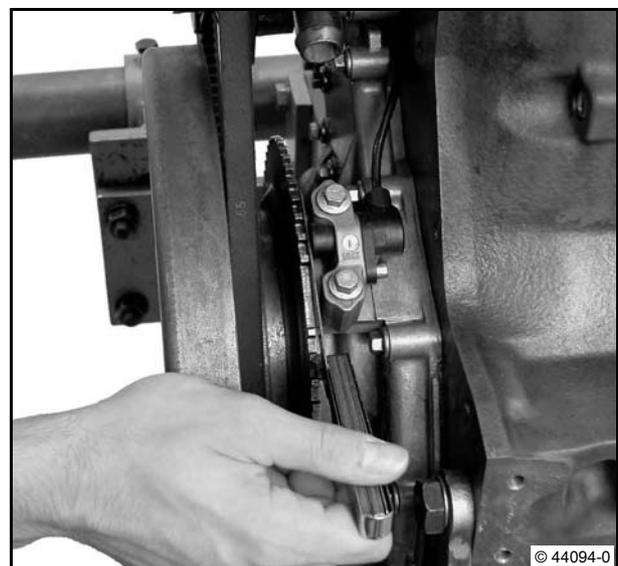
 0,6^{+0.1}_{-0.1} mm



The feeler gauge blade must fit between the tooth lock washer and impulse transmitter (crankshaft) with low resistance.

- Set gap dimension for speed governor (crankshaft).

 [W 01-03-01](#)



Removing and installing torsional vibration damper (V-belt drive)

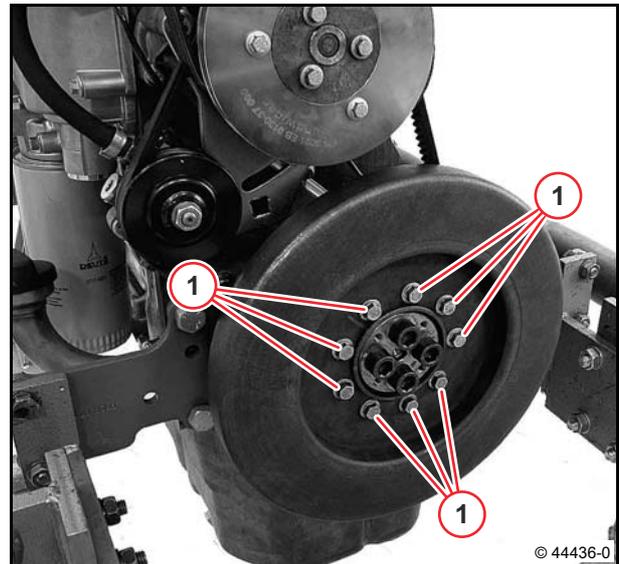


Standard tools

6

Removing the torsional vibration damper

- Unscrew all screws (1).
- Remove the torsional vibration damper.
- Visually inspect the components.



Installing the torsional vibration damper

- Mount the torsional vibration damper.



Note installation position.

The holes in the torsional vibration damper must match the threaded holes in the V-belt pulley.



Attention!

The following new screws without washers must be used when the torsional vibration damper is removed or changed.

See the spare parts documentation.

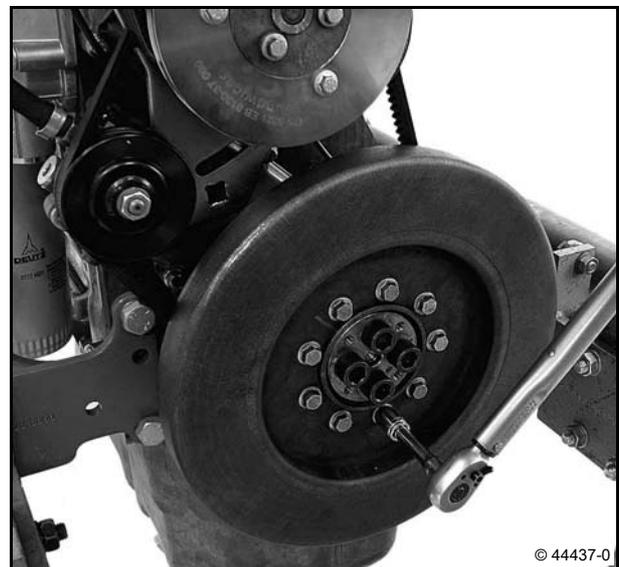
M10x20-12.9

- without washer

- Tighten screws alternately.



70 Nm





Removing and installing the flywheel



Standard tools:

- Rotation angle disc 8190
- Guide pin (self-constructed)

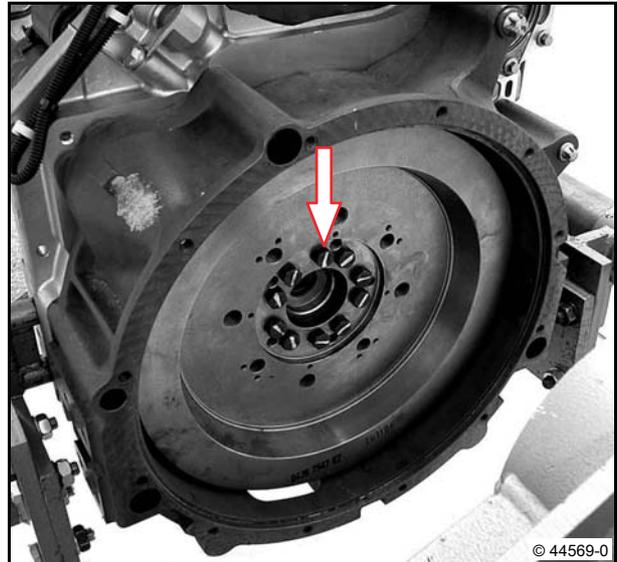
Removing the flywheel

- Unscrew all screws (arrow).



Block flywheel with suitable tool.

- Remove flywheel.

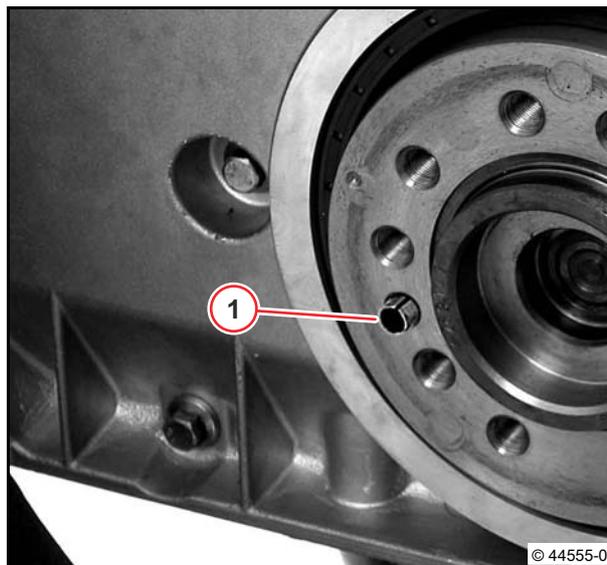


- Visually inspect the components.



Installing the flywheel

- Insert clamping bushing (1).



- Insert self-made guide pin (arrow).

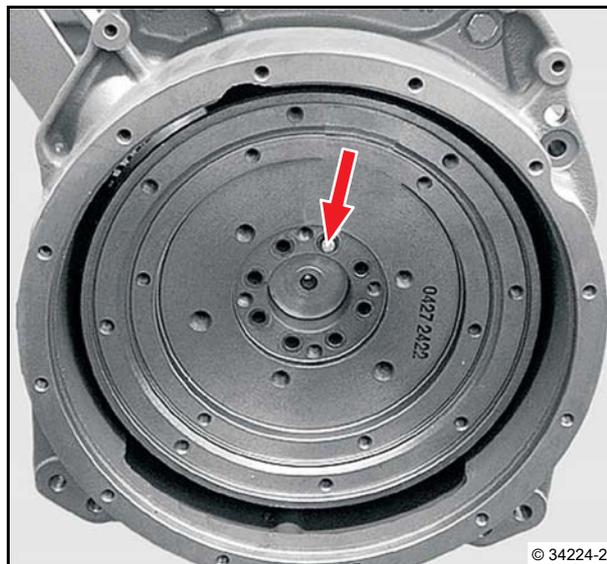


For example a pin bolt.

- Mount flywheel.



The bores in the flywheel must match the threaded bores in the crankshaft flange.

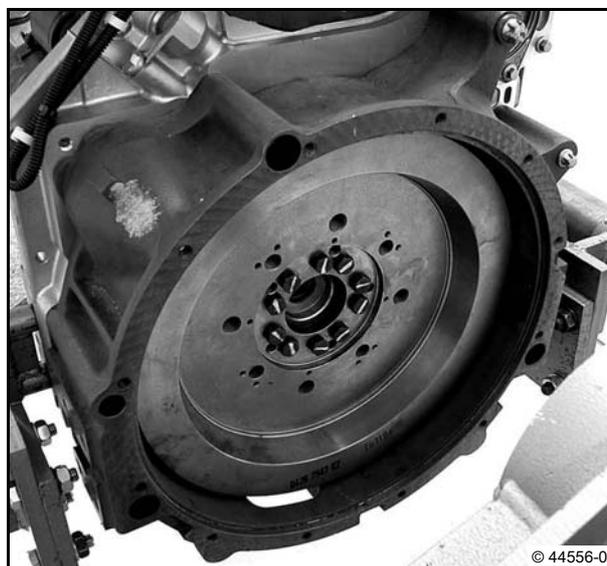


- Fasten screws.



Attention!
Use new screws.

- Remove guide pin.



M10x35 - M10x85

• Tighten screws .

– Stage 1:

30 Nm

– Stage 2:

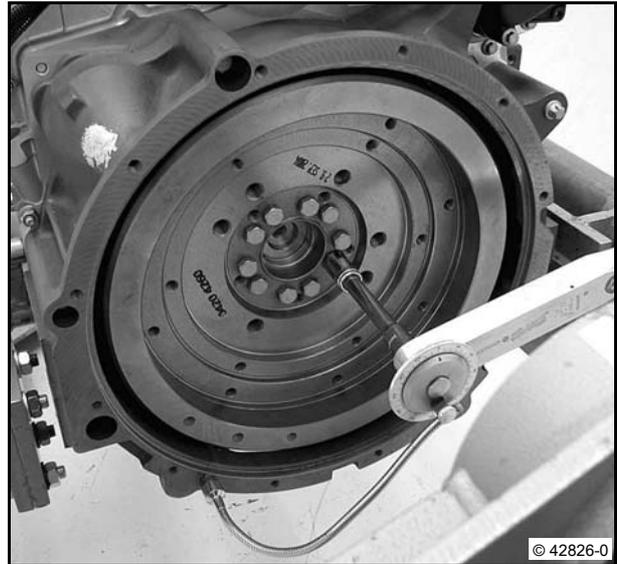
60°

– Stage 3:

60°



Block flywheel with suitable tool.



M10x30

• Tighten screws .

– Stage 1:

30 Nm

– Stage 2:

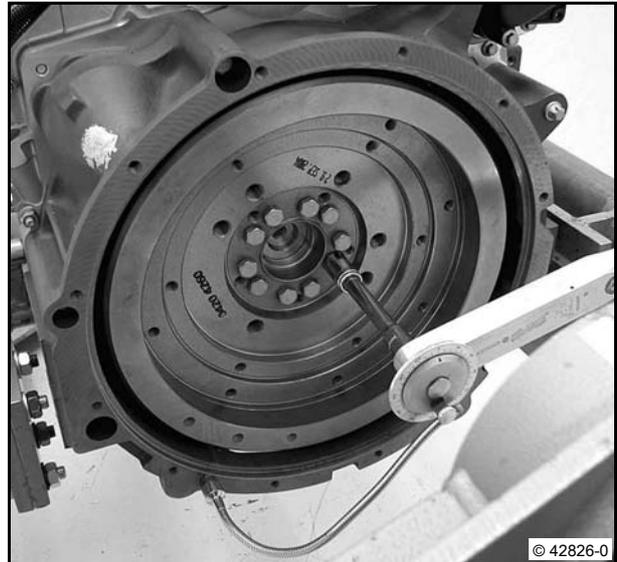
60°

– Stage 3:

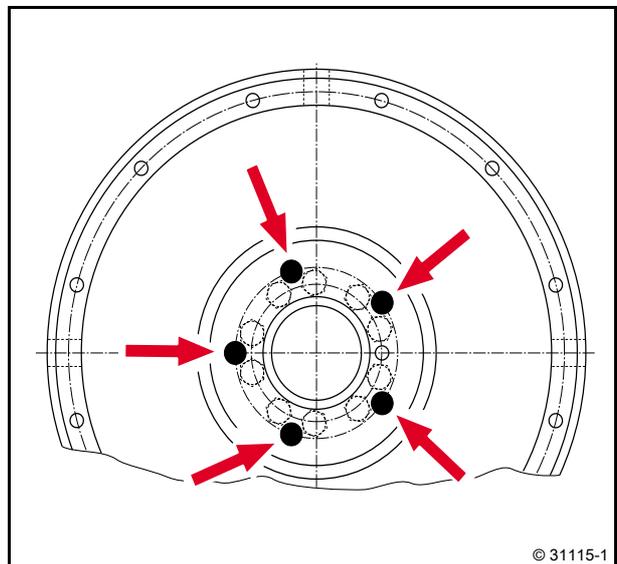
30°



Block flywheel with suitable tool.



- Drive plugs into the threaded bores (arrows) to the stop.





Removing and installing the crankshaft



Standard tools:

– Socket wrench insert 8035

Special tools:

– Turn-over gear 100380



– W 01-03-01

– W 05-05-03

– W 09-02-02

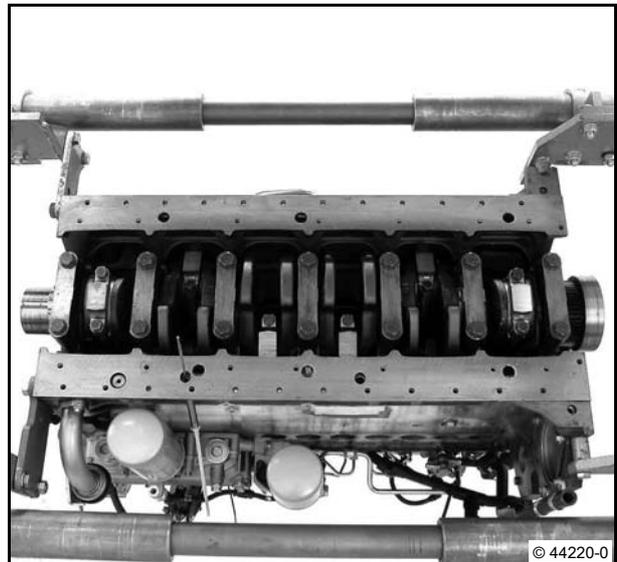
Removing crankshaft

- Remove front cover (opposite side to flywheel).

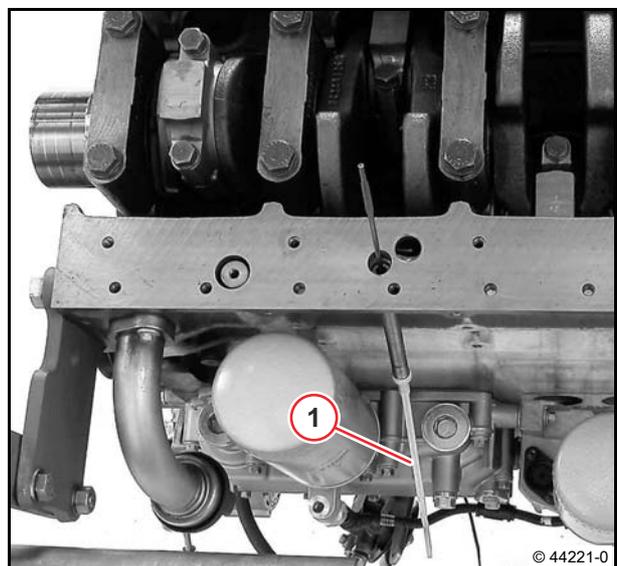
 W 01-03-01

- Remove the gear case cover (flywheel side).

 W 09-02-02

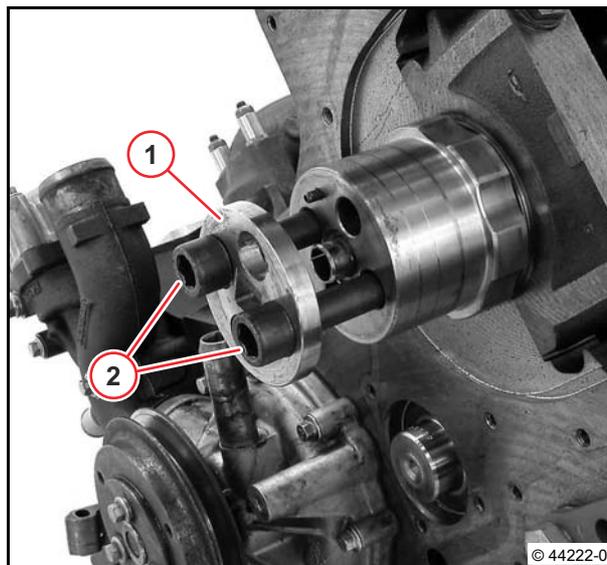


- Pull out oil dipstick (1).



Removing the big end bearing cap

- Insert turn-over gear (1).
- Tighten screws (2).

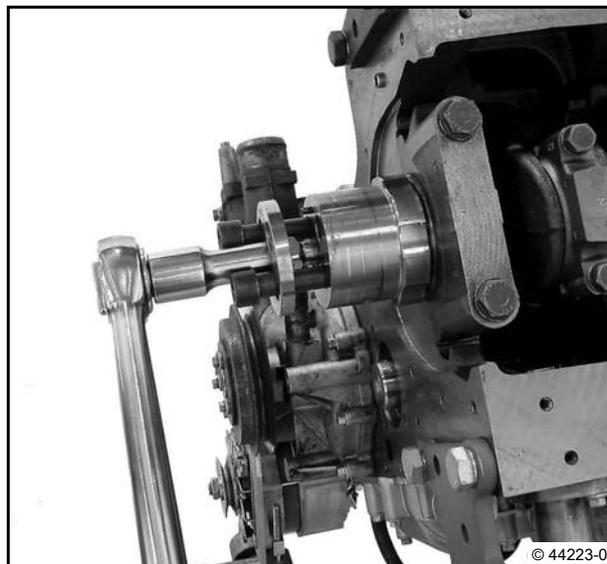


- Place lifting journal of the respective cylinder at bottom dead centre (BDC).



Attention!

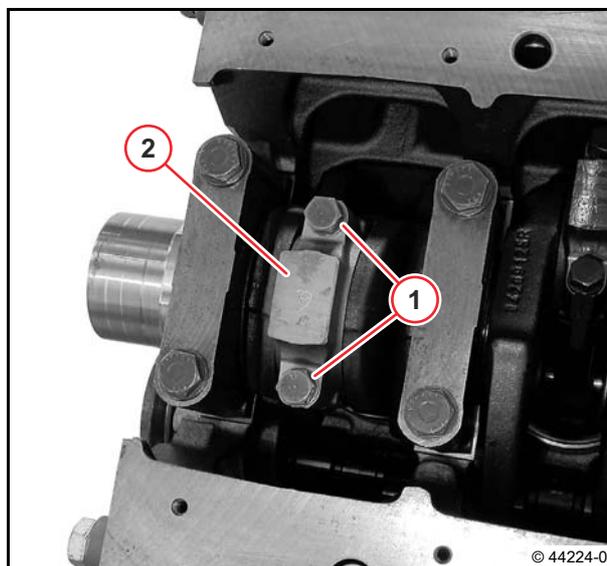
Do not jam the con rods when turning the crankshaft.



- Unscrew screws (1).
- Remove big end bearing cap (2).
- Remove bearing shell.



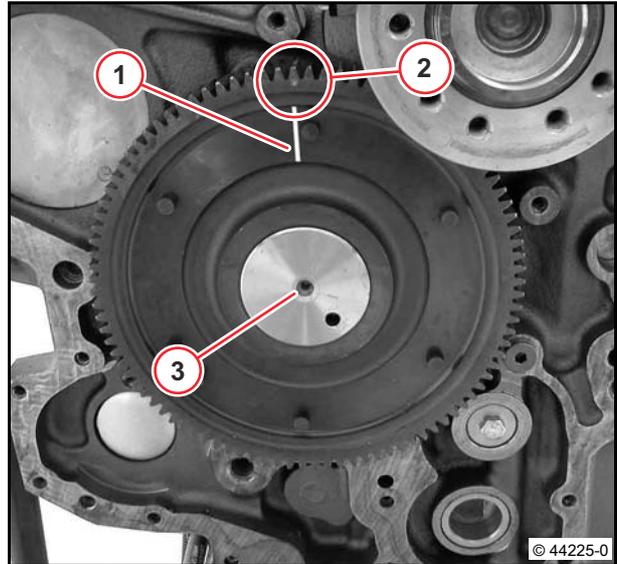
Lay out components in the order in which they should be installed.
Note order of cylinders.



- Make a mark (1) on the camshaft gear wheel for assistance.



Your mark must be on a line between the marking (2) and the middle (3) of the camshaft.



- Turn the crankshaft evenly until the marking (1) on the crankshaft flange is in line with your mark (2) on the camshaft gear wheel.

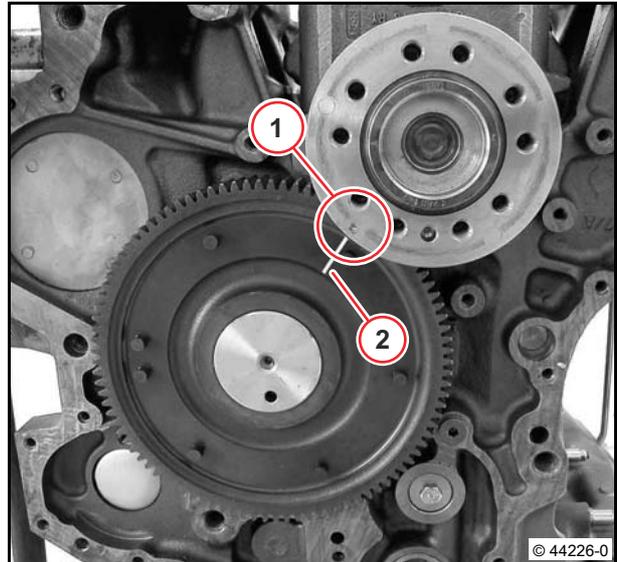


The marking on the camshaft gear wheel is covered by the crankshaft flange when it is in line.



Attention!

Do not jam the con rods when turning the crankshaft.

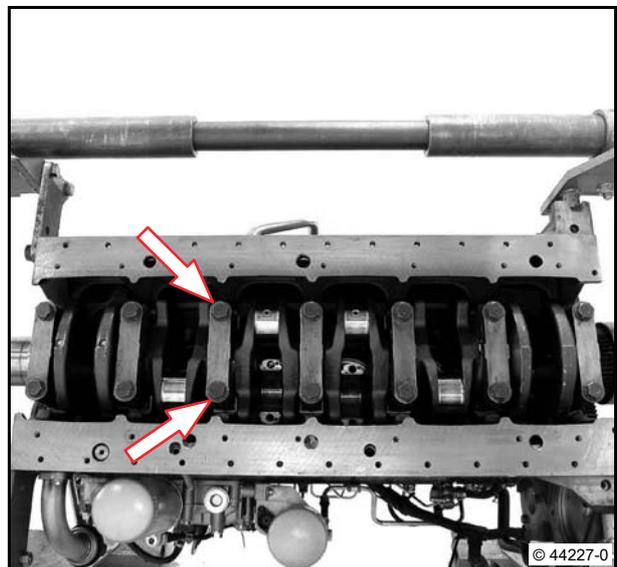


Removing the main bearing cover

- Unscrew all screws (arrow).



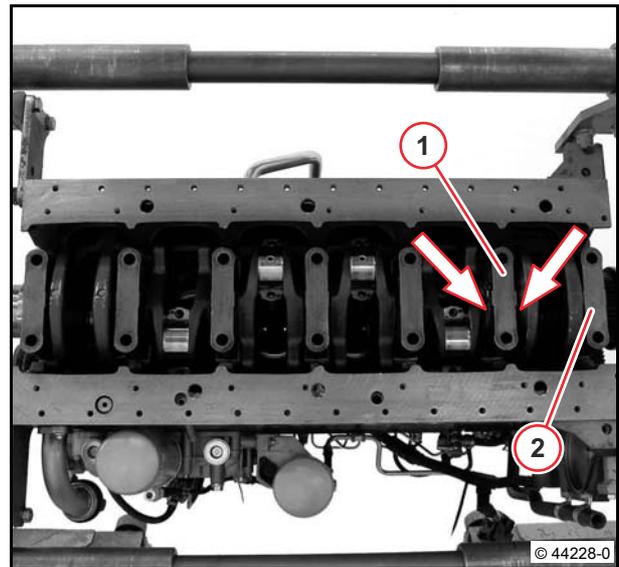
Use socket wrench insert.



- Remove bearing cap (1).
- Remove bearing shell.
- Remove both thrust ring halves (arrows).
- Remove all main bearing covers (2).
- Remove bearing shells.

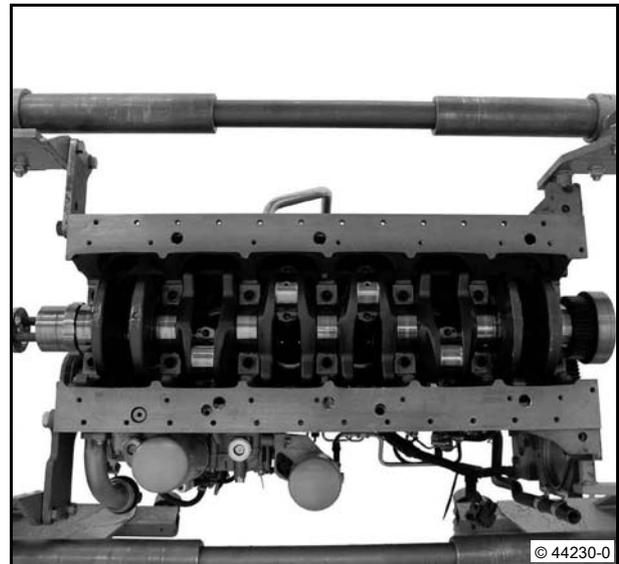


Lay out components in the order in which they should be installed.
Note order of cylinders.



6

- Press the con rods carefully out of the lifting journal.
- Lift out the crankshaft.



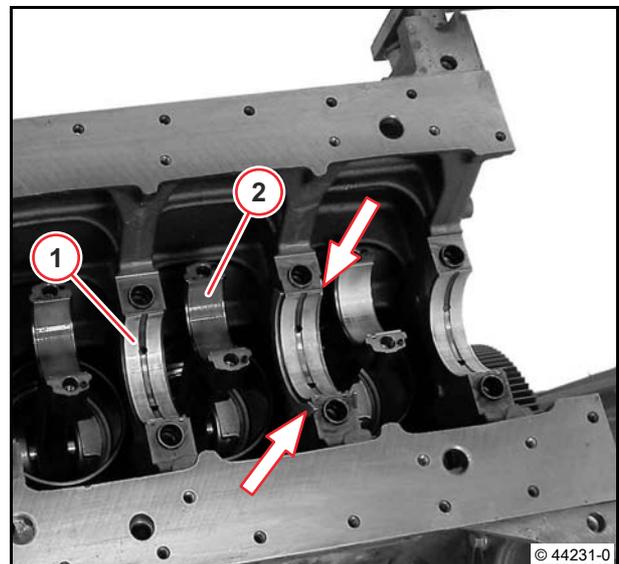
- Remove both thrust ring halves (arrows).
- Remove bearing shells (1) and (2).



Lay out components in the order in which they should be installed.
Note order of cylinders.

- Visually inspect the components.
- Check axial backlash of crankshaft (crankshaft removed).

W 05-05-03

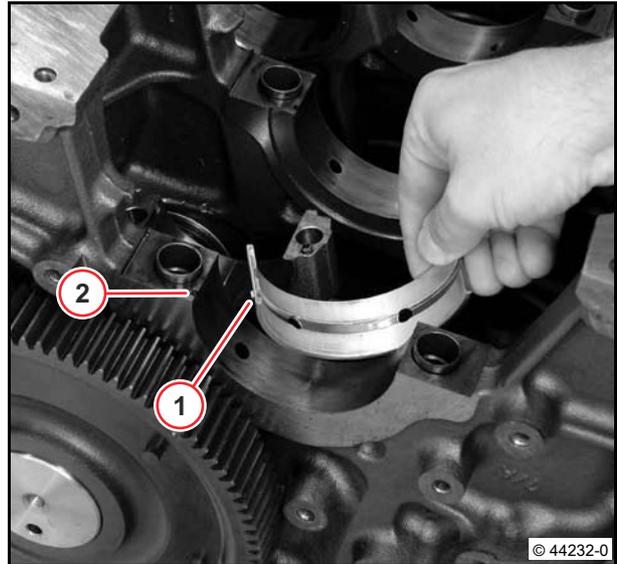


Installing the crankshaft

- Insert upper main bearing shells.



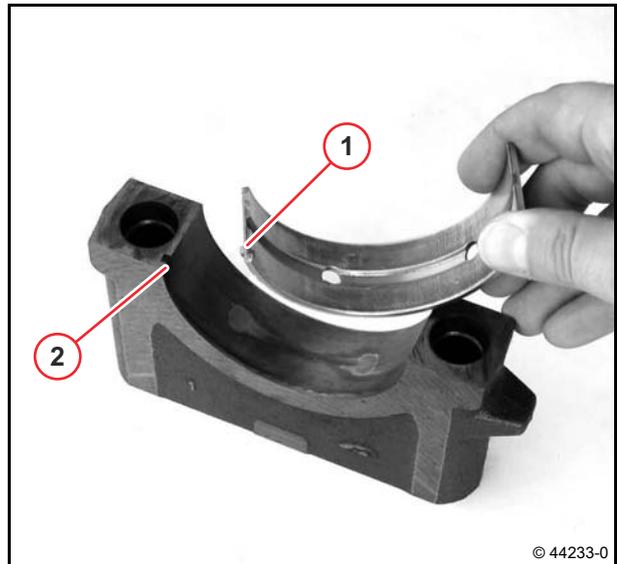
Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



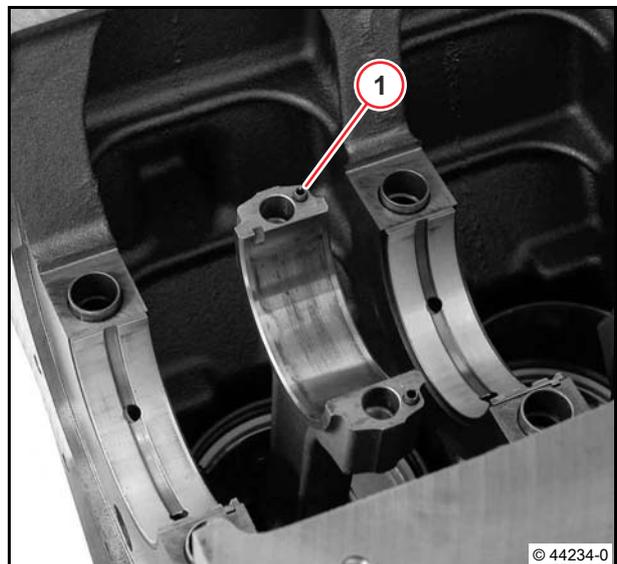
- Insert lower main bearing shells in the respective main bearing cover.



Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



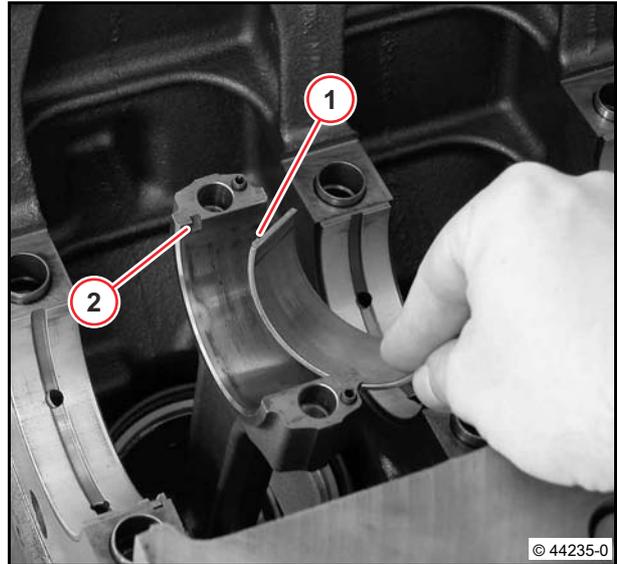
Make sure the clamping bushings (1) are in place.



- Insert bearing shell in the con rod.



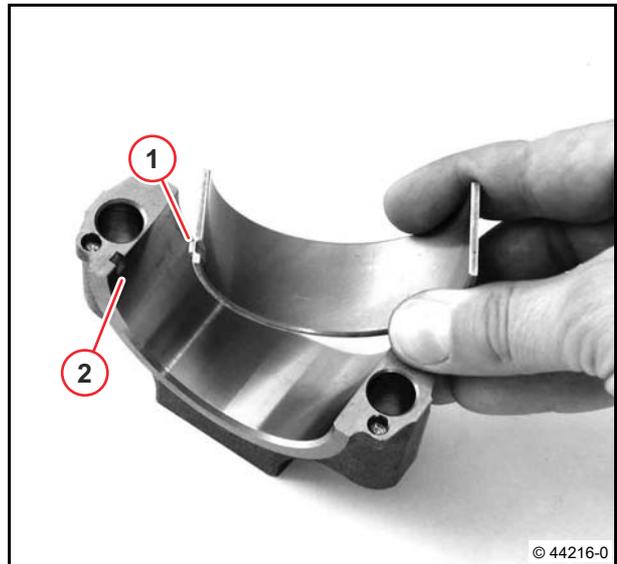
Note the assignment of the bearing shells.
The anti-rotation lock (1) must lock in
groove (2).



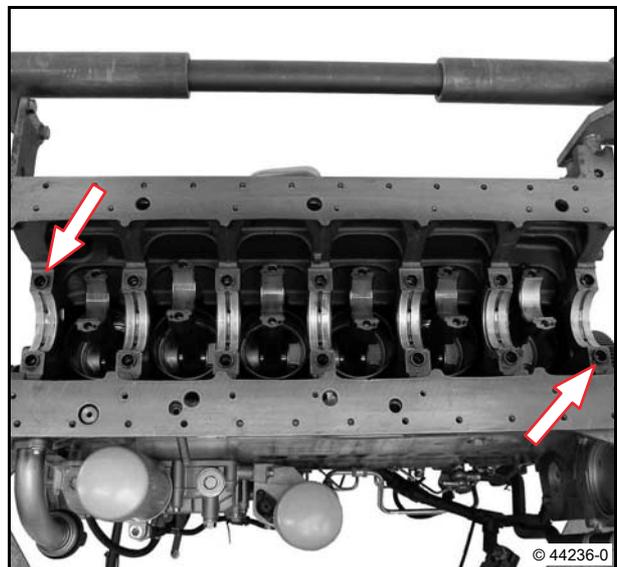
- Insert bearing shell in the respective big end bearing cap.



Note the assignment of the bearing shells.
The anti-rotation lock (1) must lock in
groove (2).



Make sure the clamping bushings (arrows)
are in place.

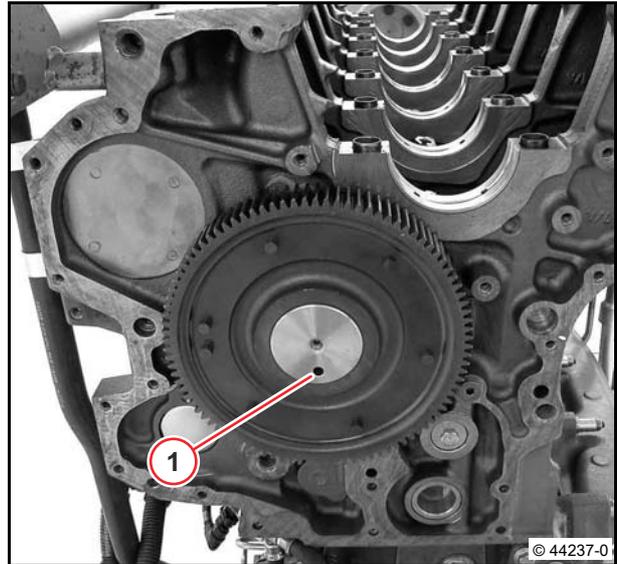


- Position camshaft.



The bore (1) must be facing the cylinder head.

- Lightly oil bearing surfaces.



- Insert the crankshaft carefully in the crankcase.



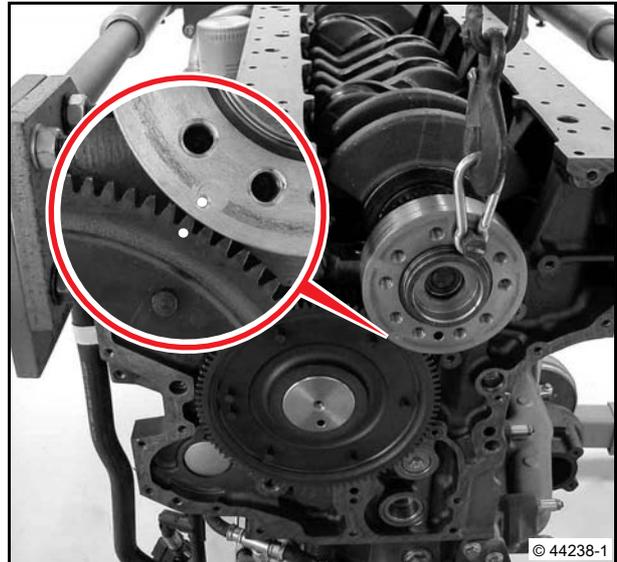
Attention!

Do not jam the con rods when inserting the crankshaft!

- Set the crankshaft in line with the camshaft.



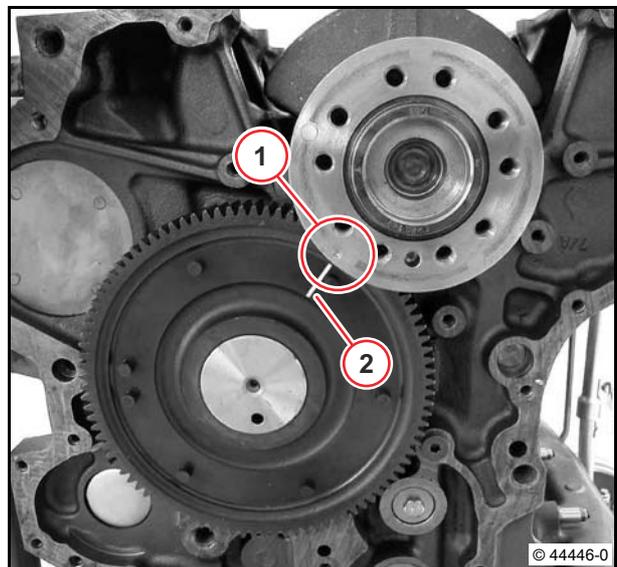
Make sure that the markings match up.



- Check control times.



The marking (1) on the crankshaft flange must be in line with your mark (2).

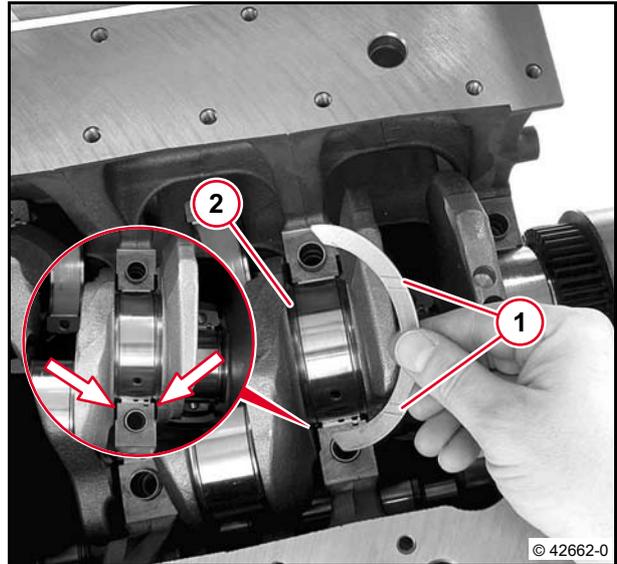


- Install upper thrust ring halves according to measured axial clearance.



Thrust ring halves, without guide lugs, between the crankshaft and the crankcase (arrows).

Oil grooves (1) of the thrust ring halves face the web face (2) of the crankshaft (arrows)



6

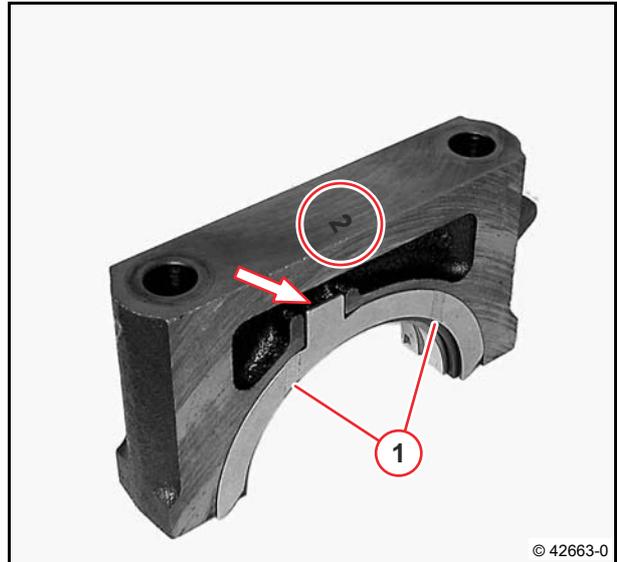
- Fix both thrust ring halves with a little grease to the bearing cap.



Bearing cap with identification "2".

Use thrust ring halves with guide lug (arrow).

Oil grooves (1) face the crankshaft web face.



Mounting the main bearing cover

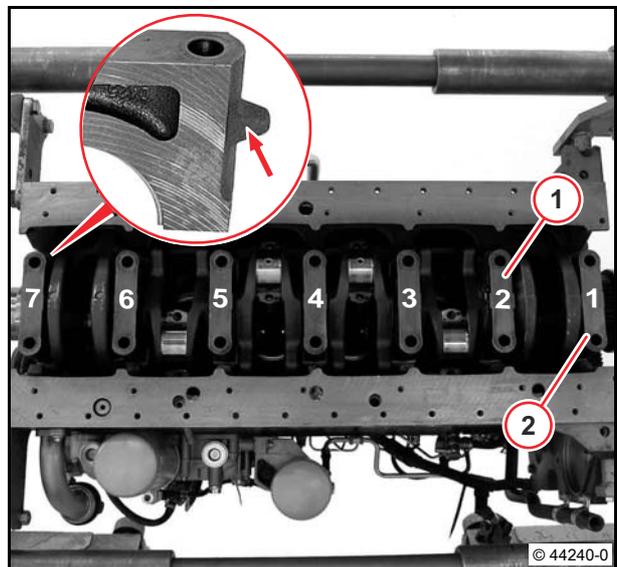
- Insert bearing cap (1).
- Insert main bearing cover (2) according to the numbering.



Note assignment and installation position:

Insert main bearing cover with the number 1 on the flywheel side.

Gate (arrow) on the bearing cover faces the manifold side.





Attention!

Screws can be used a maximum 3 times with written documentation.



Use socket wrench insert.

- Tighten all screws (1) of the main and fit bearing covers.

- Stage 1:

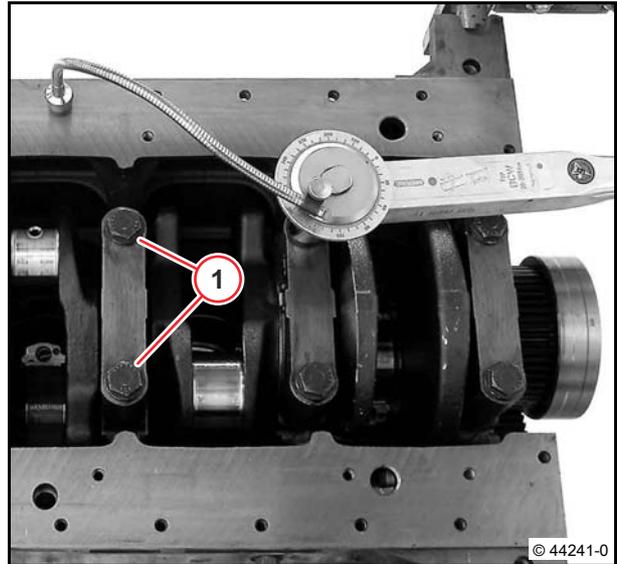
- 50 Nm

- Stage 2:

- 60°

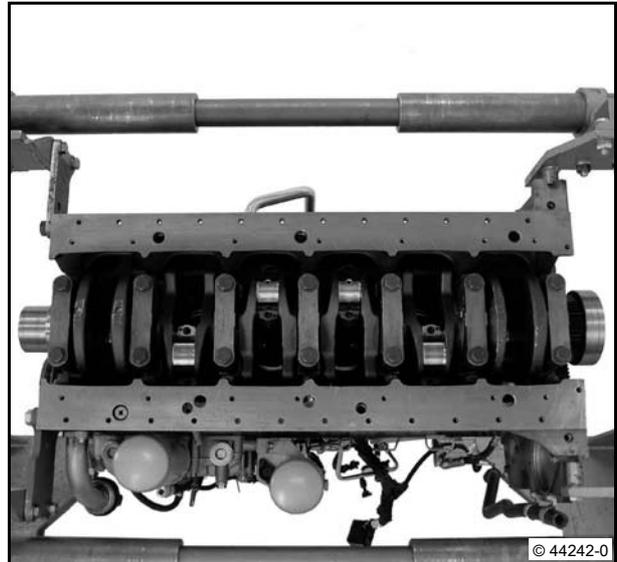
- Stage 3:

- 60°



Installing the big end bearing cap

- Pull con rods carefully on to the lifting journal.

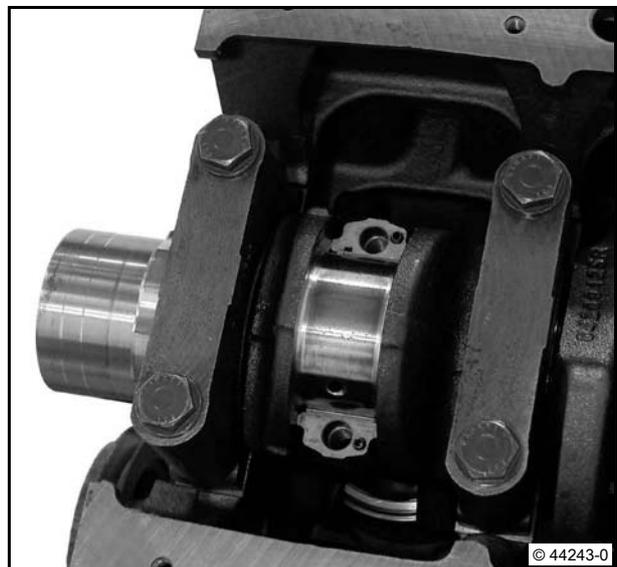


- Place lifting journal of the respective cylinder at bottom dead centre (BDC).



Attention!

Do not jam the con rods when turning the crankshaft.



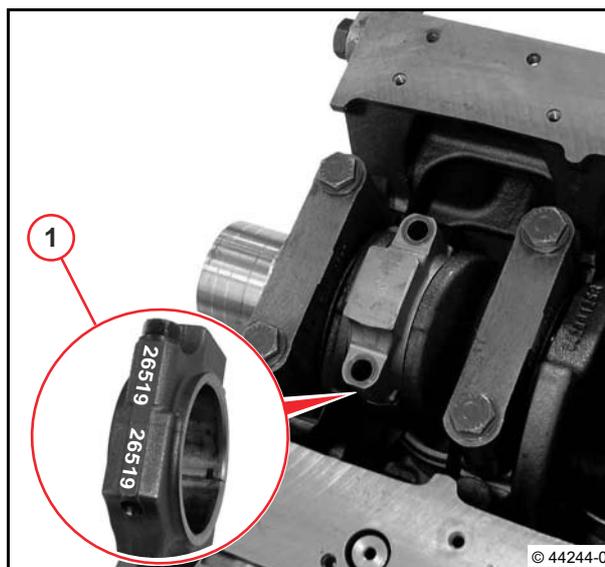
- Mount big end bearing cap.



Attention!

Note the assignment of the big end bearing cap.

The identification numbers (1) on the con rod and the big end bearing cap must be identical and opposite to each other when assembled.



- Tighten new screws with rotation angle disc.

– Stage 1:

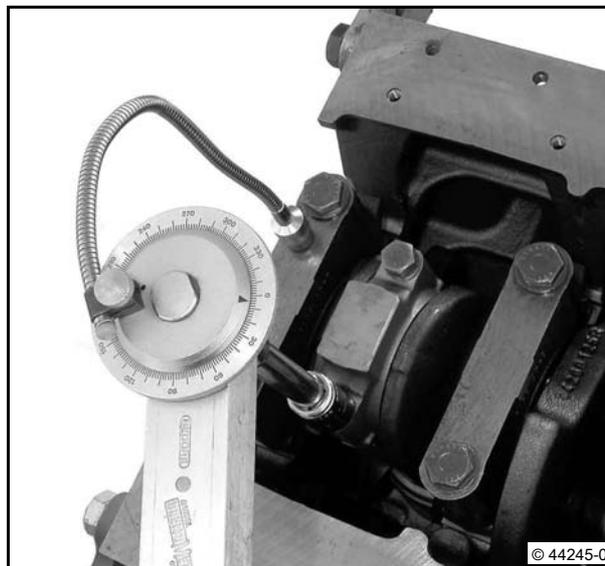
 30 Nm

– Stage 2:

 60°

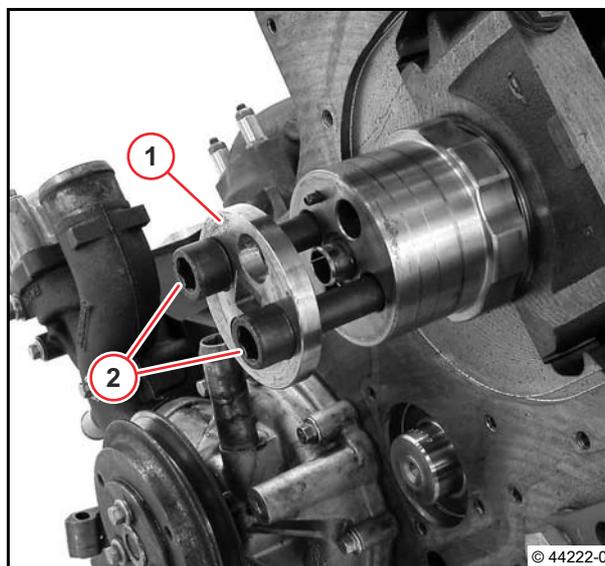
– Stage 3:

 60°

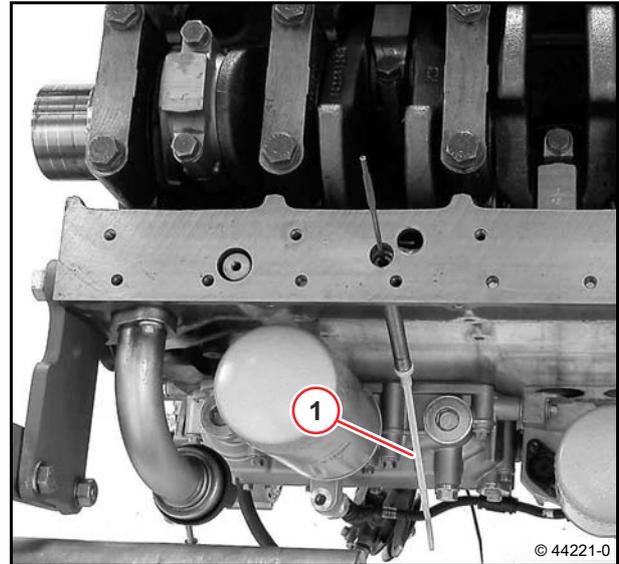


- Unscrew screws (2).

- Remove turning gear (1).

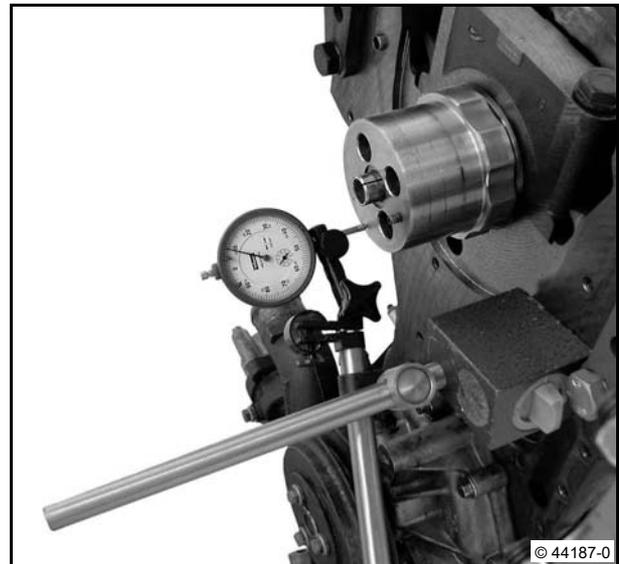


- Insert oil dipstick (1).



- Check axial backlash of crankshaft (crankshaft installed).

 [W 05-05-03](#)

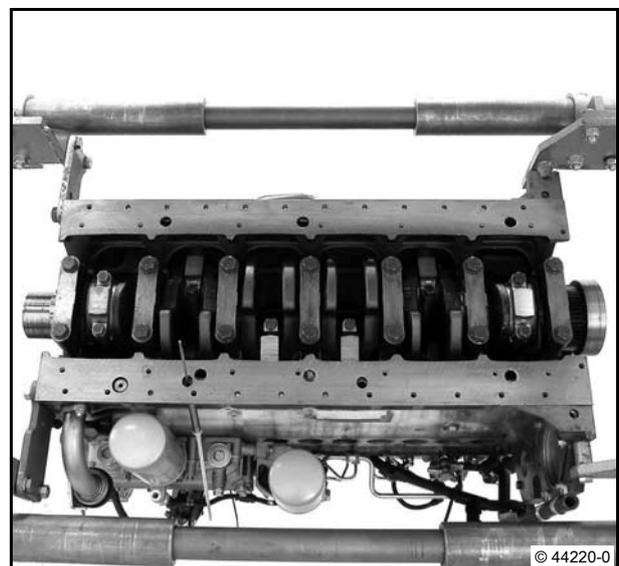


- Install the gear case cover (flywheel side).

 [W 09-02-02](#)

- Install front cover (opposite side to flywheel).

 [W 01-03-01](#)





Checking the crankshaft



Standard tools:

- Magnetic measuring stand
- Micrometer gauge
- Internal measuring device
- Prisms
- Hardness tester

Special tools:

- Dial gauge 100400



– W 05-05-01

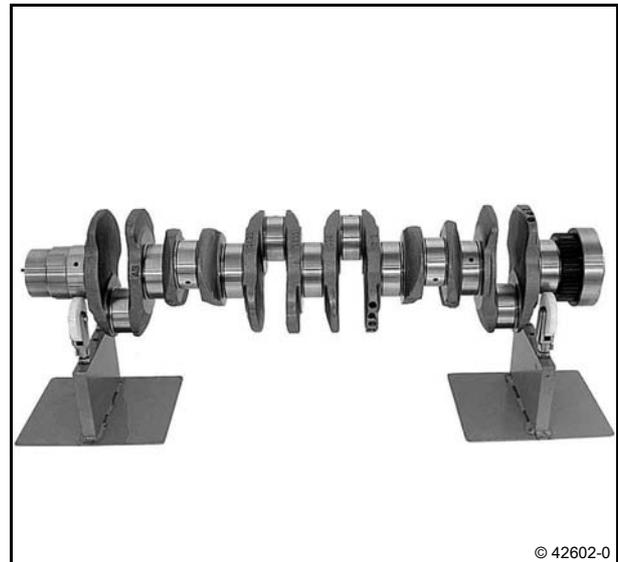
Checking the bearing pin hardness

- Remove crankshaft.

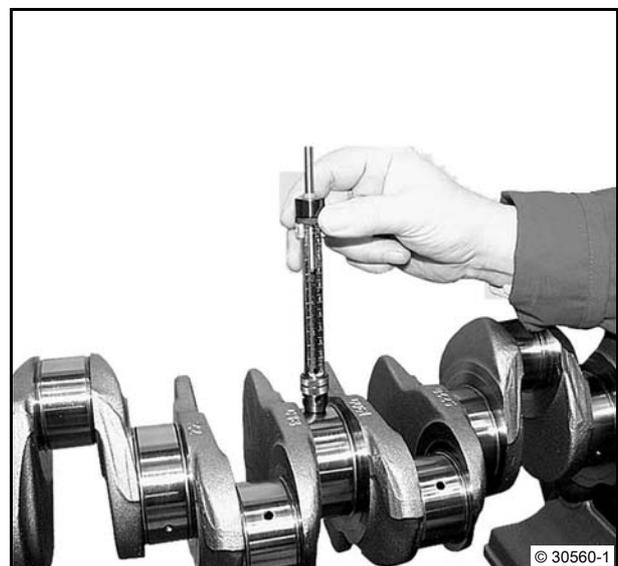


W 05-05-01

- Place crankshaft on prism.



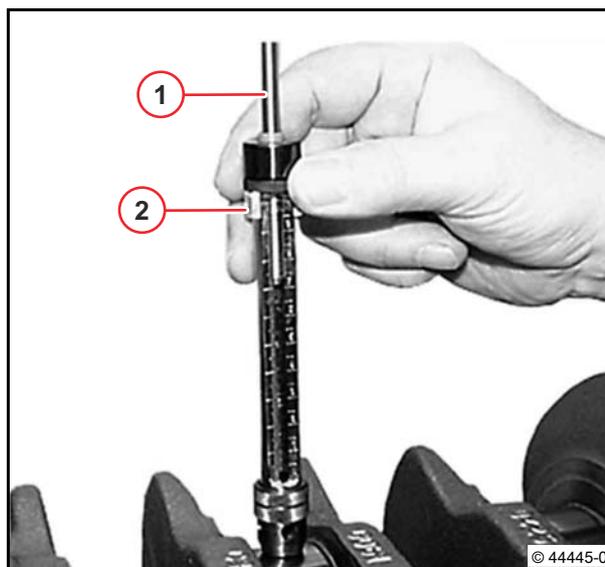
- Put hardness tester on journal.



- Raise stylus (1) and press release (2).



Stylus (1) falls down, briefly strikes the surface and jumps up to the measured value.



6

- Read off displayed value (arrow) from hardness tester.

 53 $^{+3}_{-3}$ HRC



The measured value is to be converted according to the table of the measuring device.

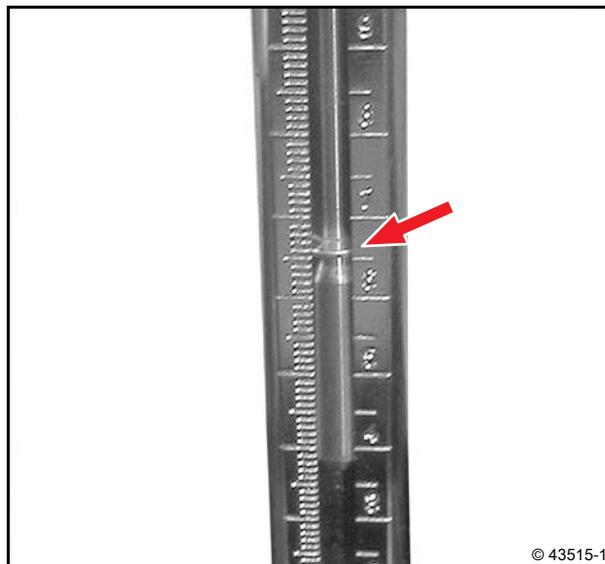
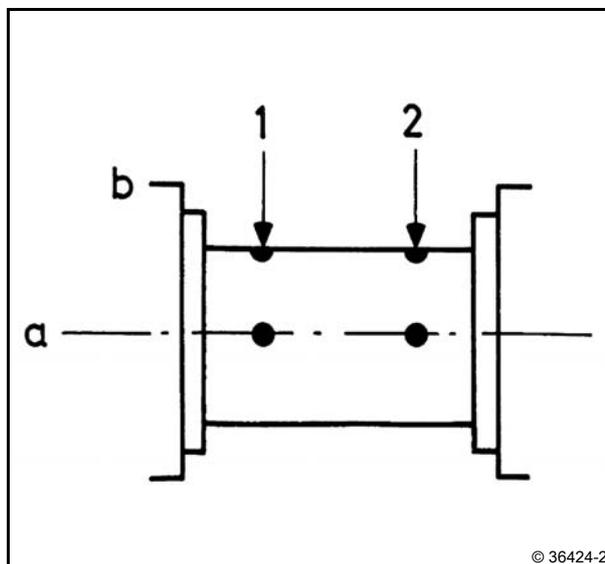


Diagram for measuring the journals at the points 1 and 2 in the levels a and b.



Checking the diameter of the main bearing pins

- Measure main bearing pin with micrometer gauge.
 - Standard

 85,00⁰_{-0.02} mm



Measuring points see diagram.



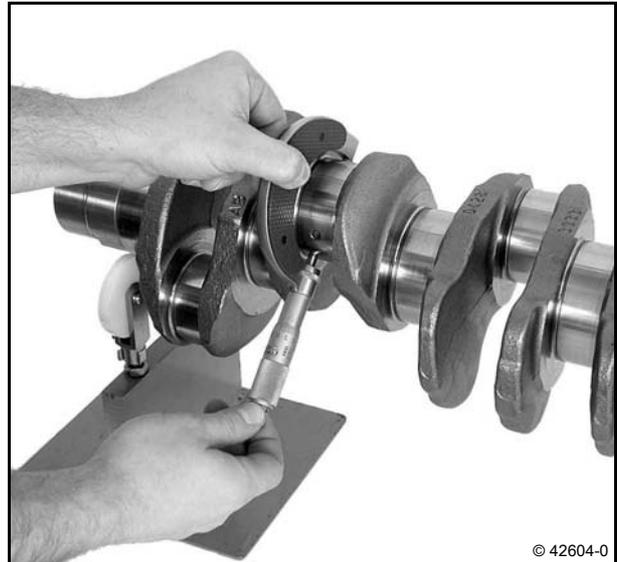
Checking the diameter of the lifting journals

- Measure lifting journal with micrometer gauge.
 - Standard

 68,00⁰_{-0.02} mm



Measuring points see diagram.



Checking the rotation

- Mount magnetic measuring stand.
- Insert dial gauge.
- Apply stylus to the main bearing pin with pre-tension (arrow) and adjust dial gauge to "0".
- Turn crankshaft evenly and check rotation.

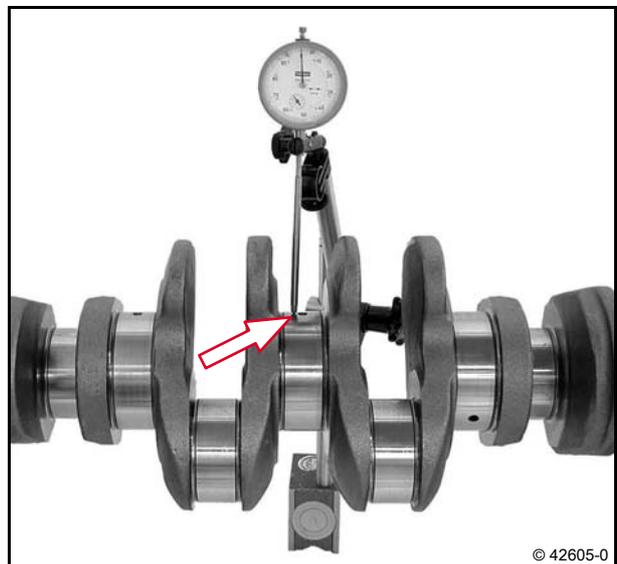
4-cylinder:

 0,07 mm

6-cylinder:

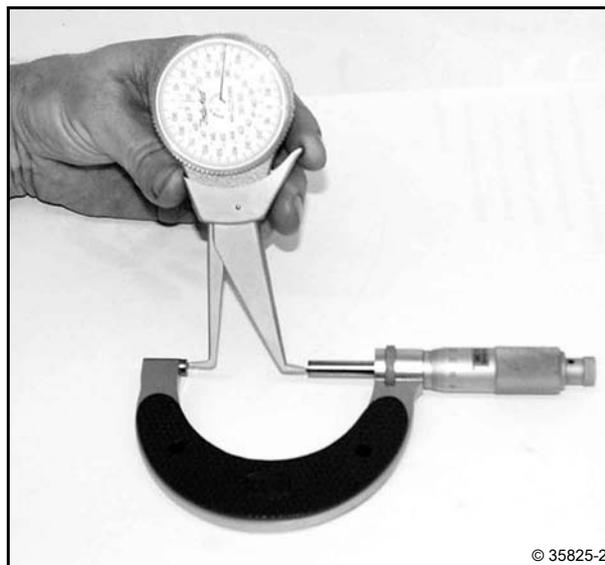
 0,10 mm

- Remove magnetic measuring stand.
- Remove dial gauge.



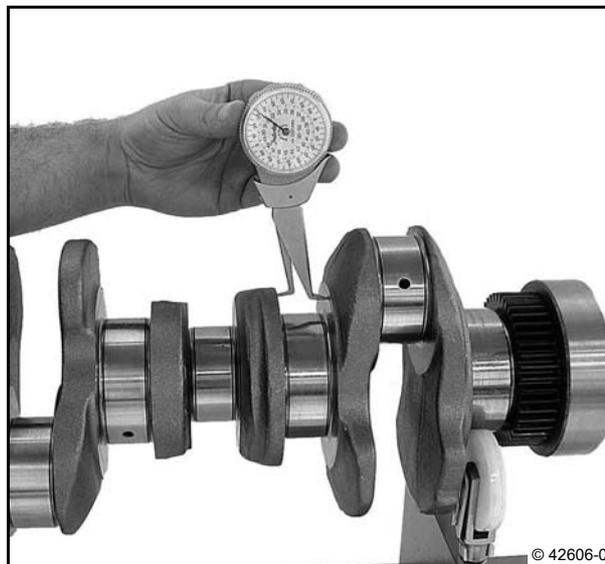
Measuring the fit bearing width

- Set micrometer gauge to 38 mm.
 - Balance the internal measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to "0".



- Measure bearing width with internal measuring device between thelay-on surfaces of the thrust rings.
 - Standard

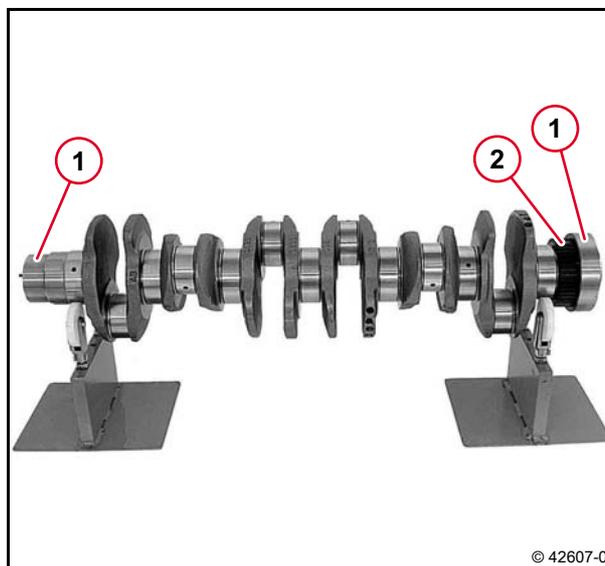
 $38^{+0.06}$ mm



Visual inspection

- Check the running surfaces (1) of the crankshaft sealing rings visually.
- Visually inspect gear wheel (2).
- Install crankshaft.

 [W 05-05-01](#)



Checking the axial clearance of the crankshaft



Standard tools:

- Magnetic measuring stand
- Micrometer gauge
- Internal measuring device
- Socket wrench insert 8035

Special tools:

- Dial gauge 100400



- W 01-03-01
- W 05-05-01
- W 09-02-02

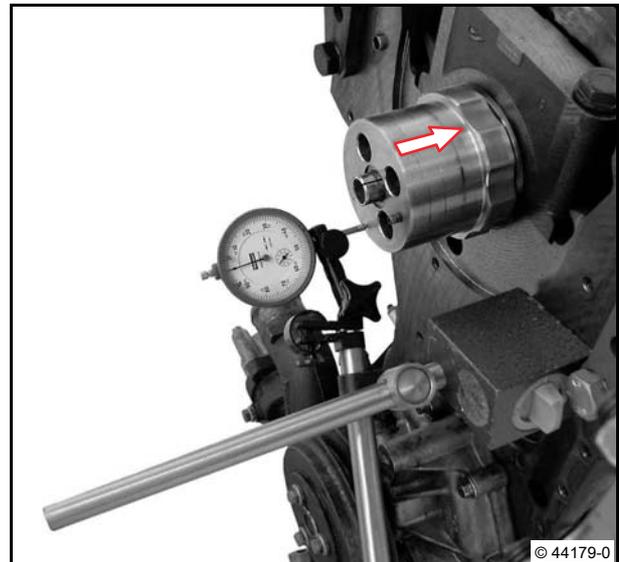
- Remove front cover.

 [W 01-03-01](#)

- Remove the gear case cover.

 [W 09-02-02](#)

- Mount magnetic measuring stand.
- Insert dial gauge.
- Apply stylus to the crankshaft end with pre-tension.
- Press crankshaft in direction of arrow.
- Adjust dial gauge to "0".

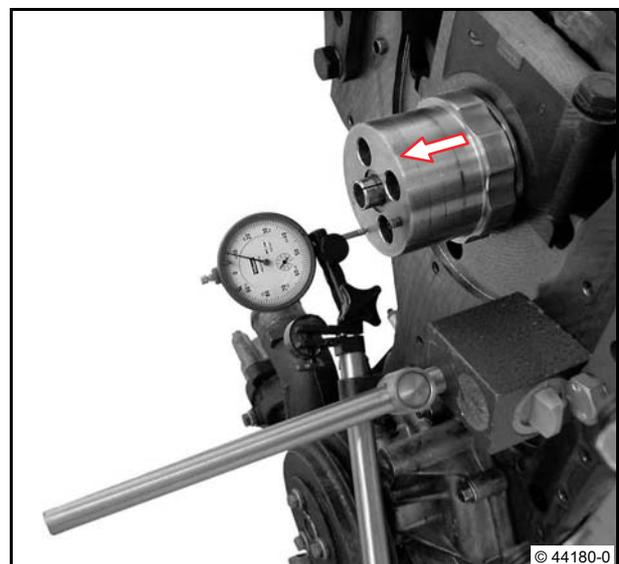


- Press crankshaft in direction of arrow.
- Read off measured value.

 0,1 - 0,3 mm



In case of deviating axial clearance, the permissible axial clearance should be set by changing the thrust ring halves.

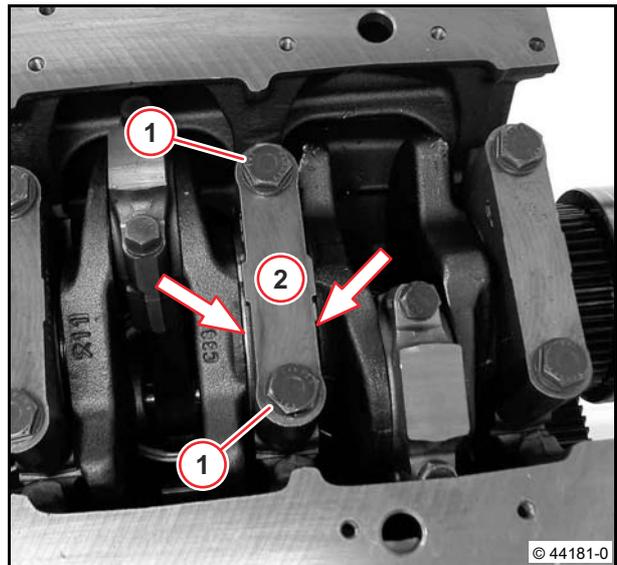


- Unscrew screws (1).

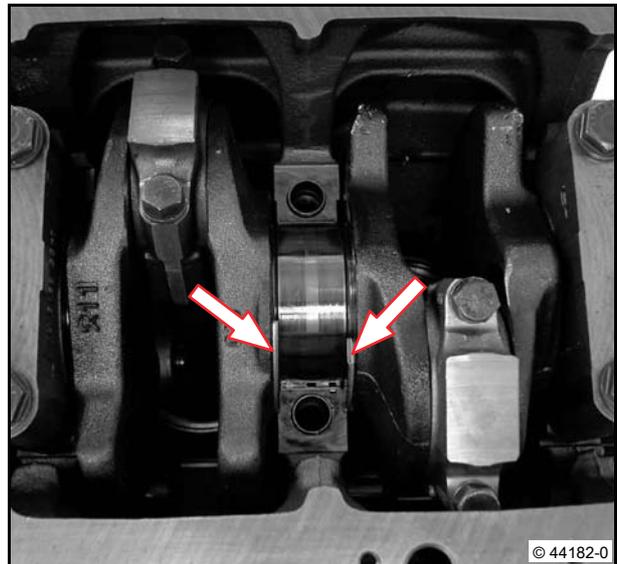


Use socket wrench insert.

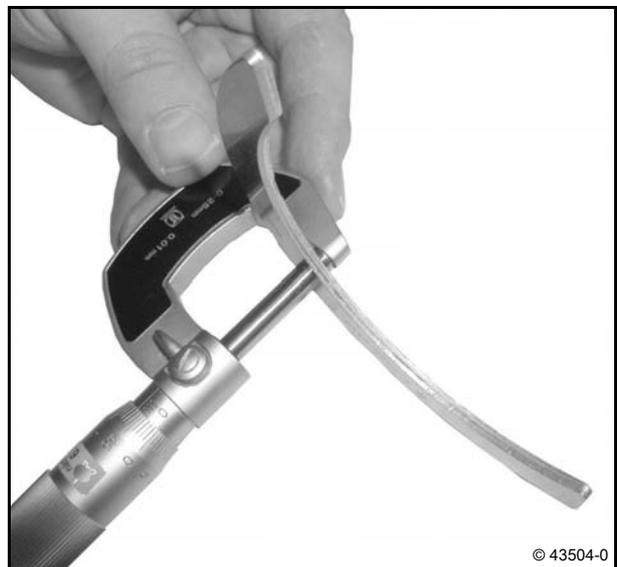
- Remove bearing cap (2).
- Remove lower bearing shell.
- Remove both thrust ring halves (arrows).



- Remove both thrust ring halves (arrows).



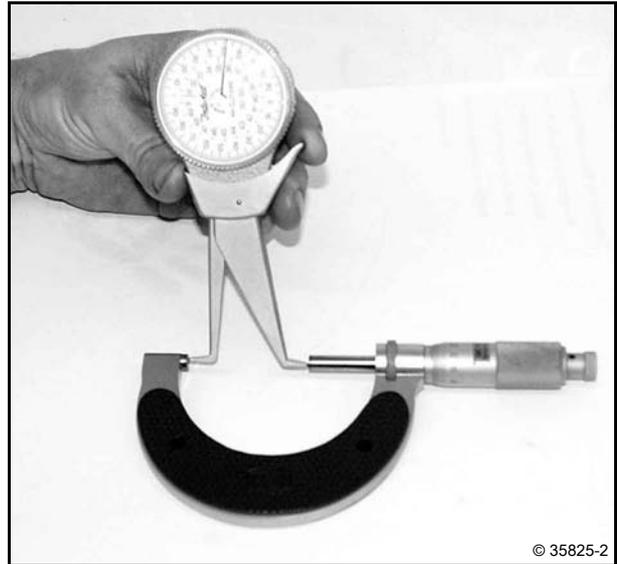
- Measure the wall thickness of the thrust ring halves.
 - Standard
-  $2,9_0^{+0,05}$ mm
- Select thrust ring halves according to measured value.



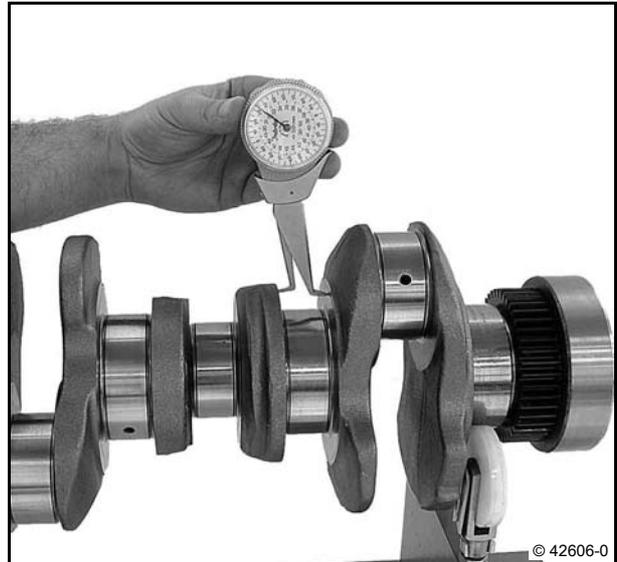
- Remove crankshaft.

 W 05-05-01

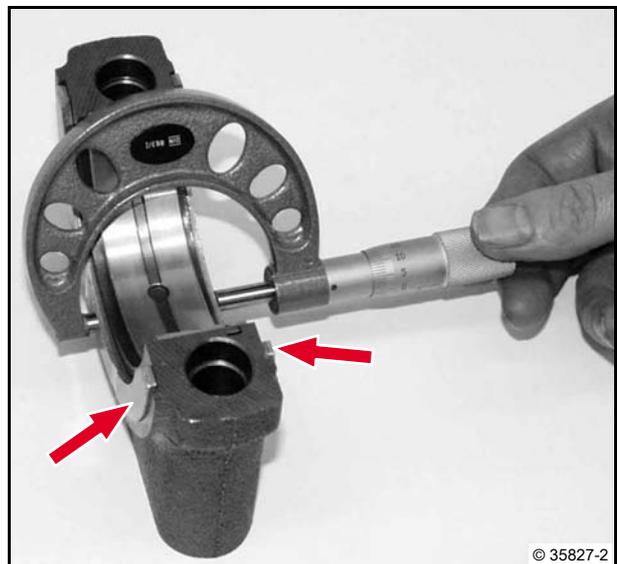
- Set micrometer gauge to 38 mm.
- Push the internal measuring device between the test surfaces of the micrometer gauge and set to "0".



- Measure locating bearing width
- Note measured value, dimension (a).



- Place thrust ring halves on bearing caps (arrows).
- Measure width with micrometer gauge.
- Note measured value, dimension (b).



- Determine axial backlash.

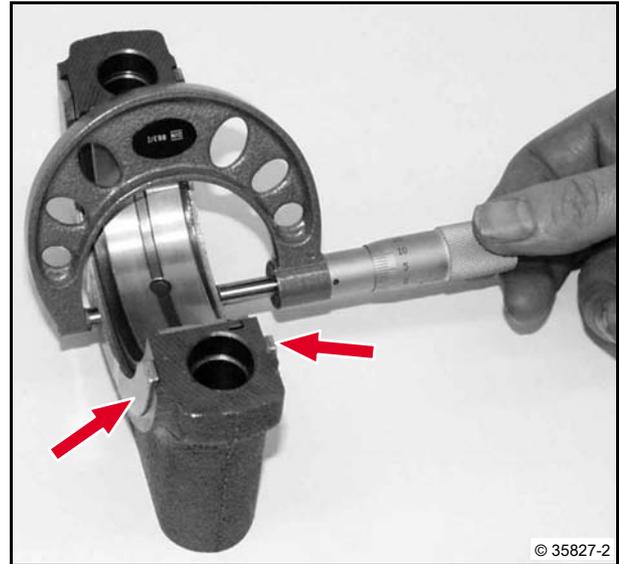
0,1 - 0,3 mm

Calculation example

Desired: Axial backlash
 Given:
 Measured: (a) = 38.6 mm
 (b) = 38.4 mm
 Calculation: Dimension (a) - Dimension (b)
 Result: = 0.2 mm

- Install crankshaft.

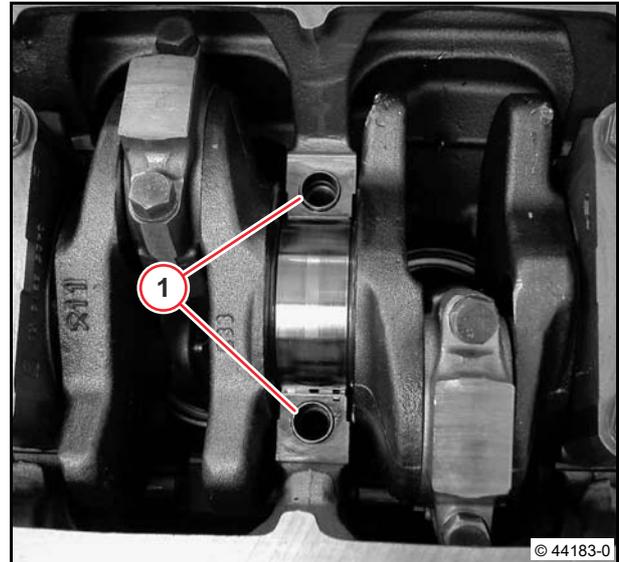
[W 05-05-01](#)



6



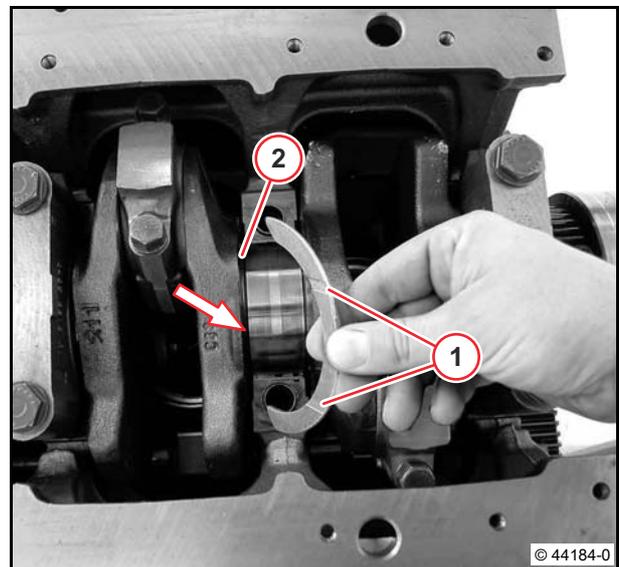
Make sure the clamping bushings (1) are in place.



- Install upper thrust ring halves according to measured axial clearance.



Oil grooves (1) of the thrust ring halves face the crankshaft web face (2). Insert thrust ring halves between crankcase and crankshaft web (arrow).



- Fix both thrust ring halves with a little grease to the bearing cap.

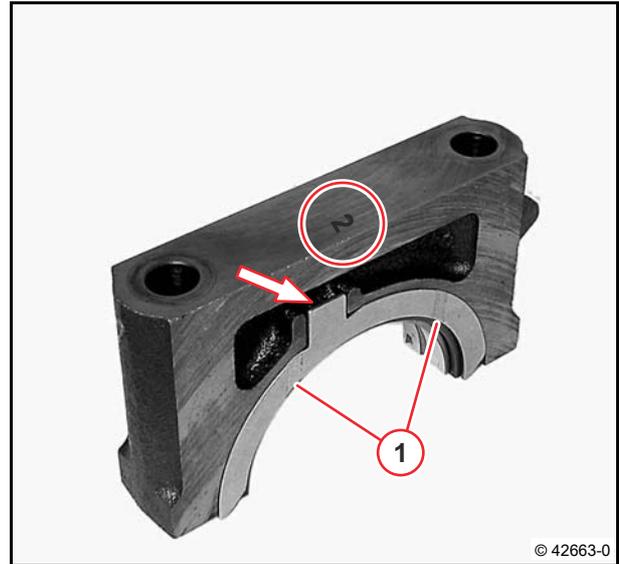


Use lower thrust ring halves with guide lug (arrow).

Install thrust ring halves according to measured axial clearance.

Bearing cap with identification "2".

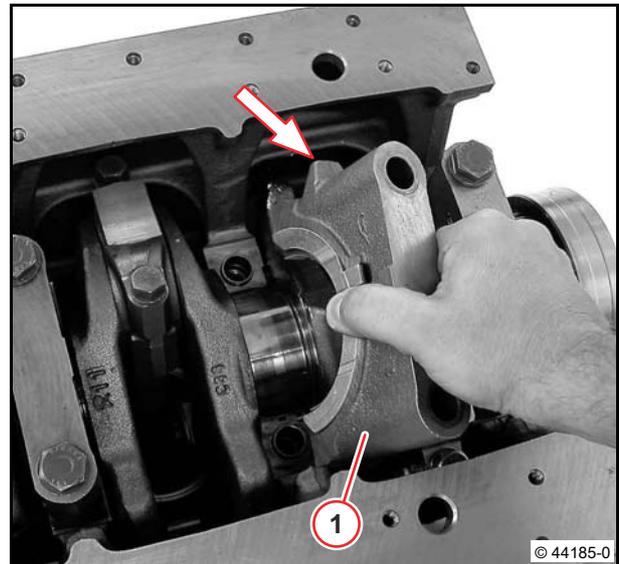
The oil grooves (1) face the crankshaft web face.



- Insert bearing cap (1).



The gate (arrow) on the bearing cap faces the manifold side.



- Tighten screws (arrows).

– Stage 1:

50 Nm

– Stage 2:

60°

– Stage 3:

60°

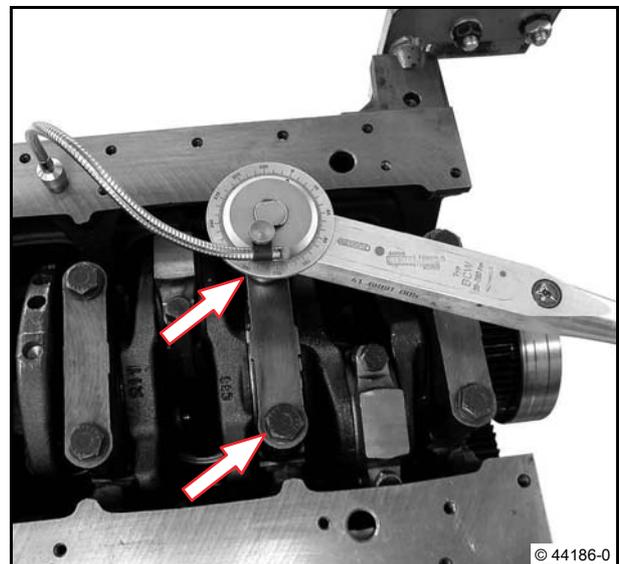


Attention!

Screws can be used a maximum 3 times with written documentation.



Use socket wrench insert.



- Check axial backlash of crankshaft.

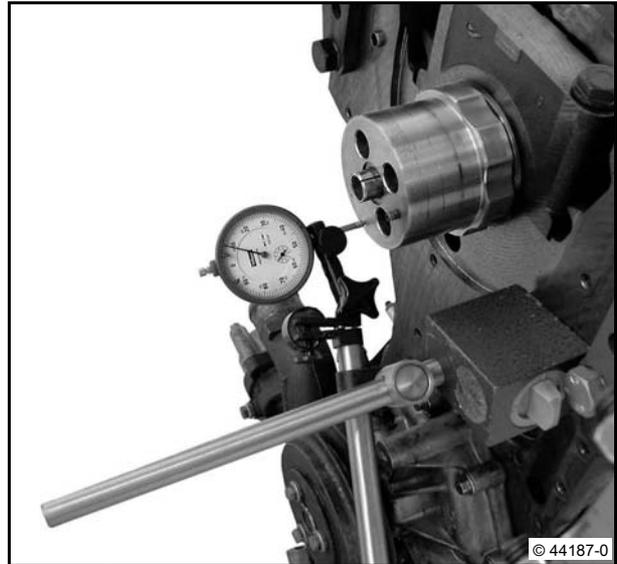
 0,1 - 0,3 mm

- Remove magnetic measuring stand.
- Remove dial gauge.
- Install front cover.

 [W 01-03-01](#)

- Install the gear case cover.

 [W 09-02-02](#)



Removing and installing the piston and con rod



Standard tools:

– Rotation angle disc 8190

Special tools:

– Piston ring compressor 130640

– Liner holder 150180



– W 07-02-02

– W 08-03-01

– W 16-01-01



Attention!

The assignment of con rod and big end bearing cover must stay as it is. If con rod and big end bearing cover are assembled the wrong way around, the con rod will be unusable!

Do not damage the fracture surfaces of the con rod and big end bearing cover!



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The engine oil and coolant should be added according to the operating manual.

Removing the piston and con rod

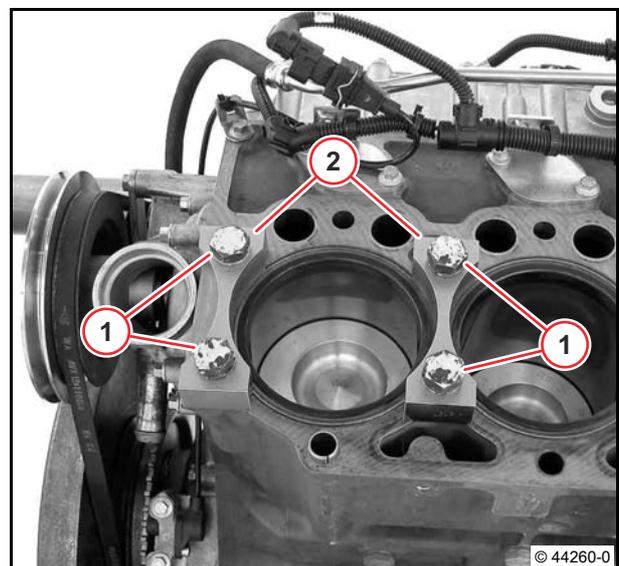
- Remove cylinder head.

 W 08-03-01

- Remove oil suction pipe

 W 16-01-01

- Mount liner holder (2).
- Tighten screws (1).
- Pull out oil dipstick.

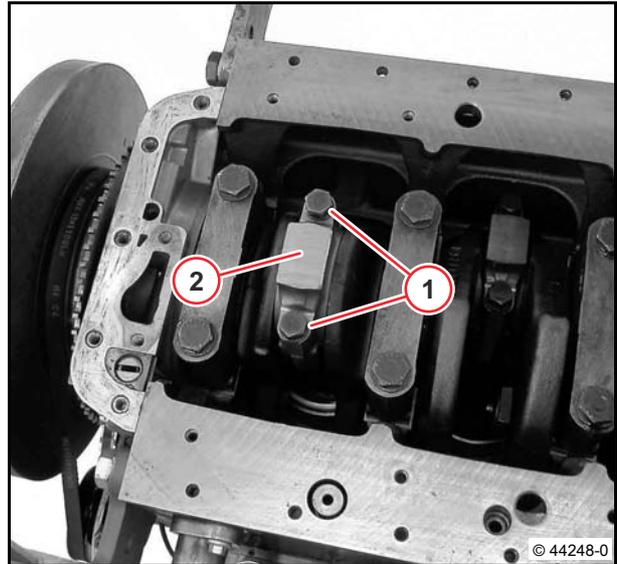


Removing the big end bearing cap

- Set lifting journal at bottom dead centre (BDC).
- Unscrew screws (1).
- Remove big end bearing cap (2).
- Remove bearing shell.



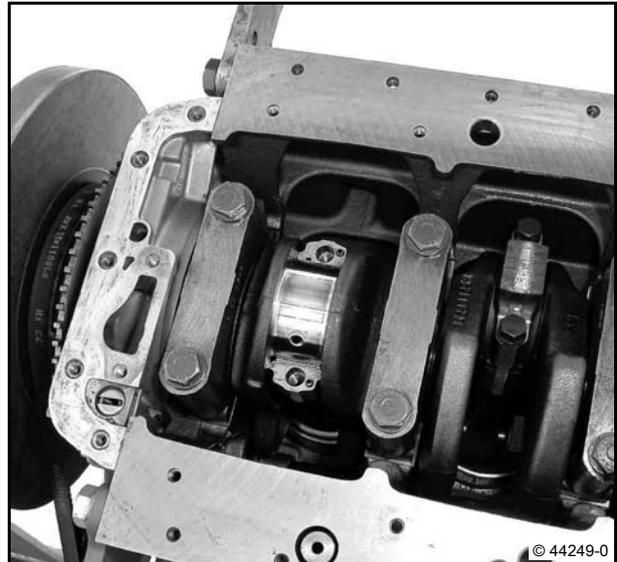
Lay out components in the order in which they should be installed.
Note order of cylinders.



- Press out the piston and connection rod.



Lay out components in the order in which they should be installed.
Note order of cylinders.



- Remove con rod bearing shells (1).
- Visually inspect the components.



Removing the piston

- Remove locking ring.
- Press out piston pin.
- Visually inspect the components.



Completing con rod and piston

- Insert new locking ring.



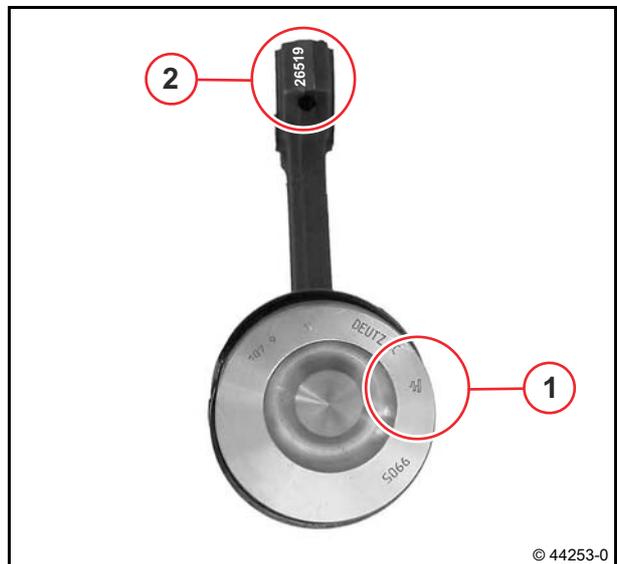
Ensure that the installation location is free from faults.



- Insert con rod.



The flywheel/crankshaft symbol (1) on the piston base must face to the right and the identification number (2) on the con rod must face upwards.



- Oil the piston bolt lightly.
- Press the piston bolt through.
- Insert new locking ring.



Ensure that the installation location is free from faults.



6

Installing the piston and con rod



Make sure the clamping bushings (1) are in place.



- Insert bearing shell in the con rod.



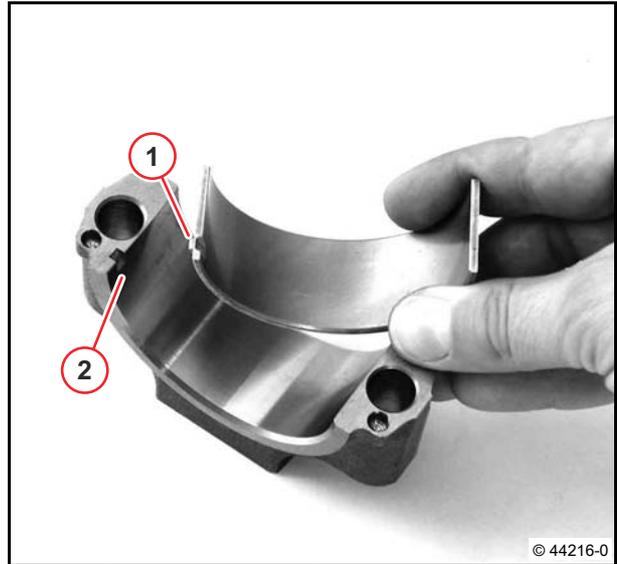
Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



- Insert bearing shell in the respective big end bearing cap.

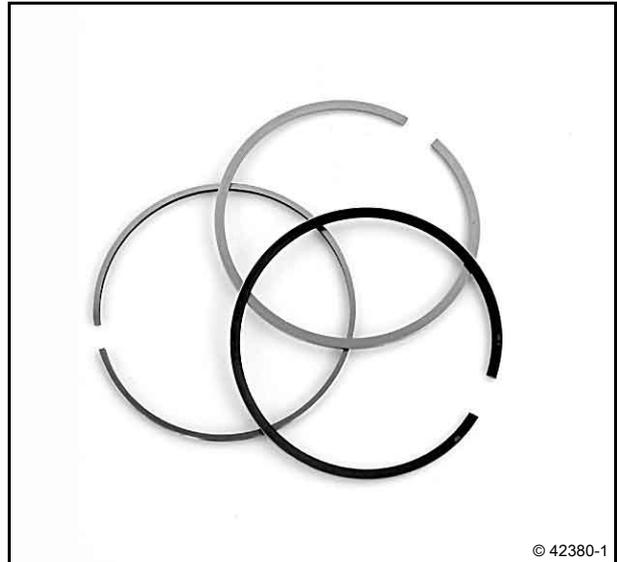


Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



- Arrange the piston ring joints with an offset of about 120° to each other.
- Check piston rings and piston ring grooves.

[W 07-02-02](#)



- Lightly oil cylinder running surface, piston rings and lifting bearing journal lightly.
- Clamp piston rings with piston ring compressor (1).



Do not turn the piston rings any further.



- Set lifting journal at bottom dead centre (BDC).
- Push piston and con rod completely into cylinder liner.

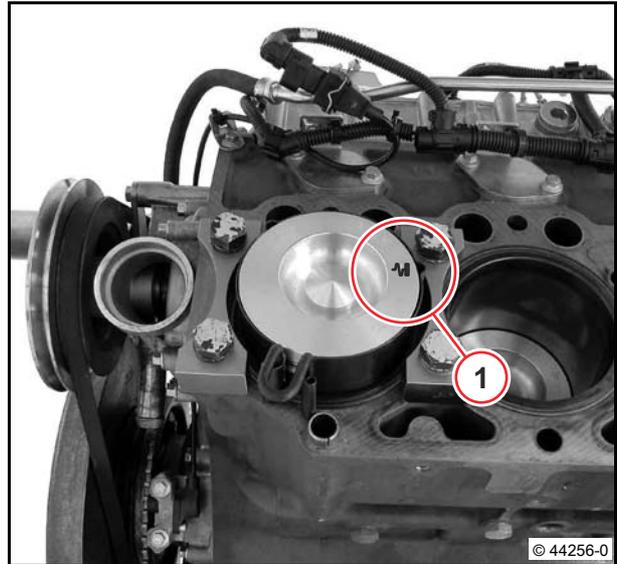


Note the cylinder assignment of the piston.

Note the label indicating the installation position on the piston base.

The symbol flywheel/crankshaft (1) must face the flywheel.

The piston ring compressor must lie flat on the cylinder liner.

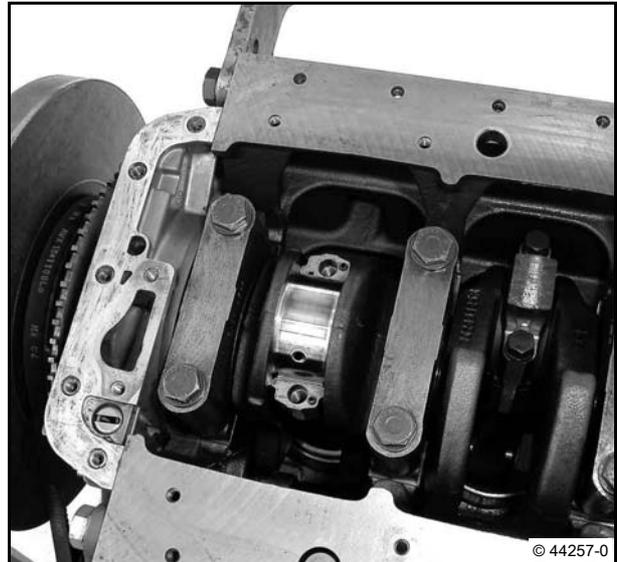


- Press the con rod carefully against the lifting journal.



Attention!

Do not jam the con rod with the crankshaft.



Installing the big end bearing cap

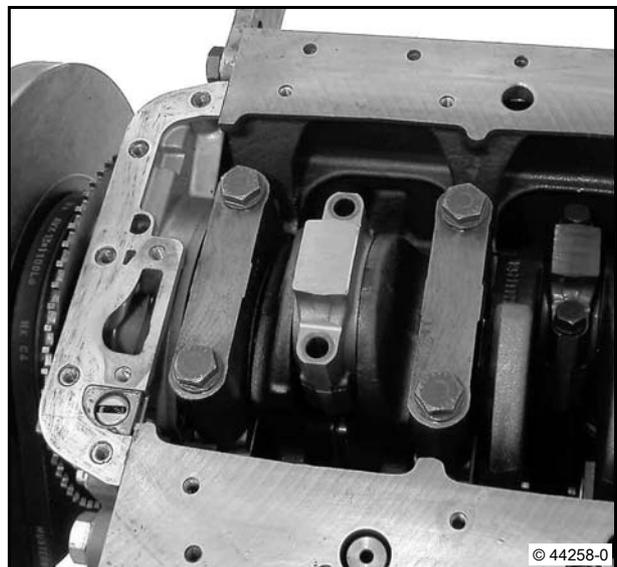
- Mount big end bearing cap.



Attention!

Note the assignment of the big end bearing cap.

The identification numbers (1) on the con rod and the big end bearing cap must be identical and opposite to each other when assembled.



- Tighten new screws with rotation angle disc.

- Stage 1:

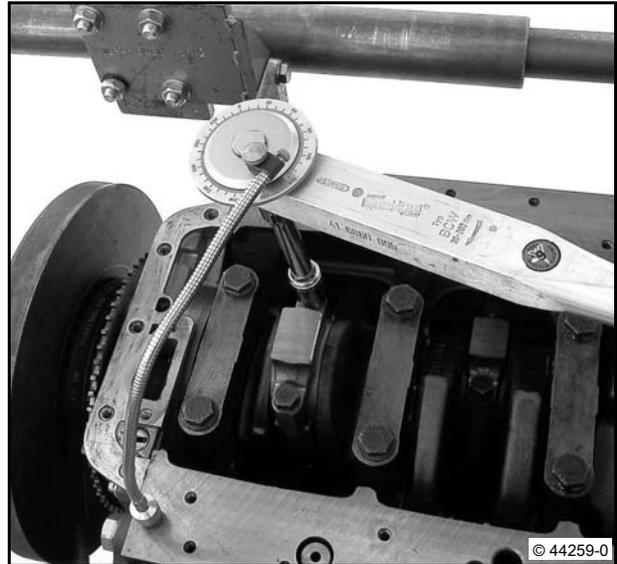
-  30 Nm

- Stage 2:

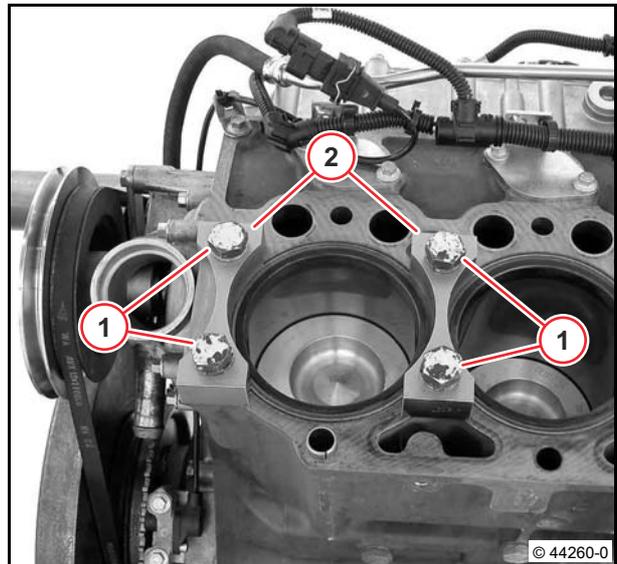
-  60°

- Stage 3:

-  60°



- Insert oil dipstick.
- Unscrew screws (1).
- Remove the liner holder (2).

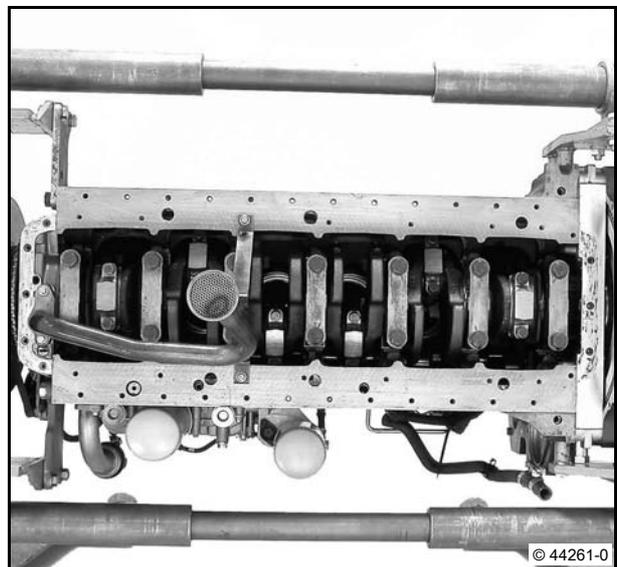


- Install oil suction pipe.

-  [W 16-01-01](#)

- Install cylinder head.

-  [W 08-03-01](#)





Checking the con rod



Standard tools:

- Micrometer gauge
- Internal measuring device
- Con rod test device
- Rotation angle disc 8190

Special tools:

- Dial gauge 100400

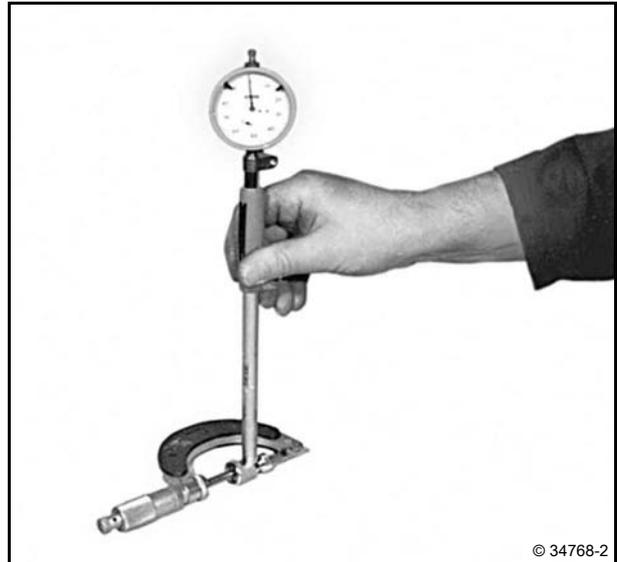


- W 05-05-02

Checking small end bush

• Prepare internal measuring device:

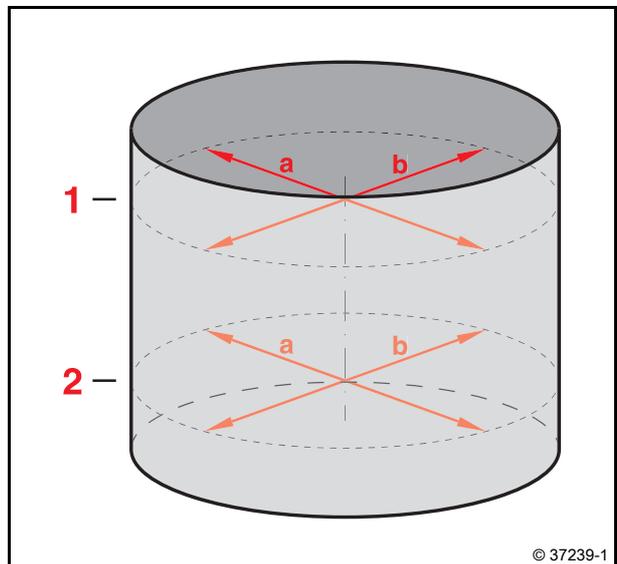
- Mount probe bolt for the appropriate measuring range in the internal measuring device.
- Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
- Set micrometer gauge to 42 mm.
- Balance the internal measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to "0".



© 34768-2



Diagram for measuring the small end bush at the points "a" and "b" in the levels "1" and "2".



© 37239-1

- Insert internal measuring device.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.

 $42^{+0.05}_{-0.04}$ mm



Measuring points see diagram.

- Note the measured value, dimension (A).



The dimension A is required to determine the piston bolt clearance.



Checking diameter of the piston bolt

- Measure piston pin with micrometer gauge.

 $42^0_{-0.006}$ mm

- Note the measured value, dimension B.



The dimension B is required to determine the piston bolt clearance.



Determining the piston bolt clearance



The piston bolt clearance is given by the difference between the internal diameter of the small end bush (dimension A) and the piston bolt diameter (dimension B).

 0,034 - 0,056 mm

Calculation example

Desired: Piston pin clearance

Given:

Measured: (A) = 40.045 mm

Calculation: (B) = 40.006 mm

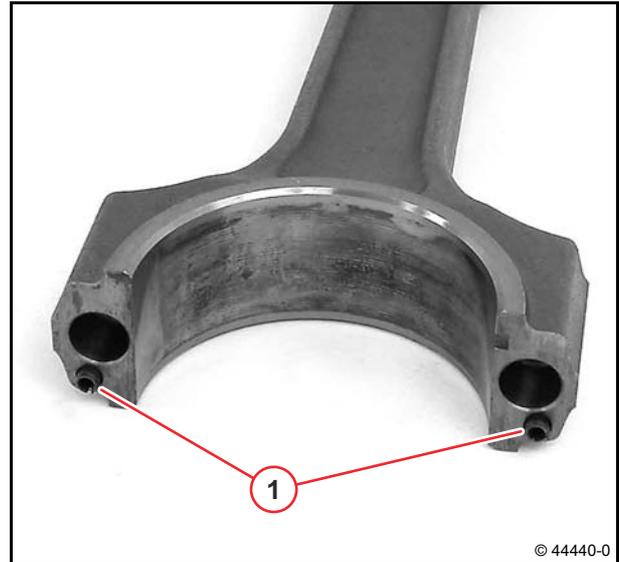
dimension (A) - dimension (B)

Result: = 0.039 mm

Checking the con rod bearing bore



Make sure the clamping bushings (1) are in place.



© 44440-0

6

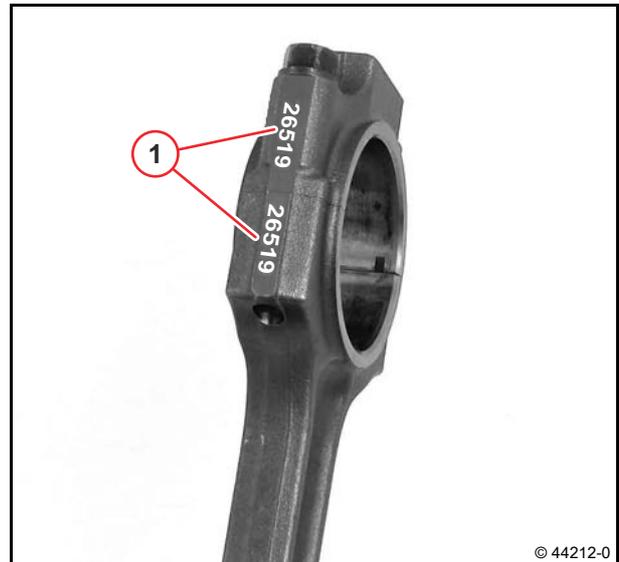
- Mount big end bearing cap.



Attention!

Note the assignment of the big end bearing cap.

The identification numbers (1) on the con rod and the big end bearing cap must be identical and opposite to each other when assembled.



© 44212-0

- Tighten screws alternately with rotation angle disc and socket wrench insert.

– Stage 1:

50 Nm

– Stage 2:

60°

– Stage 3:

60°



© 44213-0

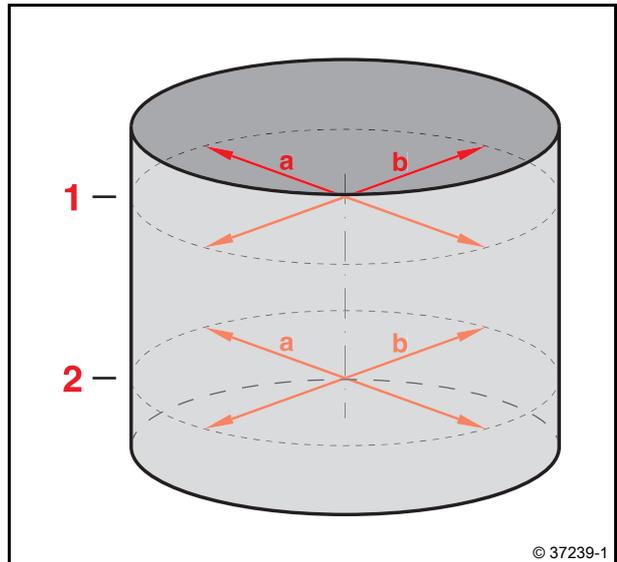
- Prepare internal measuring device:
 - Mount probe bolt for the appropriate measuring range in the internal measuring device.
 - Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
 - Set micrometer gauge to 72 mm.
 - Balance the internal measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to "0".



6



Diagram for measuring the con rod bearing bore at the points "a" and "b" in the levels "1" and "2".



- Insert internal measuring device.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.

 72,5 mm



If the measured values deviate slightly, additional measurements must be made with new bearing shells.

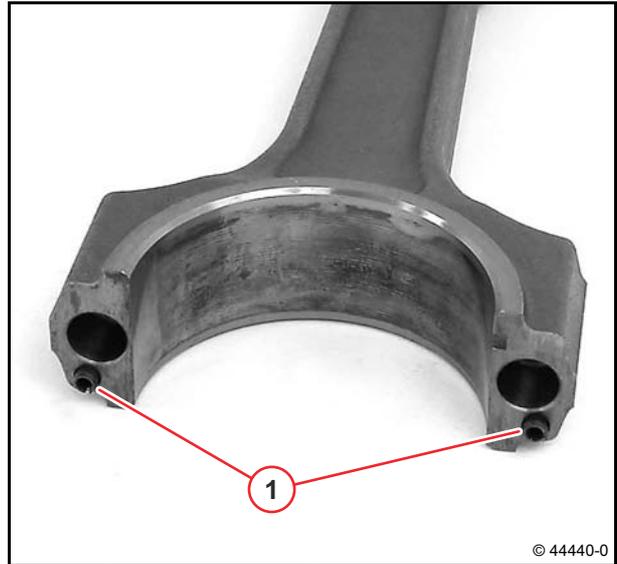


Checking internal diameter of the con rod bearing shells

- Remove screws.
- Remove the con rod bearing cover.



Make sure the clamping bushings (1) are in place.



© 44440-0

- Insert bearing shell in the con rod.



Attention!

Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



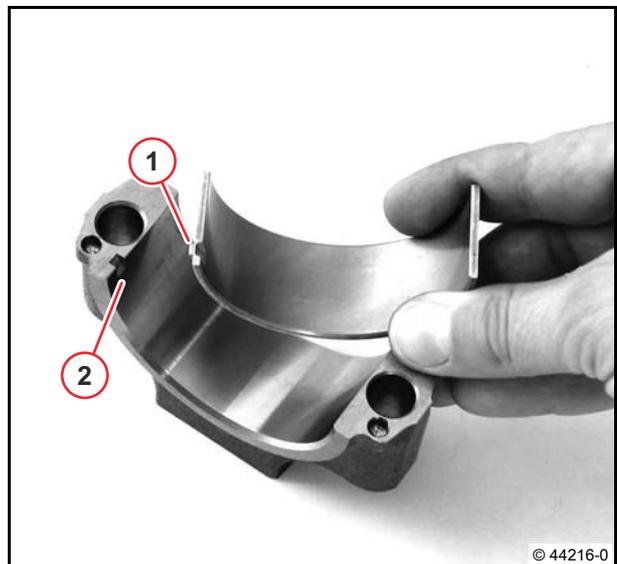
© 44215-0

- Insert bearing shell in the respective big end bearing cap.



Attention!

Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



© 44216-0

- Mount big end bearing cap.



Attention!

Note the assignment of the big end bearing cap.

The identification numbers (1) on the con rod and the big end bearing cap must be identical and opposite to each other when assembled.



- Tighten screws alternately with rotation angle disc and socket wrench insert.

– Stage 1:

 50 Nm

– Stage 2:

 60°

– Stage 3:

 60°



- Prepare internal measuring device:

– Mount probe bolt for the appropriate measuring range in the internal measuring device.

– Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.

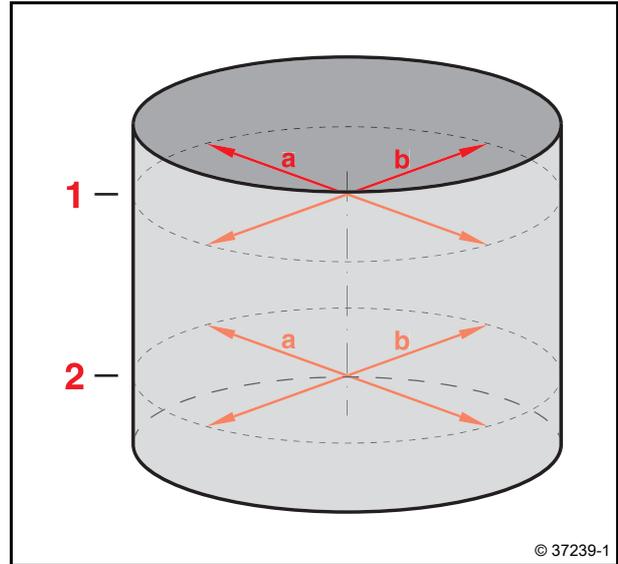
– Set micrometer gauge to 72.5 mm.

– Balance the internal measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to "0".





Diagram for measuring the inside diameter of the con rod bearing shells at the points "a" and "b" in the levels "1" and "2".



- Insert internal measuring device.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.

72,5^{+0.02} mm



When the wear limit is reached the con rod must be replaced.

- Note the measured value, dimension (C).



- Checking the diameter of the lifting journals.

[W 05-05-02](#)

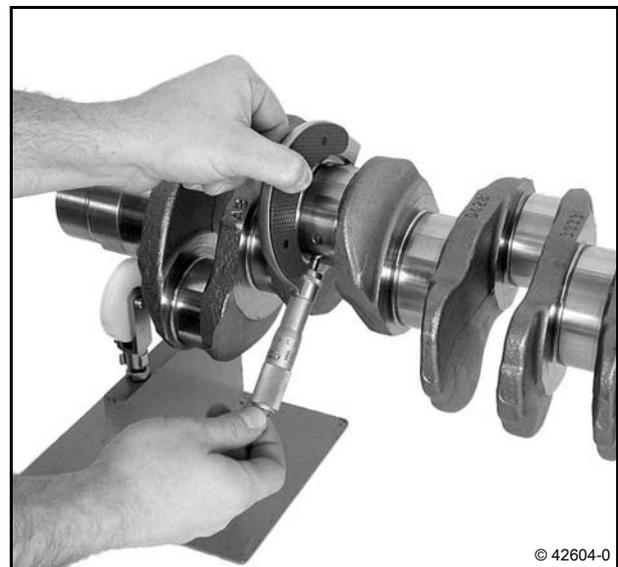
- Check con rod bearing clearance.

0,036 - 0,095 mm



The big end bearing clearance is given by the difference between the internal diameter of the big end bearing shell (C) and the lifting journal diameter (D).

- Remove screws.
- Remove the con rod bearing cover.



Checking the con rod

- Mount connecting rod on test instrument without bearing shells.



Attention!

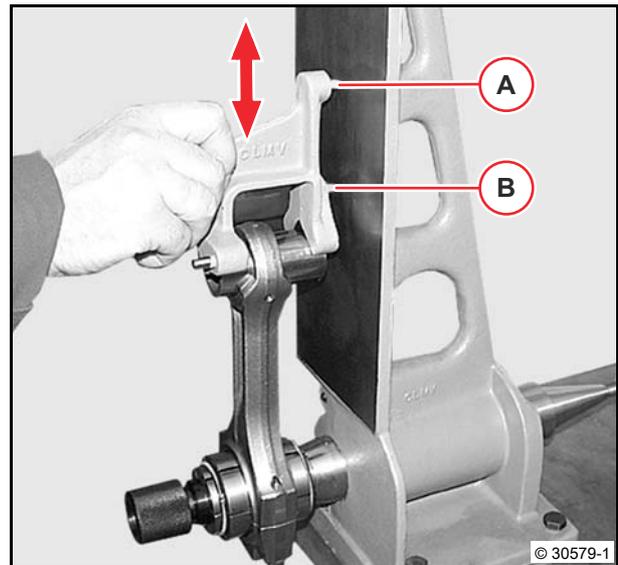
Aligning the con rod is not permissible.

- Move test fork in direction of arrow.
- Check that the con rod is parallel.
- Permissible deviation from (A) to (B).

 0,05 mm



Distance between "A" and "B" = 100 mm.

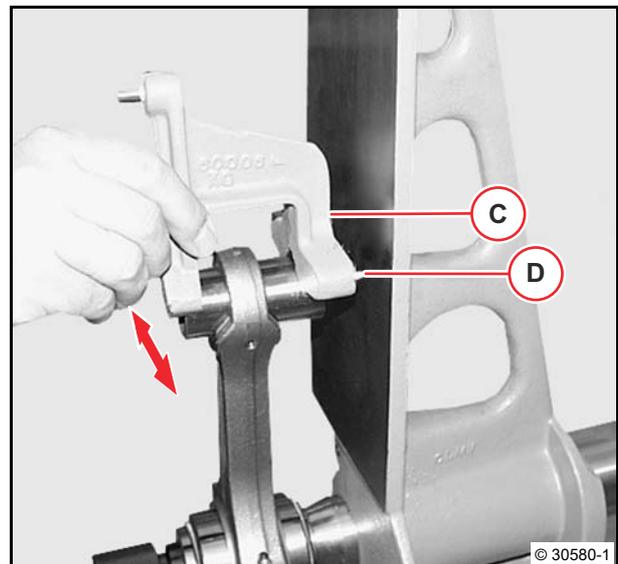


- Move test fork in direction of arrow.
- Check the angle of the con rod.
- Permissible deviation from (C) to (D).

 0,05 mm



Distance between "C" and "D" = 100 mm



Checking the piston



Standard tools:

- Micrometer gauge
- Internal measuring device

Special tools:

- Dial gauge 100400



– W 06-01-01



When the piston wear limit is reached, the piston must be renewed.

Checking the piston bolt bore

- Remove piston from con rod.



W 06-01-01



- Prepare internal measuring device:

- Mount probe bolt for the appropriate measuring range in the internal measuring device.
- Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
- Set micrometer gauge to 42 mm.
- Balance the internal measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to "0".

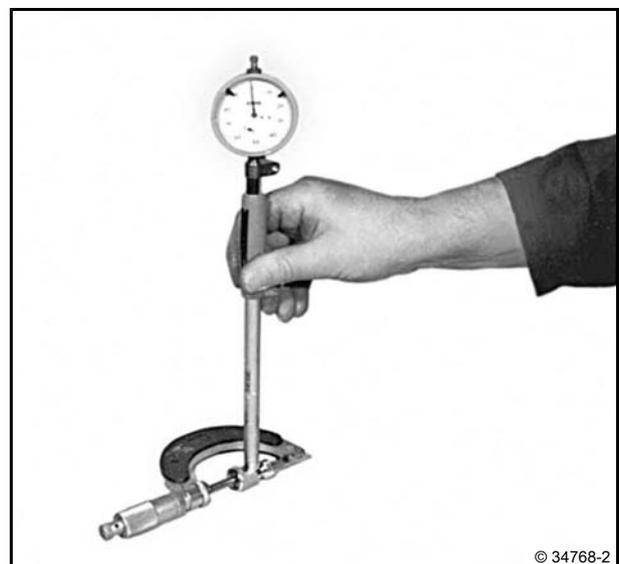
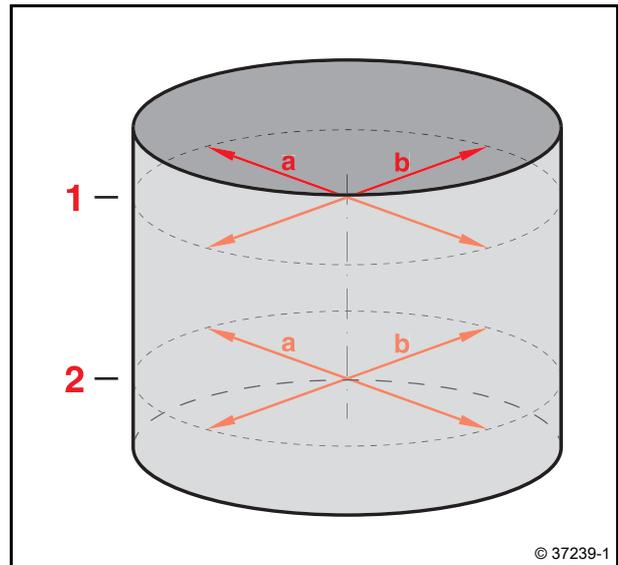




Diagram for measuring the piston bolt bore at the points "a" and "b" in the levels "1" and "2".



© 37239-1

- Insert internal measuring device in the piston bolt bore.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.

42^{+0.017}/_{+0.010} mm



See schematic diagram for measuring points.



© 43483-0

Checking the piston diameter



Diagram for measuring the piston diameter at the measuring points "1, 2 and 3", transverse to the piston bolt bore.

– Measuring point 1

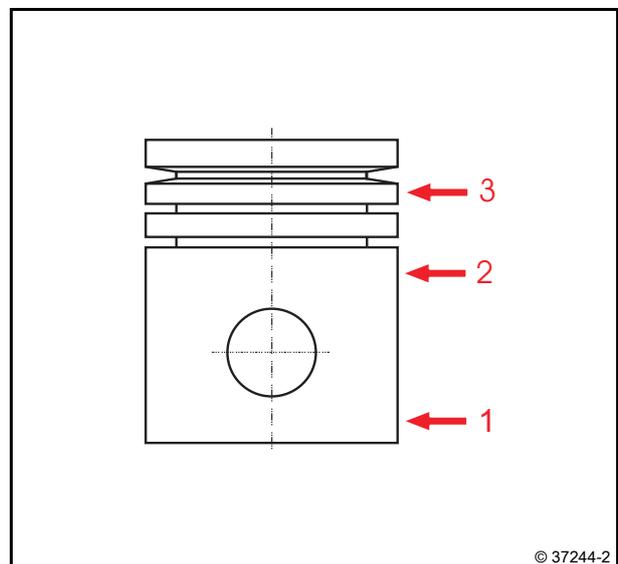
12 mm

– Measuring point 2

64 mm

– Measuring point 3

97 mm



© 37244-2

- Measure piston diameter with micrometer gauge.

- Measuring point 1

 107,700 mm

- Measuring point 2

 107,800 mm

- Measuring point 3

 107,660 mm



See schematic diagram for measuring points.

- Assemble con rod and piston.

 [W 06-01-01](#)





Checking the piston rings and piston ring grooves



Standard tools:
– Feeler gauges

Special tools:
– Universal piston ring pliers 130300
– Trapezoidal groove wear gauge 130420



– W 06-01-01

Checking the piston rings and piston ring grooves

- Remove piston from con rod.
 W 06-01-01
- Set universal piston ring pliers to the piston diameter.
 108 mm
- Remove piston rings with universal piston ring pliers.

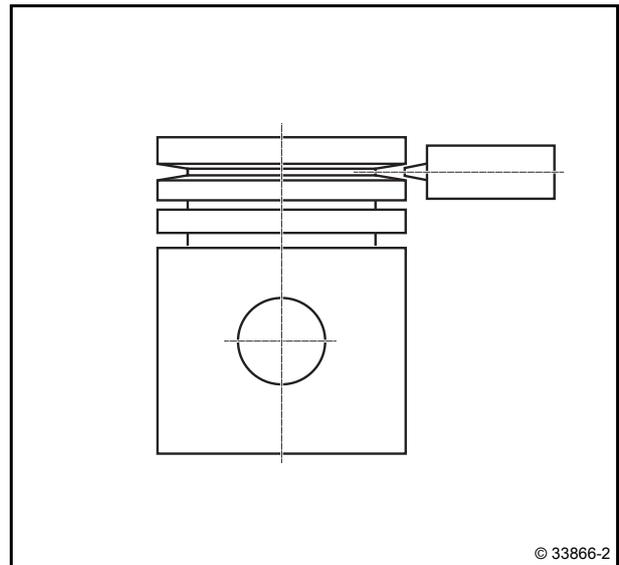


- Clean piston.
- Visually inspect piston.
- Visually inspect piston ring grooves.

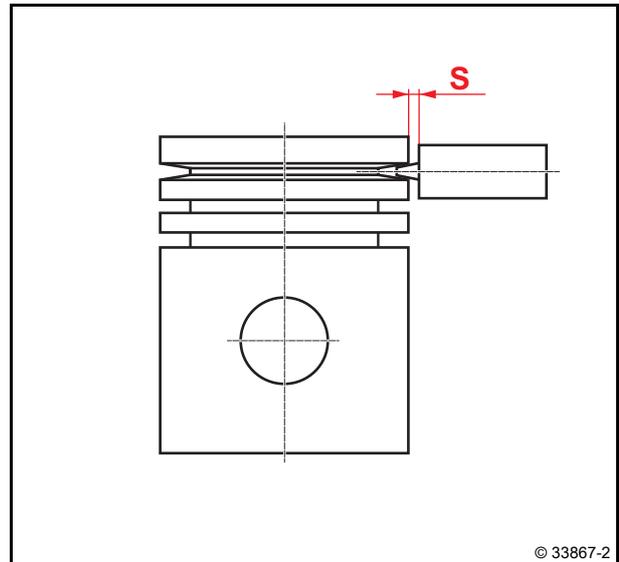


- Measure piston ring groove for first piston ring with trapezoidal groove wear gauge.

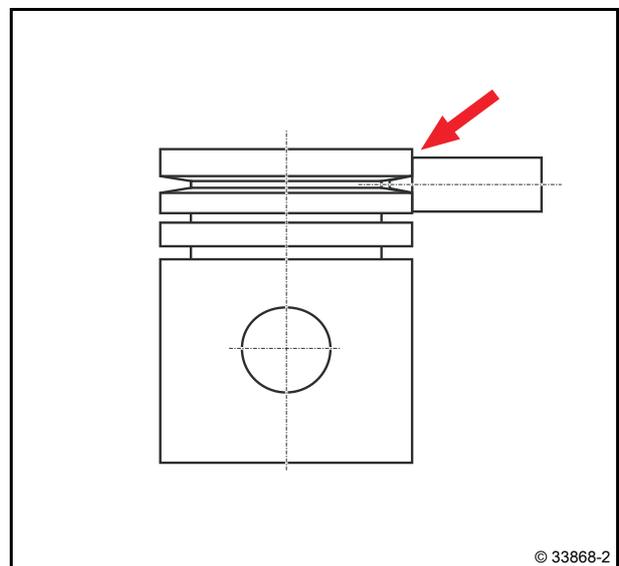
6



If there is a gap "S" between the trapezoidal groove wear gauge and piston, the piston can be used again.

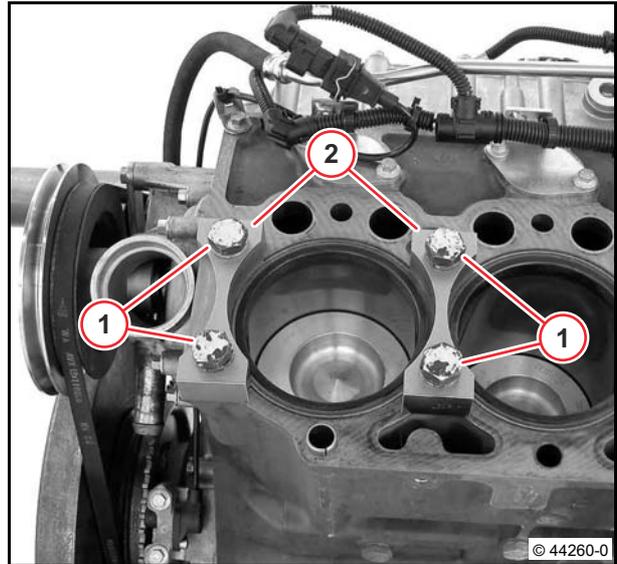


If the trapezoidal groove wear gauge is touching the piston (arrow), the piston must be changed.



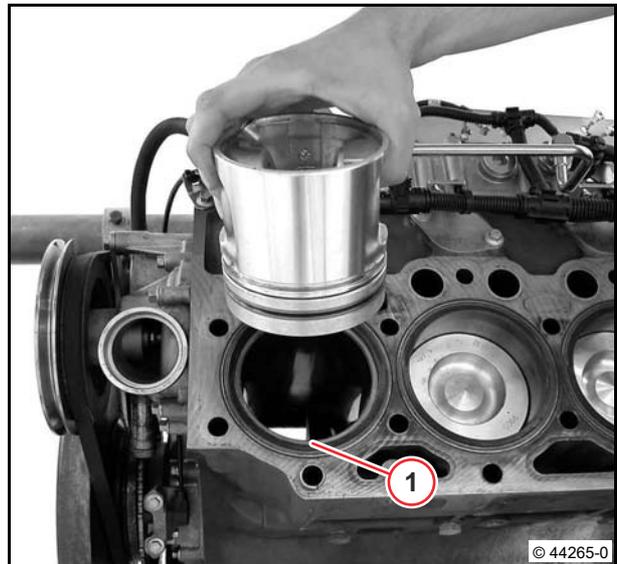
Checking the piston ring joint clearance

- Unscrew screws (1).
- Remove the liner holder (2).



6

- Insert the piston ring (1) in the cylinder.
- Align the piston ring in the cylinder by pushing the piston.



- Measure the piston ring joint clearance with a feeler gauge.

1. piston ring

 0,3 - 0,55 mm

2. piston ring

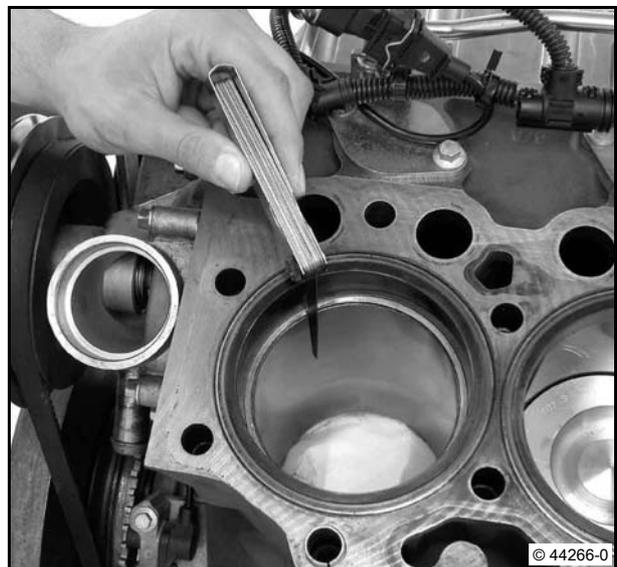
 1,5 - 2,0 mm

3. piston ring

 0,3 - 0,6 mm



When the wear limit is reached, the piston ring must be renewed.



- Install piston rings.



Order and position of the piston rings as seen from the piston base.

- Double-sided keystone ring (1)
- Taper-faced ring (2)
- Bevelland-edge oil control ring with coiled spring expander (3)

“Top” label faces the combustion chamber.



- Install piston rings with universal piston ring pliers.



Set spring joint of the bevelland-edge oil control ring 180° to the ring joint.



Checking the piston ring axial clearance

- Check axial backlash with feeler gauge between piston ring and piston ring groove.

2. piston ring

 0,09 - 0,13 mm

3. piston ring

 0,03 - 0,075 mm



Check with new piston rings.

When the piston wear limit is reached, the piston must be renewed.



- Assemble con rod and piston.

 [W 06-01-01](#)





Checking the compression pressure



Standard tools:

- Compression pressure tester 8005
- Torx tool set 8189

Special tools:

- Connector 100190



- W 11-01-01
- W 19-01-01

Checking the compression pressure

- Setting the valve clearance (with exhaust return module installed).

 [W 11-01-01](#)

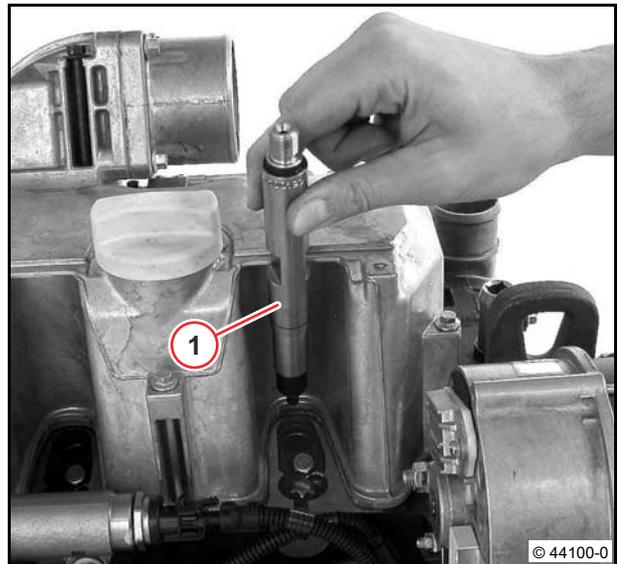
- Remove injector.

 [W 19-01-01](#)

- Insert connector (1).



Use sealing ring for injector.



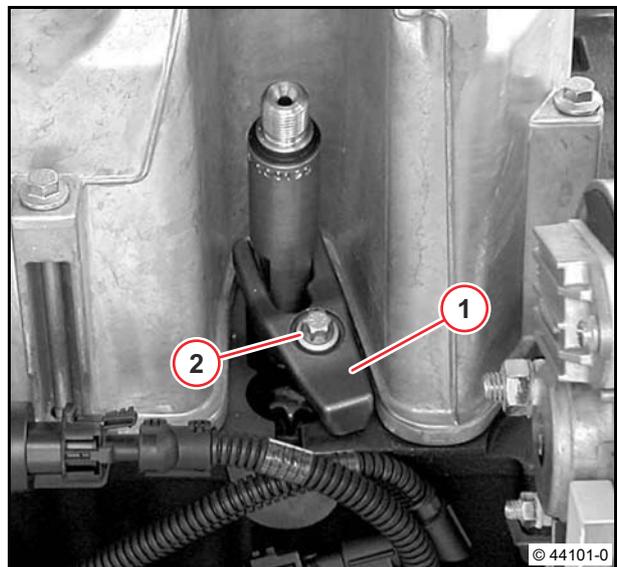
- Mount clamping shoe (1).

- Tighten screw (2).

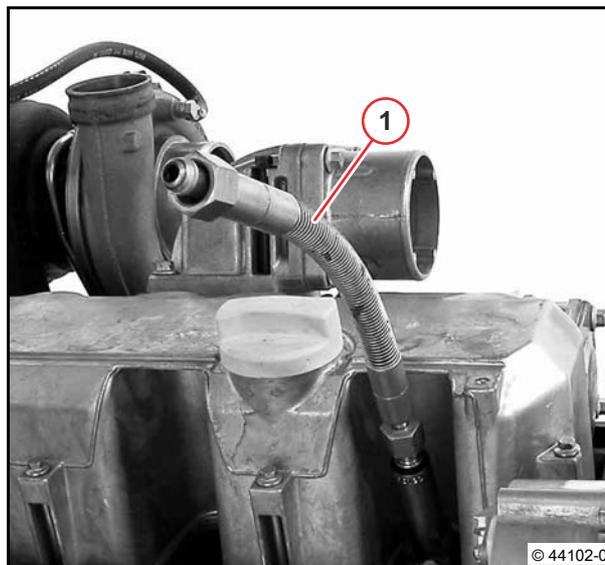
 25 Nm



When installing the connector on cylinders 1 to 5, the clamping shoe must be inserted together with the connector.



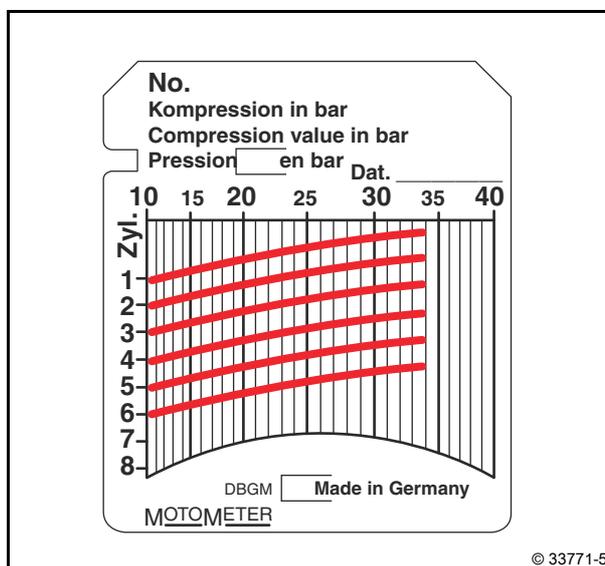
- Connect adapter (1) to connector.



- Connect compression pressure tester to connector.
- Turn over engine with starter.



The measured compression pressure depends on the starting speed during the measuring process and the altitude of the engine installation site. Therefore, limit values cannot be determined exactly. The compression pressure measurement is only recommended as a reference measurement of all cylinders of an engine to each other. If more than 15% deviation has been determined, the cause should be determined by disassembling the cylinder unit concerned.

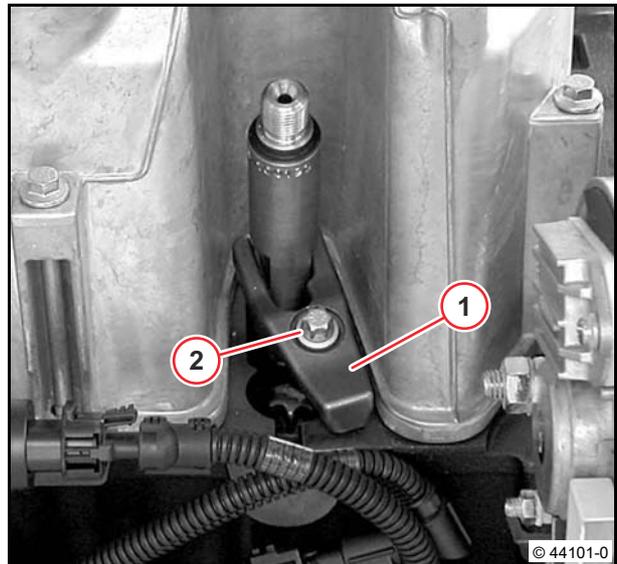


- Remove the compression pressure tester.



- Unscrew screw (1).
- Remove clamping shoe (2).
- Remove connector.
- Remove sealing ring.
- Installing the injector.

 [W 19-01-01](#)



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A49 001	Connection piece on cylinder head, clamping shoe			25 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

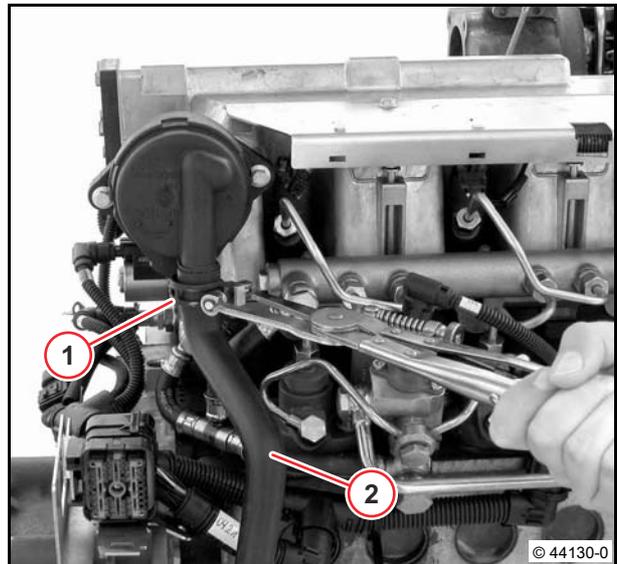
Removing and installing the cylinder head cover



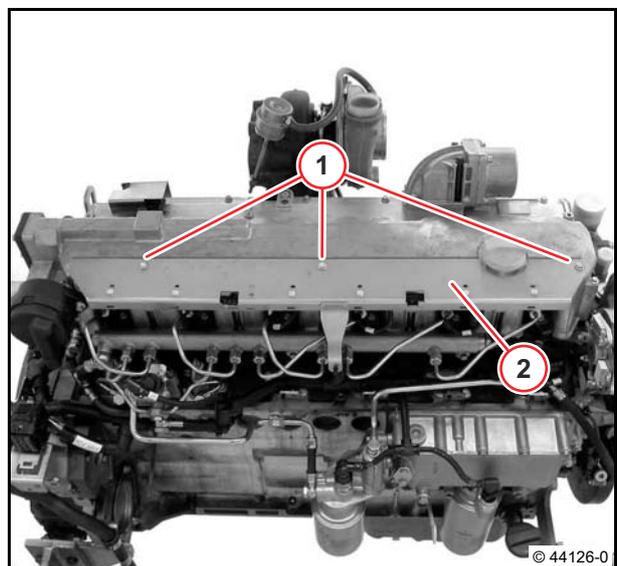
Standard tools:
– Spring band pliers 9090

Removing cylinder head

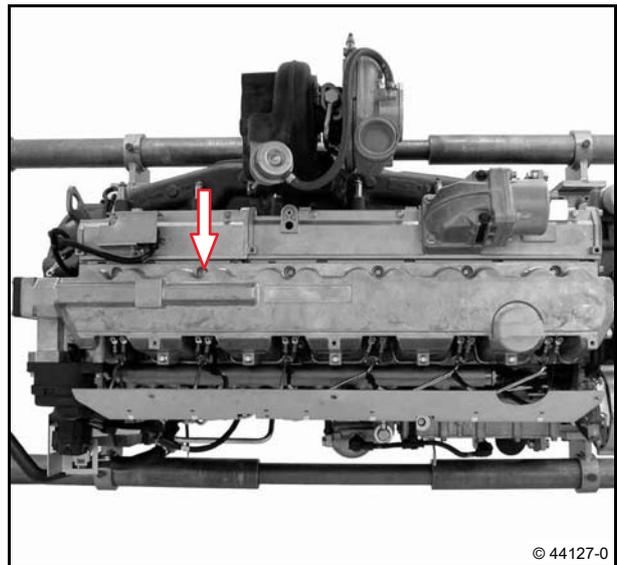
- Loosen spring band clip (1) with spring band pliers.
- Pull off bleeding hose (2).



- Unscrew screws (1).
- Remove the cover (2).



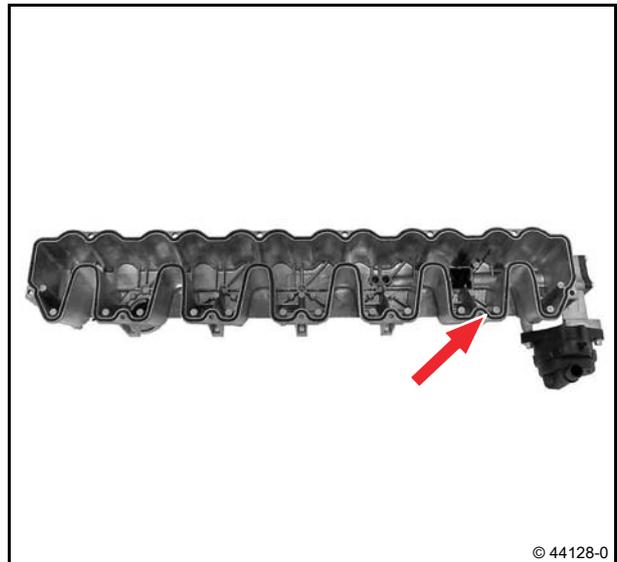
- Unscrew all screws.
- Remove cylinder head cover and gasket.



6

Installing cylinder head cover.

- Clean sealing surfaces.
- Insert new gasket (arrow).



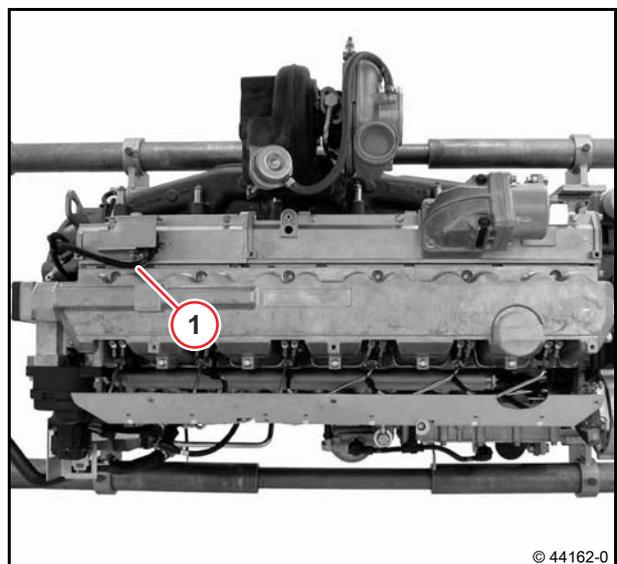
- Mount cylinder head cover.
- Tighten screws alternately.

 13 Nm



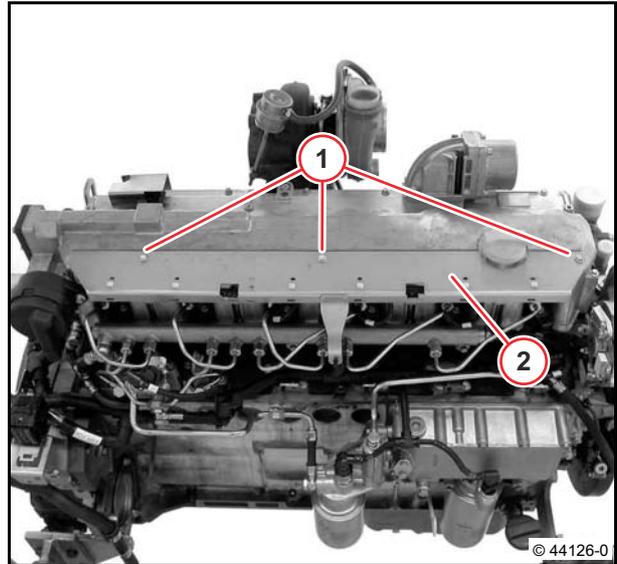
Attention!

Do not trap the cable (1).

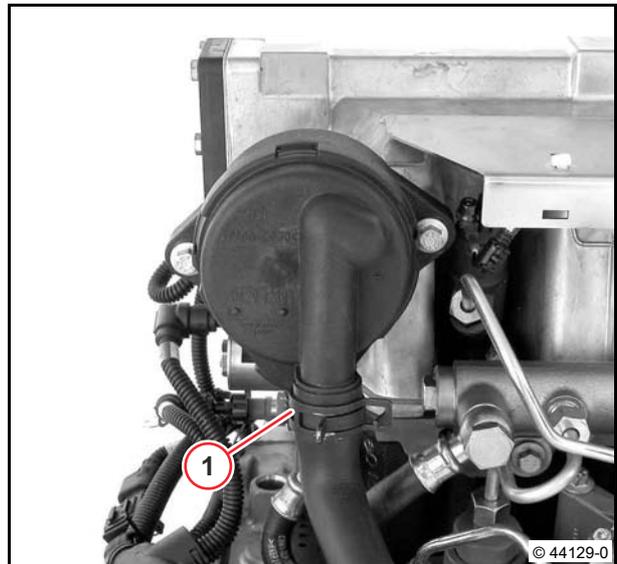


- Mount cover (2).
- Tighten screws (1).

 8.5 Nm



- Plug on bleeding hose.
- Position the spring band clip (1) with the spring band pliers.



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A01 004	Cylinder head cowling on cylinder head	M6		13 Nm
A13 041	Cover plate on cylinder head cover	M6x16	self-tapping	8.5 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

Removing and installing the exhaust return module



Standard tools

- W 08-01-01
- W 11-01-01

Remove exhaust return module

- Remove the cylinder head hood.

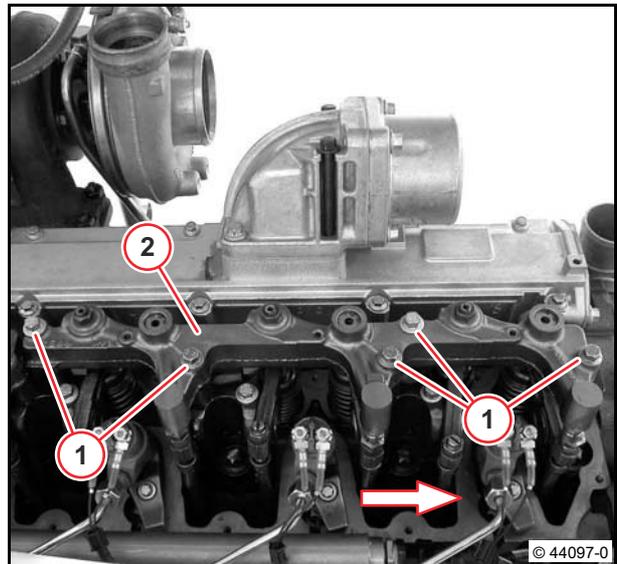
 W 08-01-01

- Unscrew screws (1).



Loosen screws evenly to avoid jamming the exhaust return module.

- Pull the exhaust return module (2) off the plug element in the direction of the arrow.
- Remove exhaust return module (2).

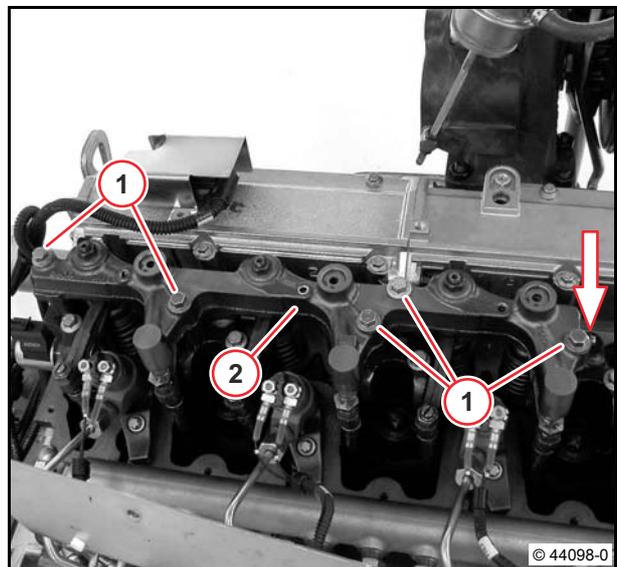


- Unscrew screws (1).
- Remove exhaust return module (2).



Loosen screws evenly to avoid jamming the exhaust return module.

Note plug element (arrow).



- Visually inspect the components.



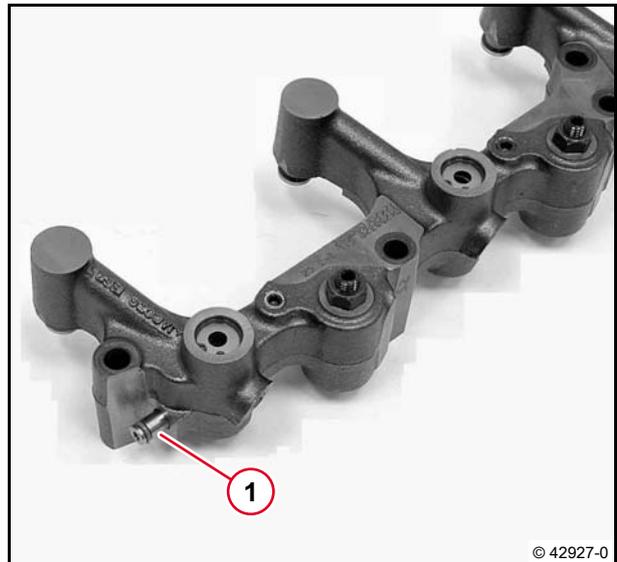
6

Installing the exhaust return module

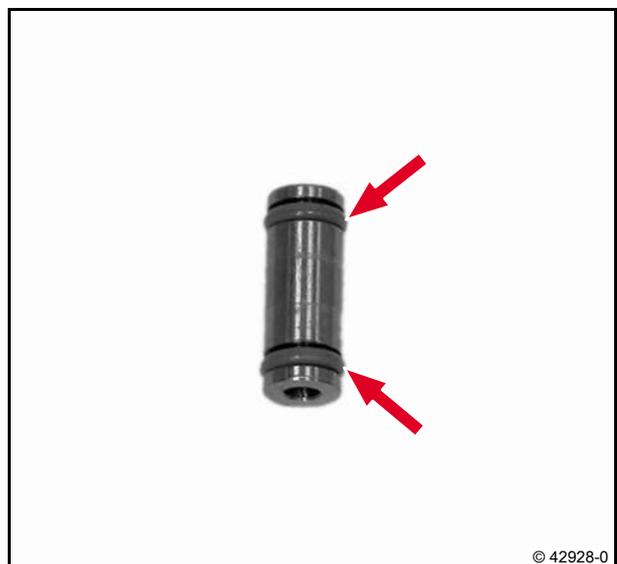
- Setting the valve clearance (with or without removal of exhaust return module).

 [W 11-01-01](#)

- Pull out plug element (1).



- Insert new O-rings (arrows).
- Oil O-rings lightly.
- Push plug element into exhaust return module.



- Mount exhaust return module for cylinders 1 - 3.
- Fasten screws.

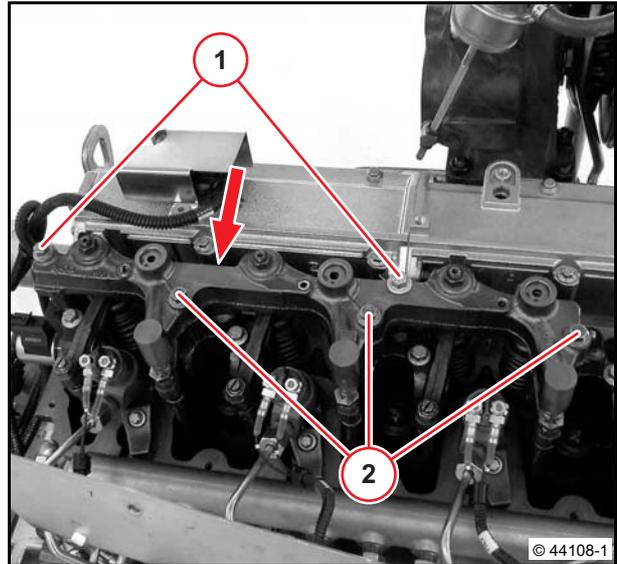


Note identification (1) for assignment of the exhaust gas return modules.

Note different screw lengths:

Screws M8 x 55 mm (2)

Screws M8 x 120 mm (3)



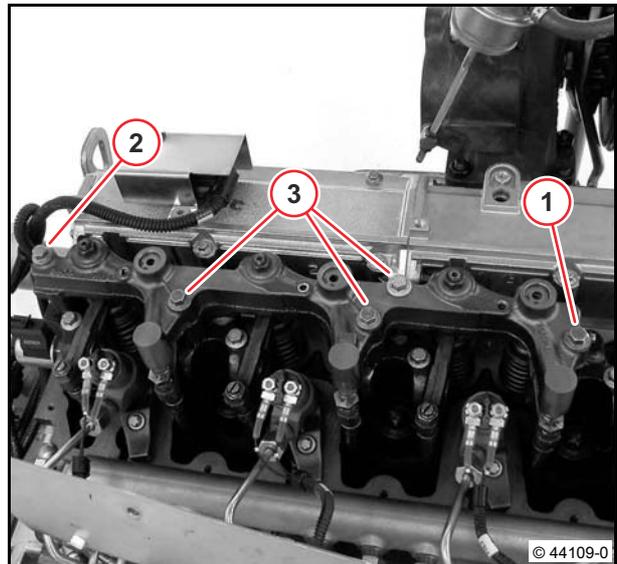
- Retighten the screws (1), (2) and (3) in the tightening order.

– Stage 1:

 10 Nm

– Stage 2:

 30 Nm



- Push exhaust return module for cylinders 4 - 6 onto plug element.
- Fasten screws.

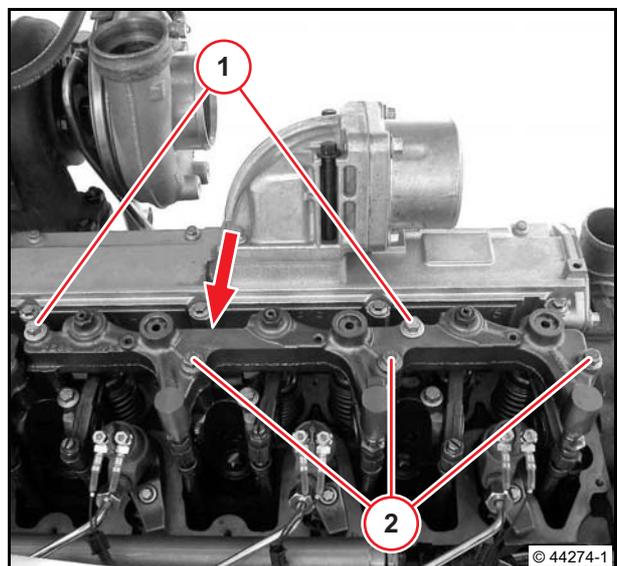


Note identification (1) for assignment of the exhaust gas return modules.

Note different screw lengths:

Screws M8 x 55 mm (2)

Screws M8 x 120 mm (3)



- Retighten the screws (1), (2) and (3) in the tightening order.

– Stage 1:

 10 Nm

– Stage 2:

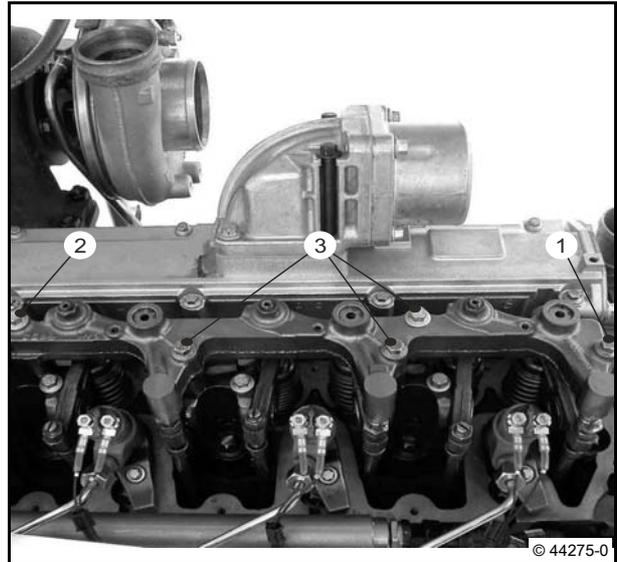
 30 Nm

- Set the control piston clearance.

 [W 11-01-01](#)

- Mount cylinder head cover.

 [W 08-01-01](#)



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A01 011	Exhaust gas return module on rocker arm bracket		Stage 1: Observe tightening sequence	10 Nm
A01 011	Exhaust gas return module on rocker arm bracket		Stage 2: Observe tightening sequence	30 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.



Removing and installing the solenoid valve (exhaust gas return)



Standard tools



– W 01-01-01



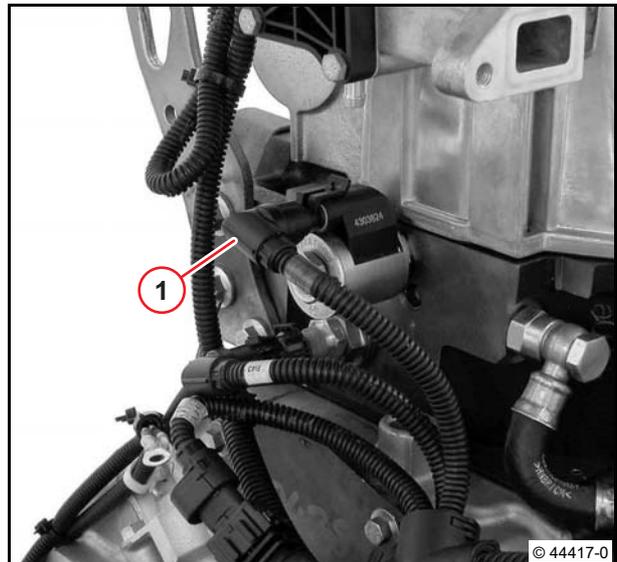
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing the solenoid valve (exhaust return line)

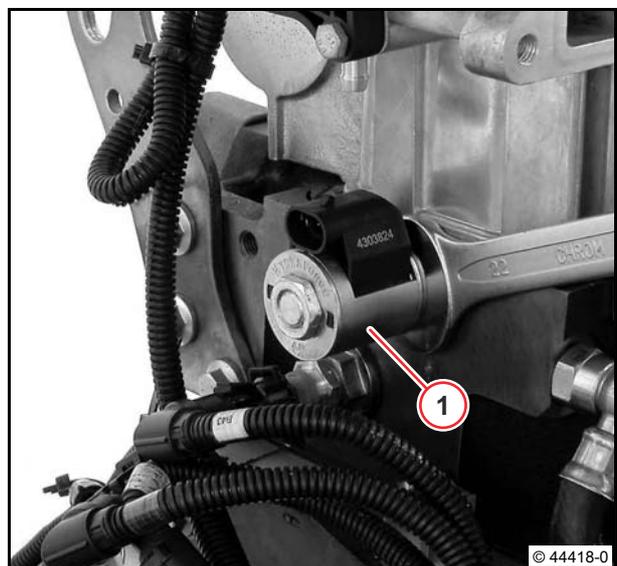
- Removing the crankcase breather.

 W 01-01-01

- Unlock cable plug.
- Pull out cable plug (1).



- Unscrew solenoid valve (1).



- Visually inspect the components.



© 44419-0

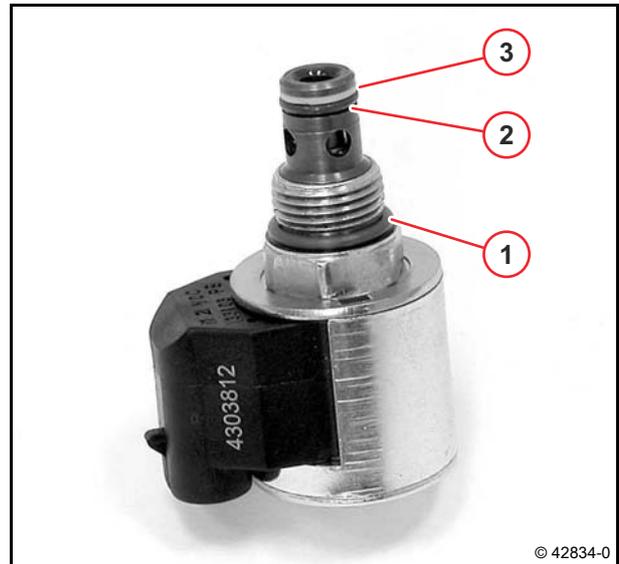
Installing the solenoid valve (exhaust return line)

- Clean sealing surfaces.
- Mount new O-ring (1).
- Insert new O-ring (2).



Observe the order of installation of the O-ring (2) and the support ring (3).

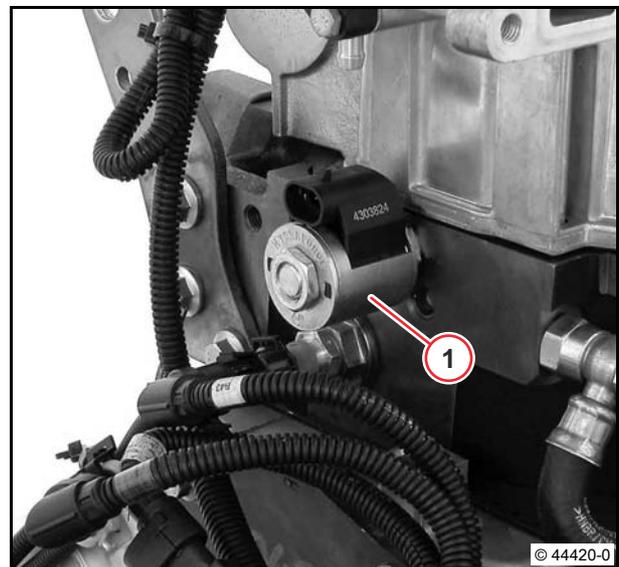
- Oil O-rings lightly.



© 42834-0

- Tighten solenoid valve (1).

24 Nm



© 44420-0

- Plug in the cable plug (1).

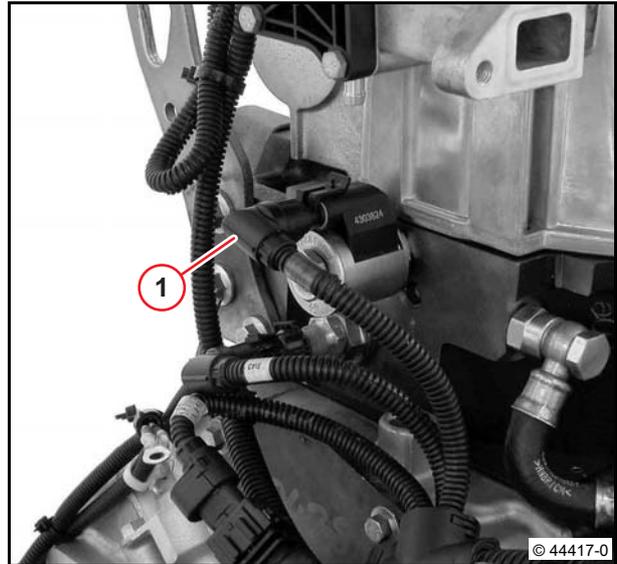


Ensure that the connection is perfect.

- Install crankcase breather.



[W 01-01-01](#)





Removing and installing cylinder head



Standard tools:

- Torx tool set 8189
- Rotation angle disc 8190



- W 01-05-01
- W 08-01-01
- W 08-03-02
- W 11-02-01
- W 19-01-01
- W 21-02-01
- W 22-01-01
- W 38-02-01
- W 41-01-01
- W 44-02-01
- W 49-02-01

Removing the cylinder head

- Attach turning gear.

 W 49-02-01

- Remove generator.

 W 44-02-01

- Unscrew screw (1).

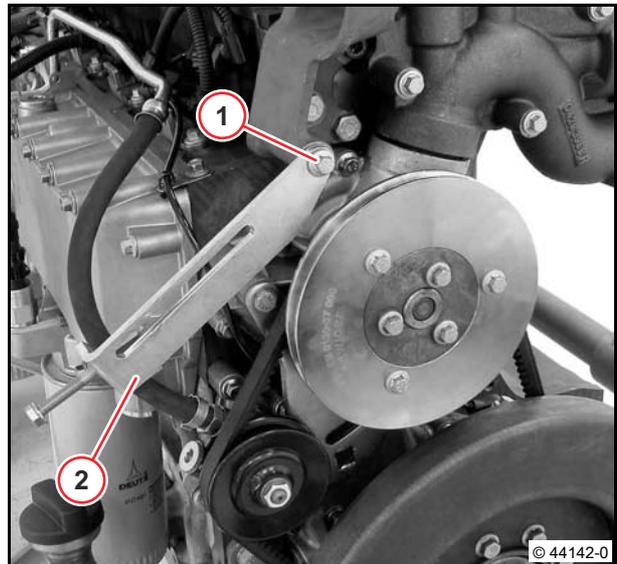
- Remove clamping strap (2).

- Remove thermostat housing.

 W 38-02-01

- Remove the exhaust pipe.

 W 41-01-01



- Remove the rail.

 W 21-02-01

- Unlock cable plug (1) and remove.

- Remove injector.

 W 19-01-01

- Remove the cylinder head hood.

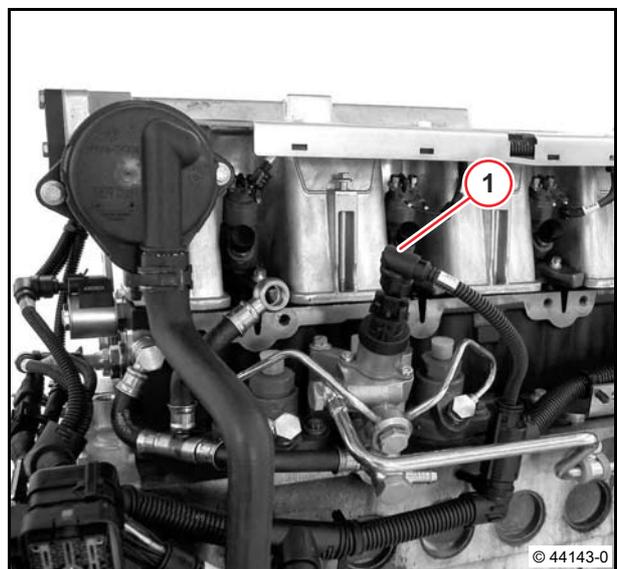
 W 08-01-01

- Remove rocker arm brackets and stop rods.

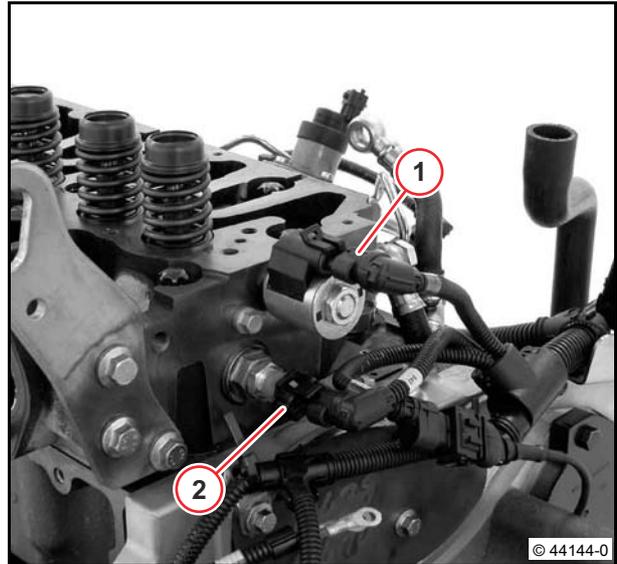
 W 11-02-01

- Remove the charge air pipe.

 W 22-01-01



- Unlock cable plug (1) and remove.
- Unlock cable plug (2) and remove.

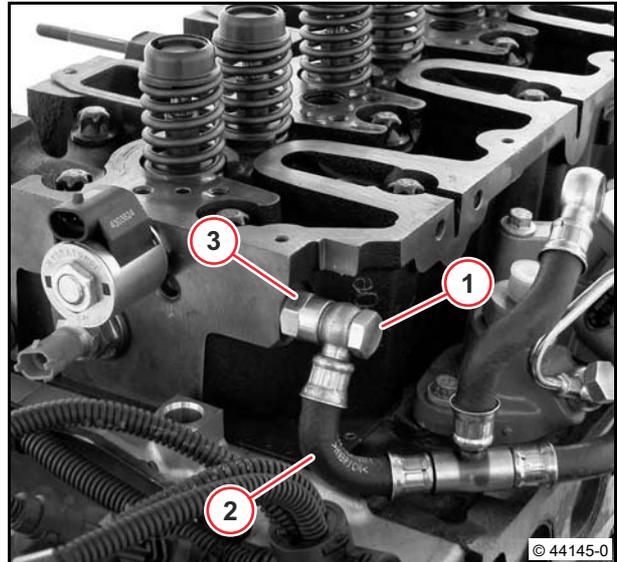


6

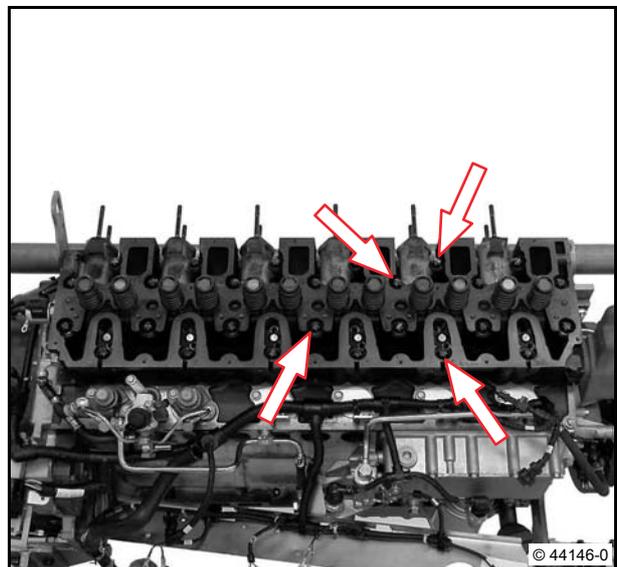


Hold connection piece (3).

- Unscrew hollow screw (1).
- Remove sealing rings.
- Remove fuel return line (2).



- Unscrew all screws (arrows).

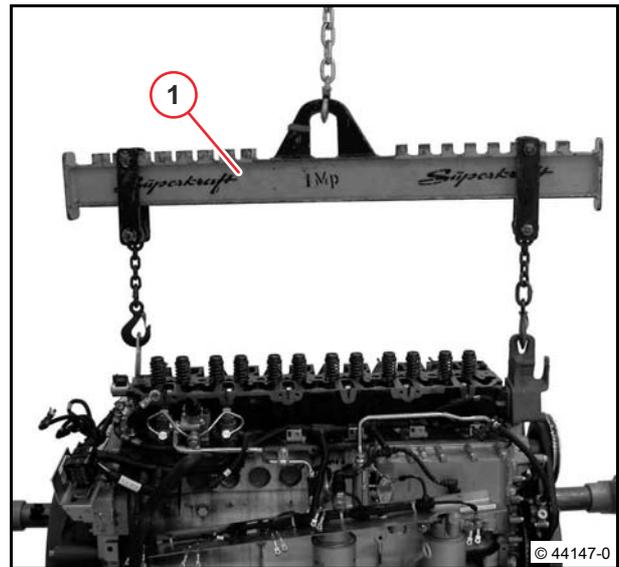


- Hang cylinder head on suitable cross beam (1) and workshop crane.

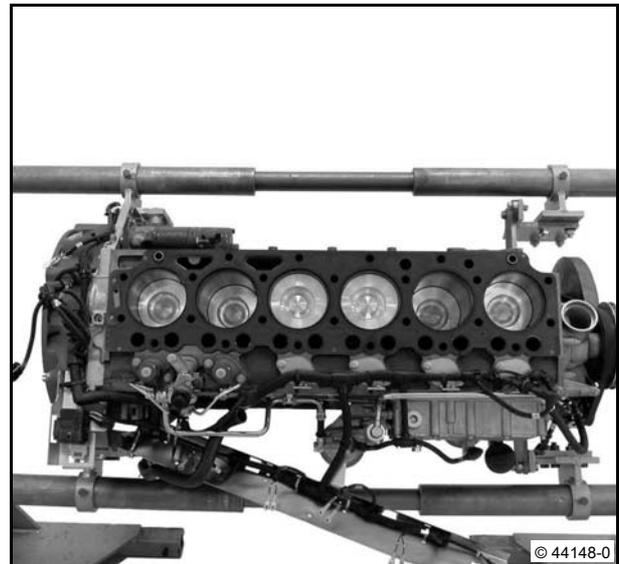


Align chains parallel to the cross beam.

- Lift the cylinder head carefully from the crankcase.



- Remove the cylinder head gasket.
- Clean sealing surfaces.



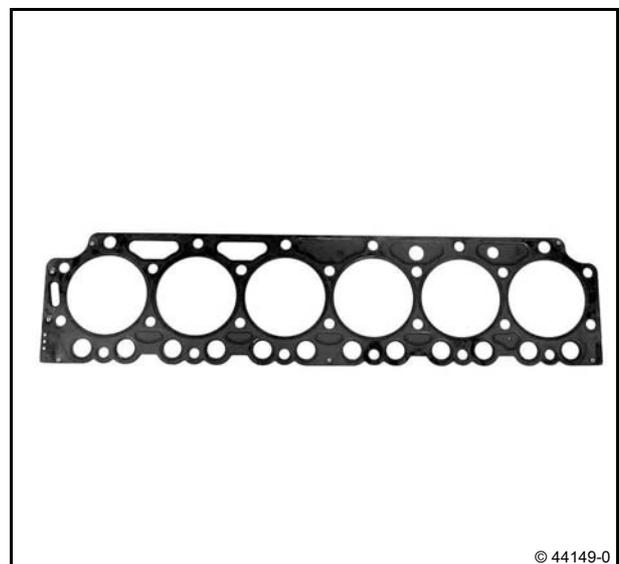
Installing the cylinder head

- Check the overhang of the cylinder liner.

 [W 01-05-01](#)

- Check piston overhang.

 [W 08-03-02](#)



- Select cylinder head gasket according to the largest piston projection measured.

 0,28 - <0,54 mm

1 hole, cylinder head gasket 1.42 mm

 0,54 - <0,64 mm

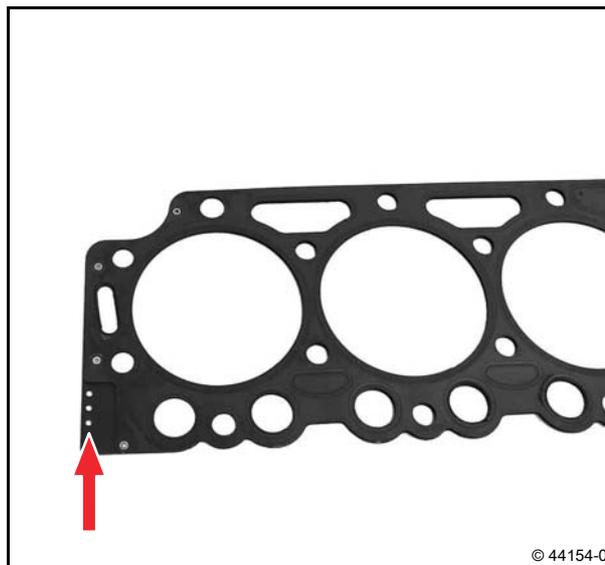
2 hole, cylinder head gasket 1.52 mm

 0,64 - <0,75 mm

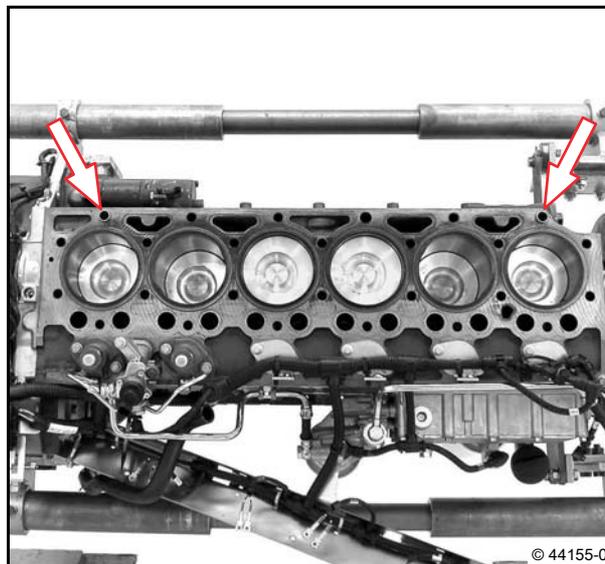
3 hole, cylinder head gasket 1.62 mm



Example: Piston projection = 0.7 mm corresponds to cylinder head gasket with 3 holes (arrow).



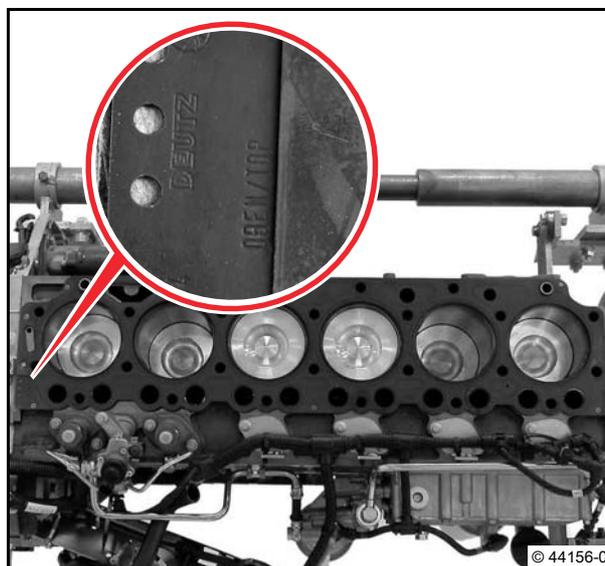
- Make sure the clamping bushings (arrows) are in place.



- Fit a new cylinder head gasket.



The sealing surfaces for the cylinder head gasket must be clean and free of oil.
Label OBEN / TOP facing the cylinder head.



- Fit cylinder head.
- Oil the cylinder head screws slightly.
- Fasten screws.



Attention!

Cylinder head screws can be used max. 3 times with written proof, otherwise renew every time they are loosened.



- Tighten all cylinder head screws according to the tightening sequence.

– Stage 1:

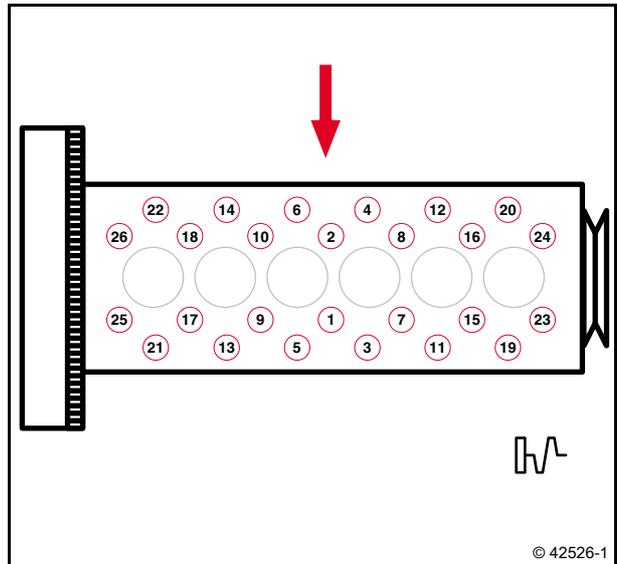
 50 Nm

– Stage 2:

 130 Nm

– Stage 3:

 90°



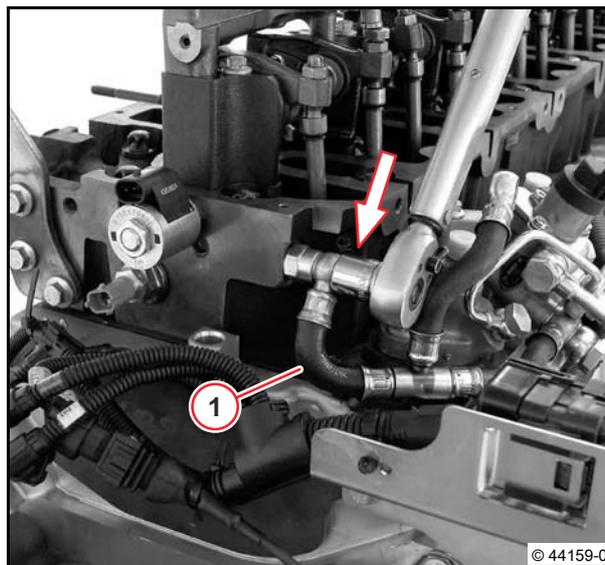
- Install rocker arm brackets and stop rods.

 [W 11-02-01](#)



- Mount fuel return pipe (1).
- Tighten hollow screw (arrow) with new sealing rings.

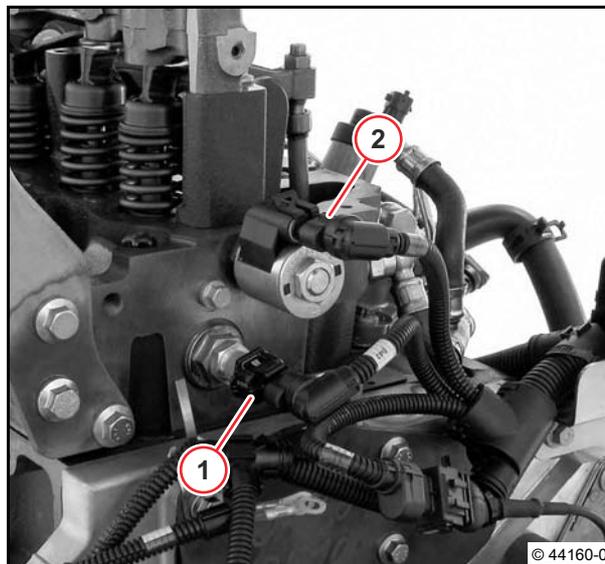
29 Nm



- Plug cable plug (1) onto temperature transmitter.
- Plug cable plug (2) into the solenoid valve (exhaust gas return line).



Ensure that the connection is perfect.



- Installing the injector.

W 19-01-01

- Mount cylinder head cover.

W 08-01-01



Do not tighten the screws of the clamping shoe until after assembling the rail.

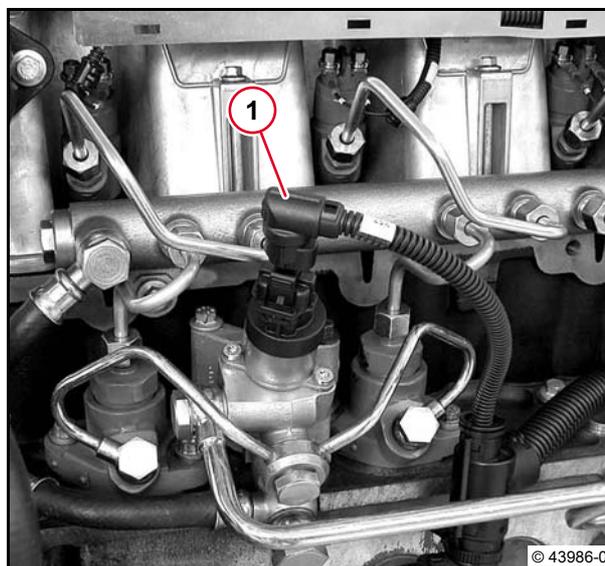
- Install rail.

W 21-02-01

- Plug in the cable plug (1).



Ensure that the connection is perfect.



- Install the charge air pipe.

 W 22-01-01

- Install the exhaust pipe.

 W 41-01-01

- Install thermostat housing.

 W 38-02-01

- Mount clamping strap (2).

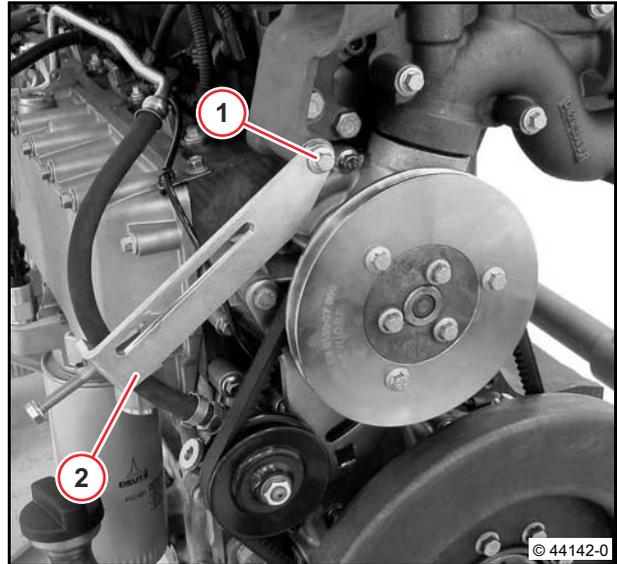
- Fasten screw (1).

- Install generator.

 W 44-02-01

- Remove turning gear.

 W 49-02-01





Checking piston overhang



Standard tools

Special tools:

- Dial gauge 100400
- Measuring device 100750



- W 08-03-01
- W 49-02-01

Checking piston overhang

- Attach turning gear.

W 49-02-01

- Remove cylinder head.

W 08-03-01

- Turn the crankshaft until the respective piston is just in front of the top dead centre (arrow).



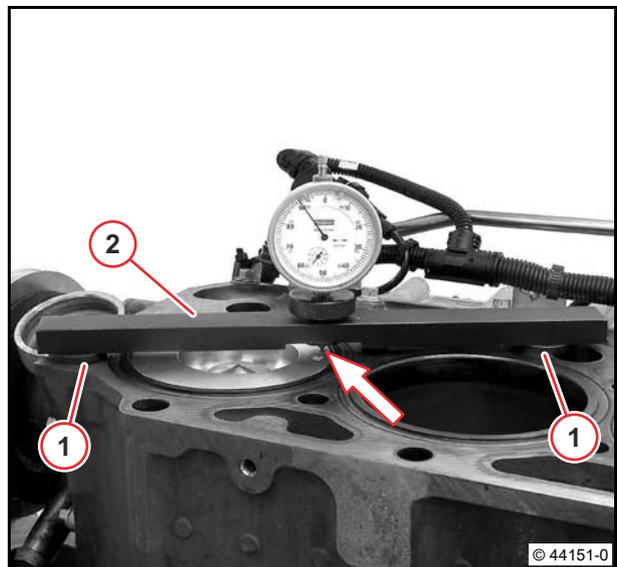
Keep the cylinder liner pressed down to the stop.



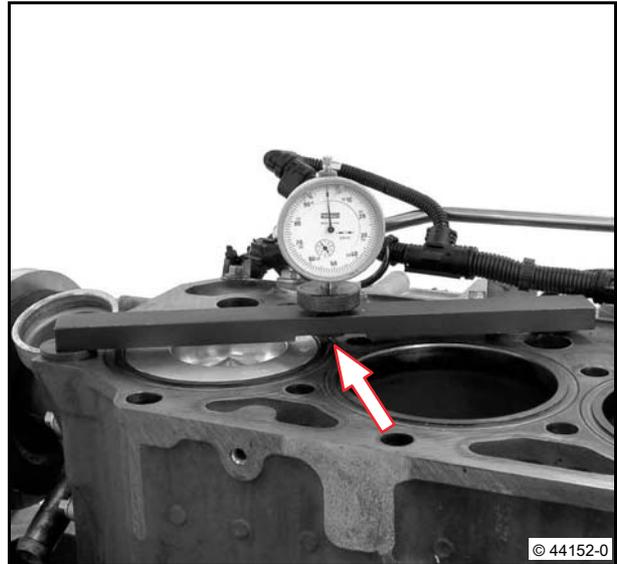
- Insert dial gauge into measuring beam.
- Place shims (1) and measuring beam (2) on the sealing surface of the crankcase.
- Apply the stylus to the piston base (arrow) under pre-tension.
- Continue turning the crankshaft evenly until the reversal point of the pointer on the dial gauge is reached.



The piston is now at top dead centre (TDC).



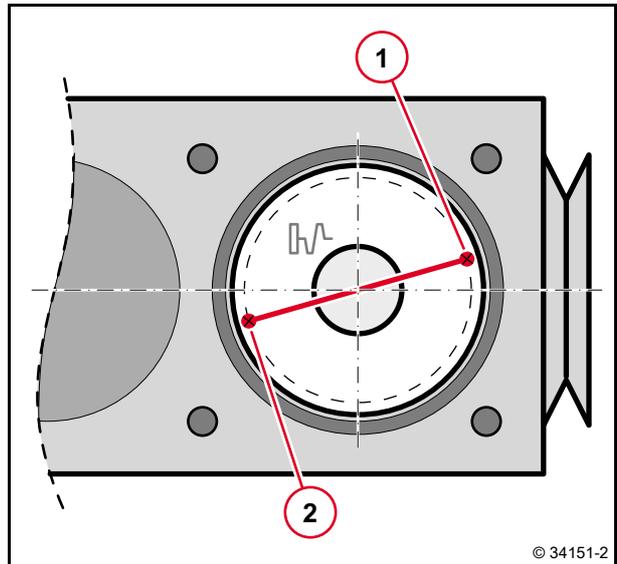
- Move the measuring beam.
- Apply the stylus to the sealing surface of the cylinder liner (arrow) under pre-tension.
- Adjust dial gauge to "0".



6



Measuring points see diagram.
Measuring points (1) and (2).



- Move the measuring beam.
- Apply stylus to the specified measuring points under pre-tension.



Measuring points see diagram.
Do not position the stylus on the piston marking.

- Note the largest measured value.



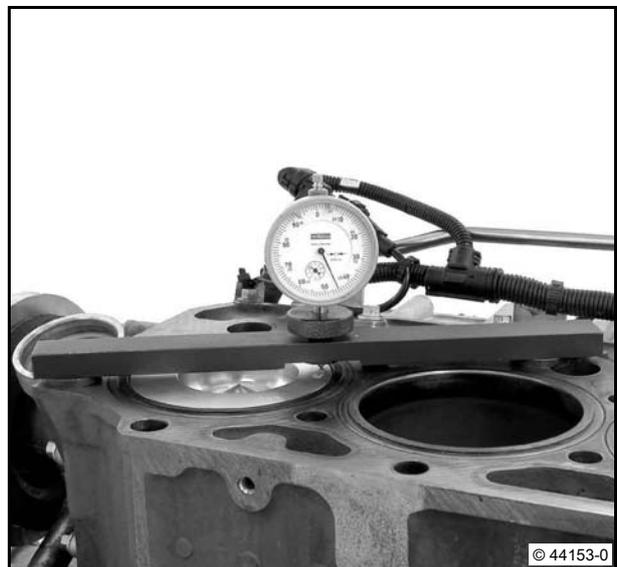
Measure the piston overhang on all pistons.

- Install cylinder head.

[W 08-03-01](#)

- Remove turning gear.

[W 49-02-01](#)



Removing and installing the valves



Standard tools:

- Slide gauge
- Assembly lever 9017

Special tools:

- Support bracket 120900
- Base plate 120910



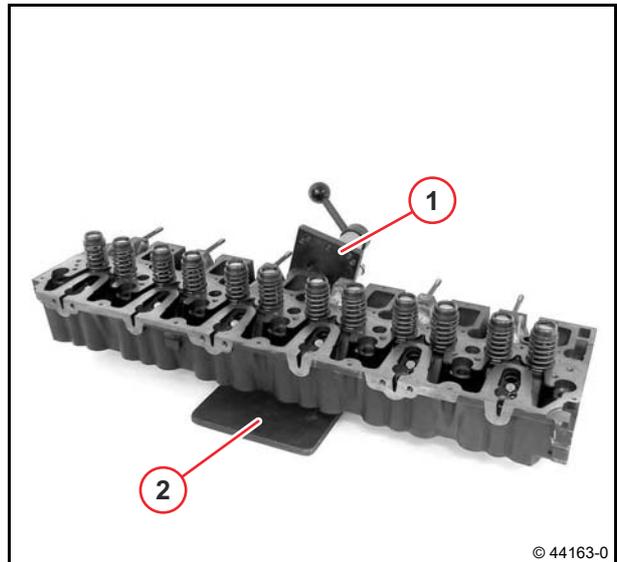
- W 08-03-01

Removing the valves

- Remove cylinder head.

W 08-03-01

- Mount support bracket (1) on base plate (2).
- Mount cylinder head on support bracket.



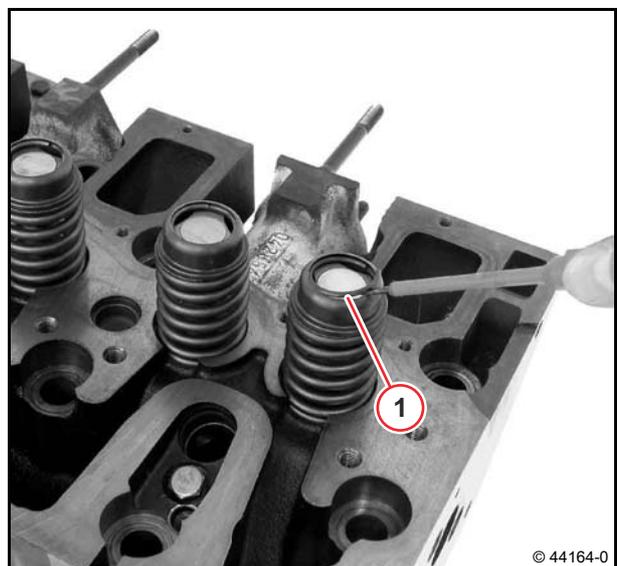
© 44163-0

- Remove snap ring (1).



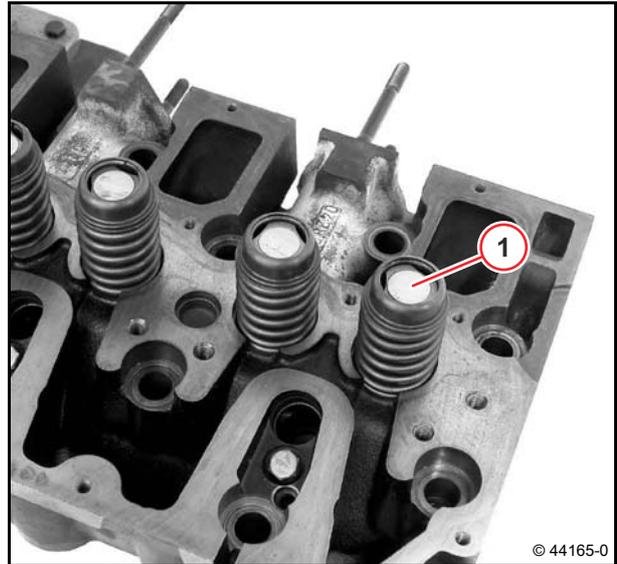
Danger!

Risk of injury! Snap ring springs off.

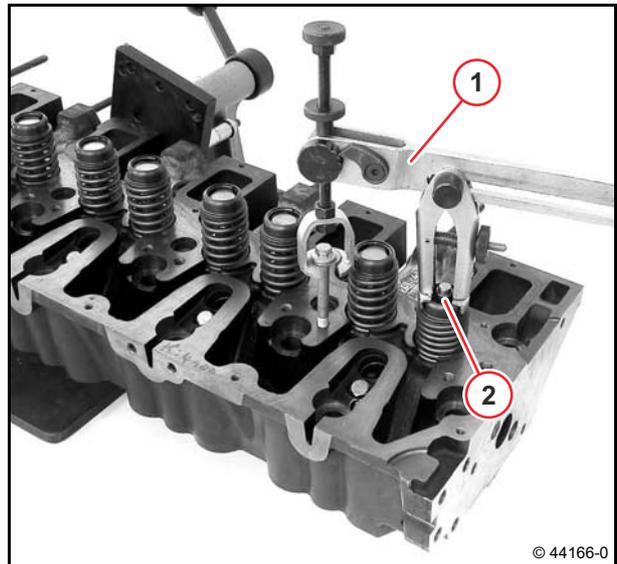


© 44164-0

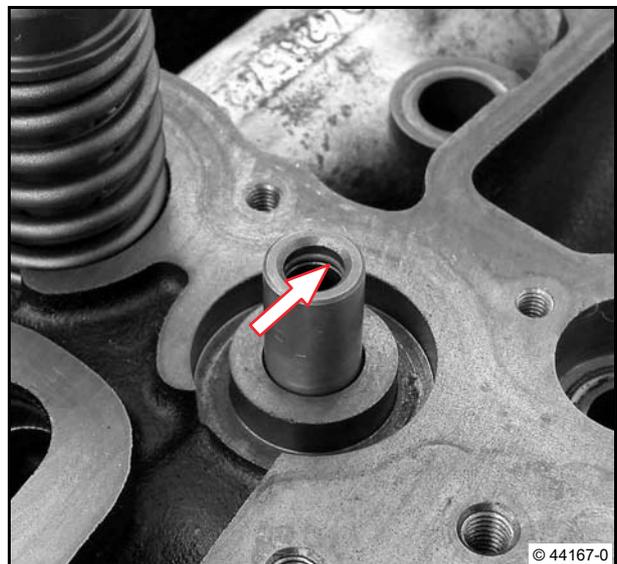
- Remove thrust washer (1).



- Install assembly lever (1).
- Press down valve spring with assembly lever.
- Remove both taper collets (2).
- Remove valve spring plates, valve springs and valves.
- Remove assembly lever.



- Remove valve stem sealing ring (arrow).



- Clean cylinder head.
- Check cylinder head.
- Visually inspect the components.



Installing the valves

- Measure valve spring length with slide gauge.

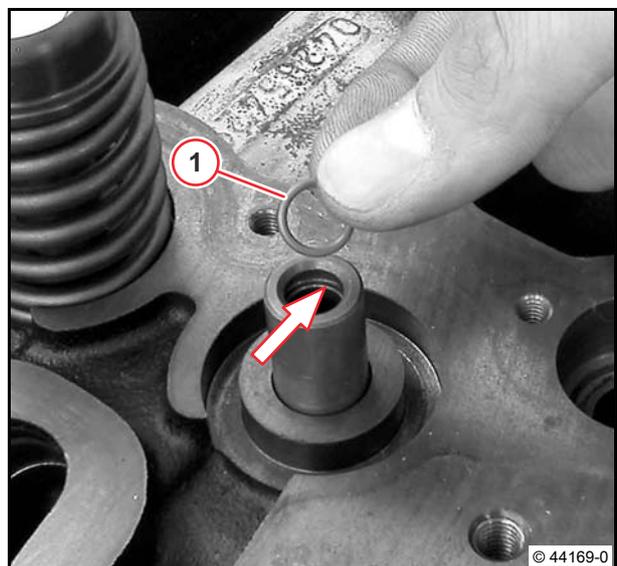
 64,7 mm



When the wear limit is reached, the valve spring must be renewed.



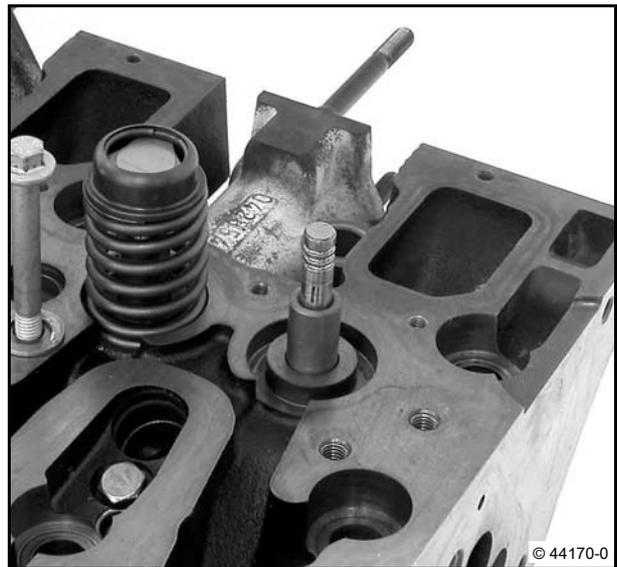
- Oil the new valve stem sealing ring lightly.
- Insert the valve stem sealing ring (1) in the groove (arrow) of the valve guide.



- Oil the valve stem lightly.
- Insert the valve in the valve guide by turning with a slight pressure.



Do not damage or press out the valve stem seal when inserting the valve.

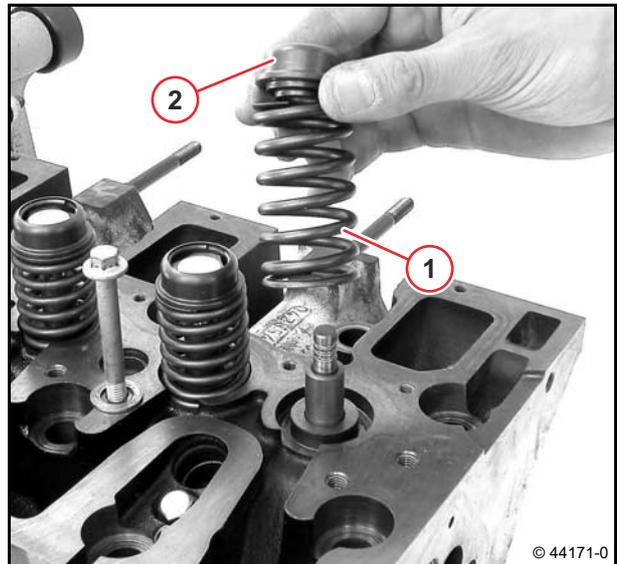


6

- Insert valve spring (1).
- Insert valve spring plate (2).



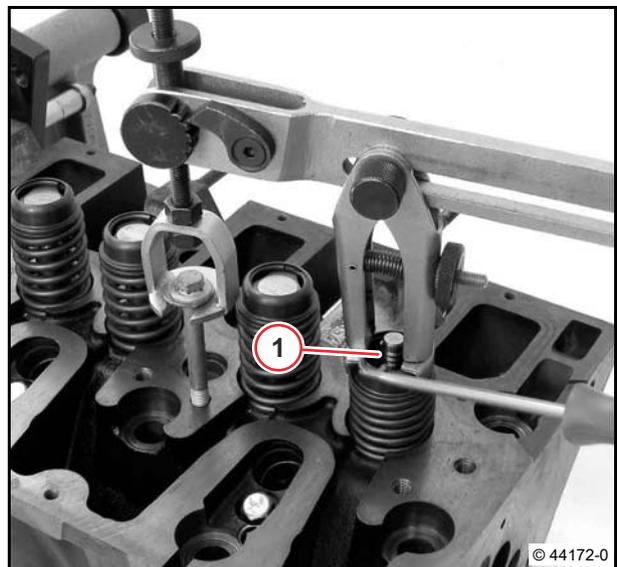
The closely wound end of the valve plate faces the cylinder head.



- Mount assembly lever.
- Press down the valve spring with the assembly lever and insert both taper collets (1).



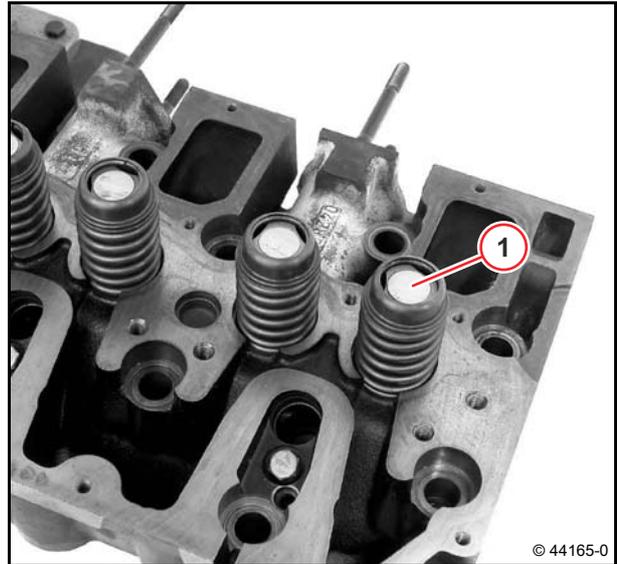
Make sure the taper collets fit correctly in the valve keyway.



- Remove assembly lever.
- Insert thrust washer (1).



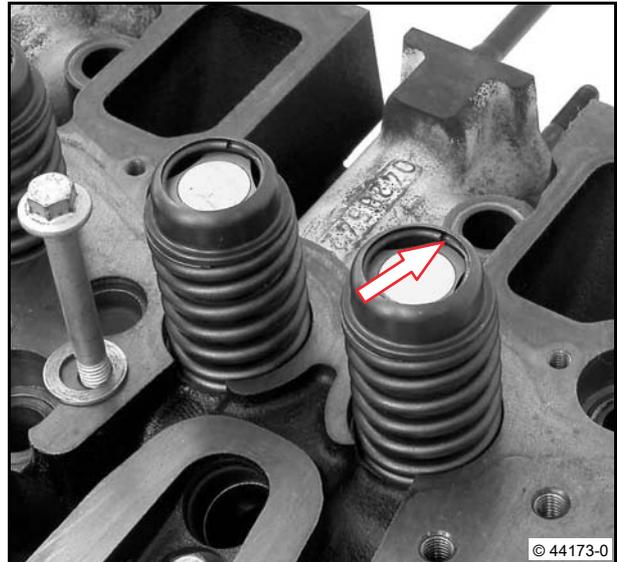
Ensure that the installation location is free from faults.



- Insert snap ring (arrow).

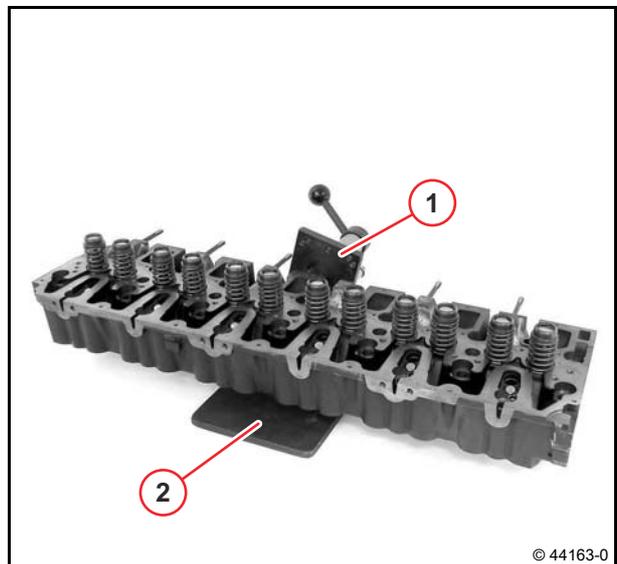


Ensure that the installation location is free from faults.



- Remove cylinder head from support bracket (1).
- Remove support bracket from base plate (2).
- Install cylinder head.

 [W 08-03-01](#)





Checking the valves



- Standard tools:
- Micrometer gauge
 - Slide gauge



– W 08-04-01



Clean all valves.
When the wear limit is reached, the valve must be renewed.

Checking valve stem diameter

- Remove valves.

 W 08-04-01

- Measure valve stem diameter with micrometer gauge.

- Inlet valve

 8,98⁰_{-0,05} mm

- Exhaust valve

 8,96⁰_{-0,05} mm



Checking valve edge thickness

- Measure valve edge thickness with slide gauge.

- Inlet valve

 2,62 mm

- Exhaust valve

 2,3 mm



Checking valve head diameter

- Measure valve head diameter with slide gauge.

– Inlet valve

 48^{+0.1}_{-0.1} mm

– Exhaust valve

 42^{+0.1}_{-0.1} mm

- Install valves.

 [W 08-04-01](#)



Checking the valve guide



Standard tools:

- Magnetic measuring stand

Special tools:

- Dial gauge 100400



– [W 08-04-01](#)



New valves are used for testing.

When the wear limit is reached, the valve guide must be renewed.

Checking the valve guide

- Remove valves and valve shaft seals.

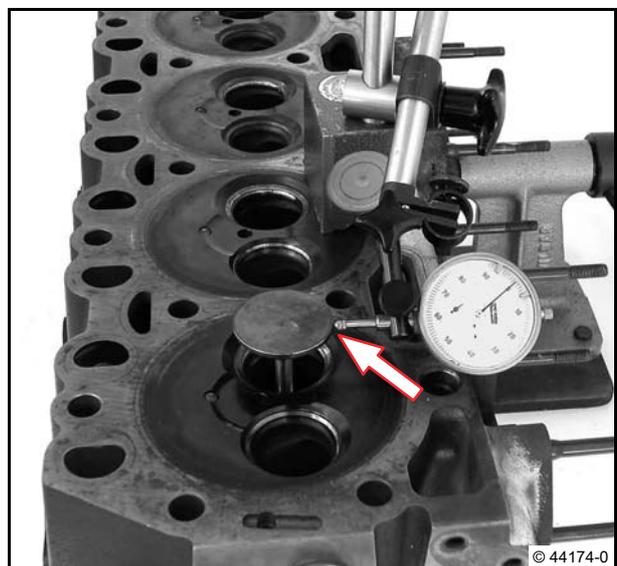


[W 08-04-01](#)

- Visually inspect valve guide for wear.



- Mount magnetic measuring stand.
- Insert dial gauge.
- Insert new valve.
- Place stylus under pre-tension on the valve head (arrow).
- Adjust meter to "0".



Measure valve stem clearance

- Move valve back and forth in direction of arrow.

– Inlet valve

 0,045 - 0,075 mm

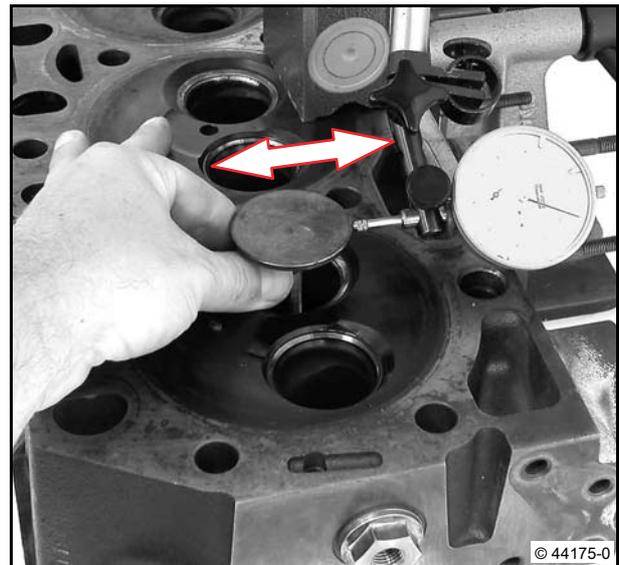
– Exhaust valve

 0,065 - 0,095 mm



The valve stem ends must be flush with the valve guide.

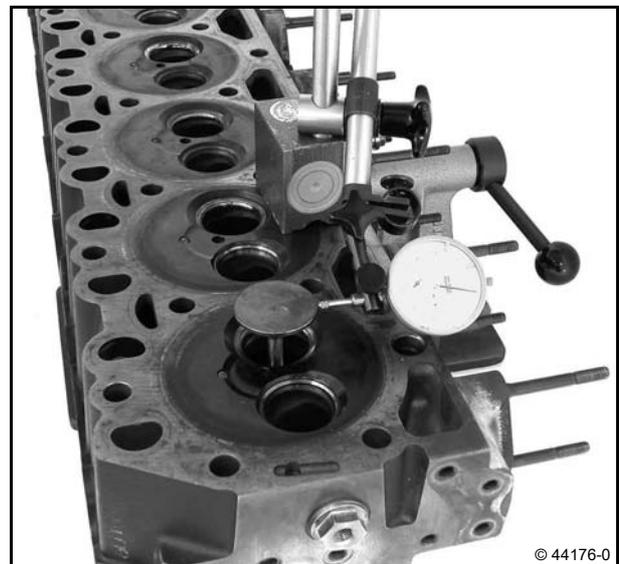
The whole rocker path must be taken into consideration.



© 44175-0

- Remove magnetic measuring stand.
- Remove dial gauge.
- Install valves.

 [W 08-04-01](#)



© 44176-0

Checking the valve lag



Standard tools:
– Depth-measuring
appliance

Special tools:
– Support bracket 120900
– Base plate 120910



– W 08-03-01



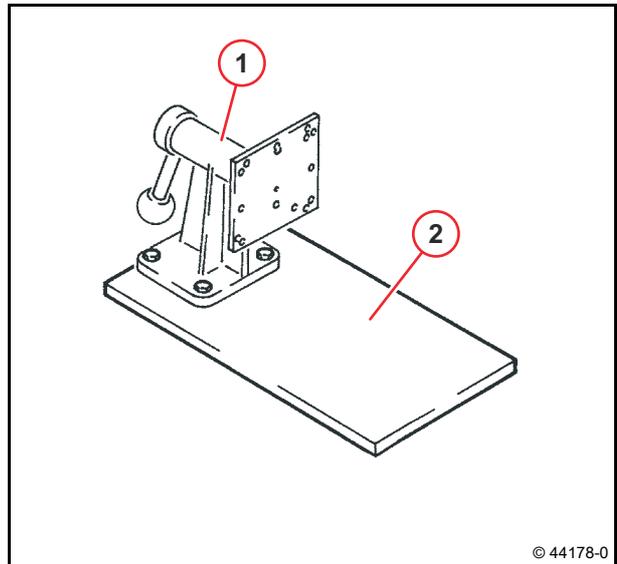
Attention!

When the wear limit is reached, the valve seat insert and/or valve must be renewed.

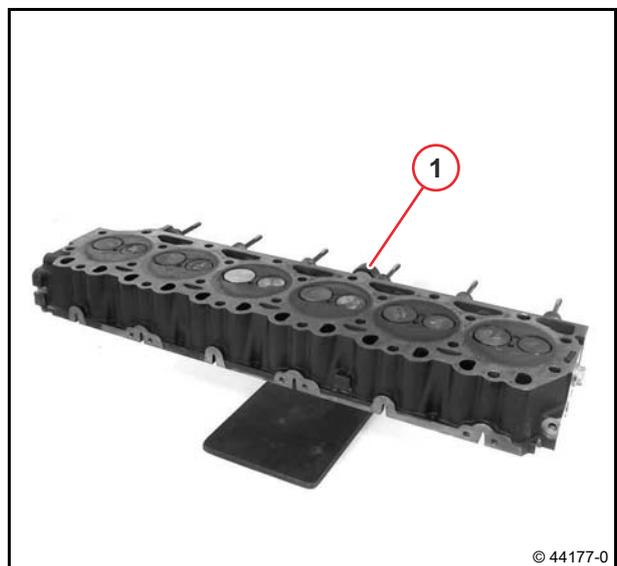
Checking the valve lag

- Mount support bracket (1) on base plate (2).
- Remove cylinder head.

W 08-03-01



- Mount cylinder head on support bracket (1).



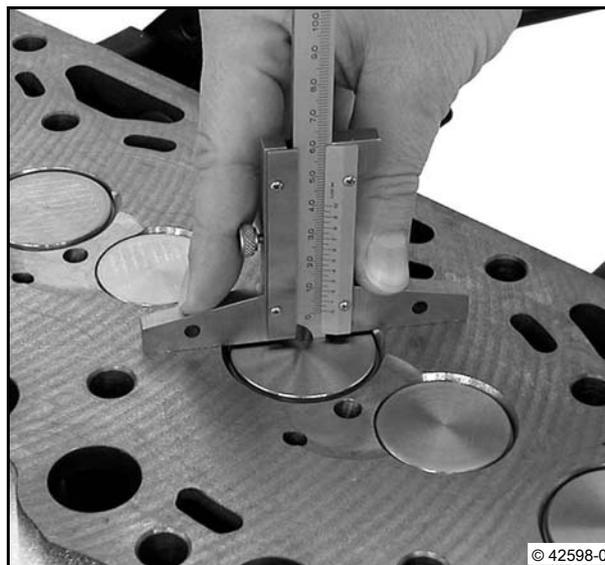
- Measure the valve lag from the centre of the valve head to the cylinder head sealing surface.

– Inlet valve

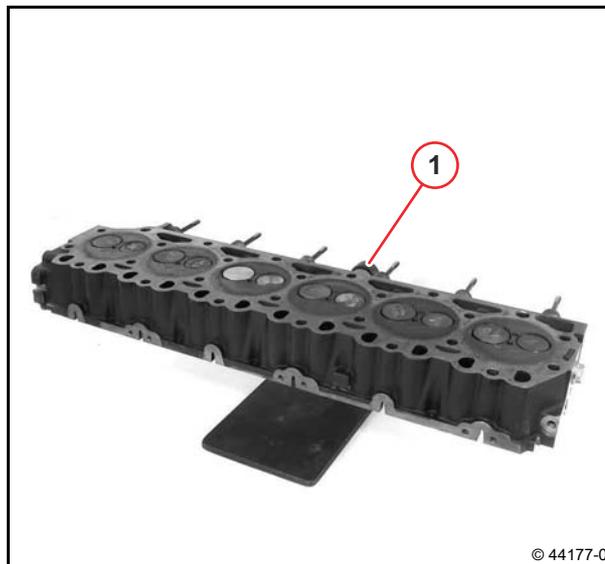
 0,99^{+0.1}_{-0.1} mm

– Exhaust valve

 1^{+0.15}_{-0.1} mm

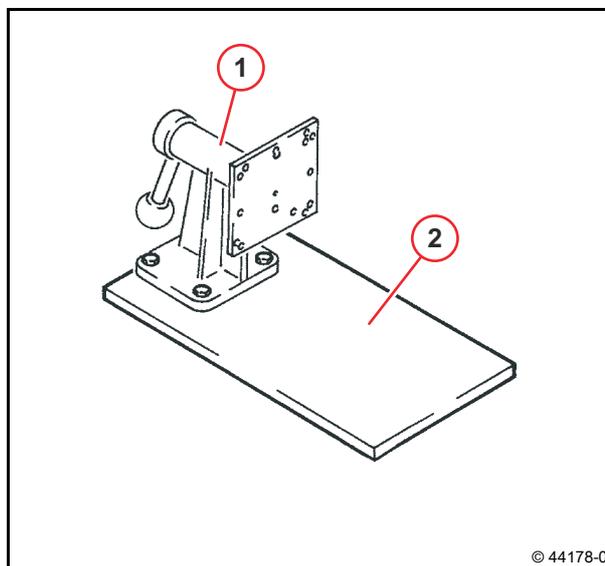


- Remove cylinder head from support bracket (1).



- Remove support bracket (1) from base plate (2).
- Install cylinder head.

 [W 08-03-01](#)



Renewing the crankshaft sealing ring (flywheel side)



Standard tools:

- Pricker 8198
- Assembly lever 9017

Special tools:

- Assembly tool 142810



- Self-tapping screw
- Washer



- W 05-03-01

Removing the crankshaft sealing ring

- Remove flywheel.



W 05-03-01

- Make a hole of approximately 3 mm in the crankshaft sealing ring with a pricker.



Attention!

Do not damage the gearcase cover and crankshaft.



© 44188-0

- Turn in a self-tapping screw with washer.



© 44189-0

- Pull out the crankshaft sealing ring with assembly lever.



- Visually inspect all running surfaces.

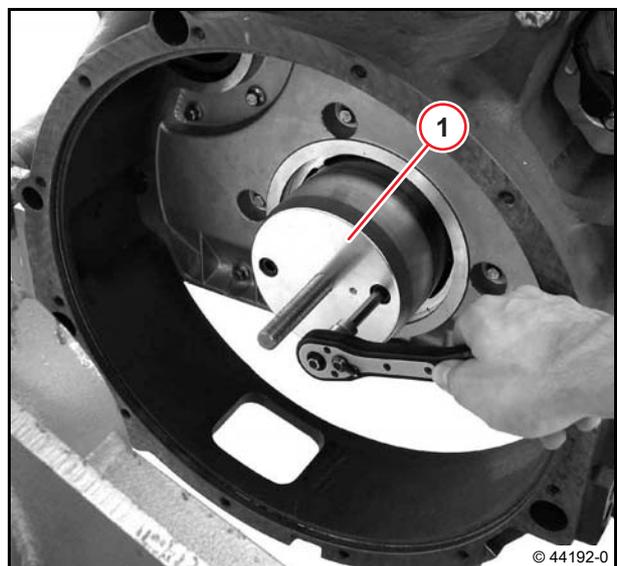


Install crankshaft sealing ring

- Mount guide sleeve (1).
- Tighten screws .



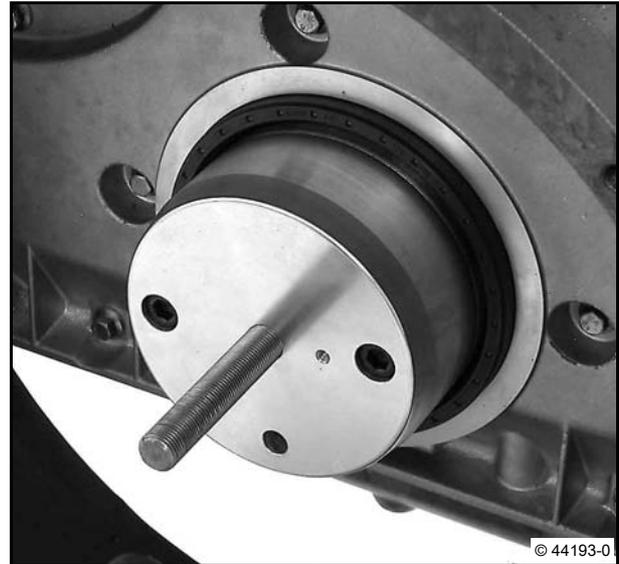
The bores in the guide sleeve must match the threaded holes in the crankshaft flange.



- Oil the sealing lip of the crankshaft sealing ring lightly.
- Push the crankshaft sealing ring carefully onto the guide sleeve.

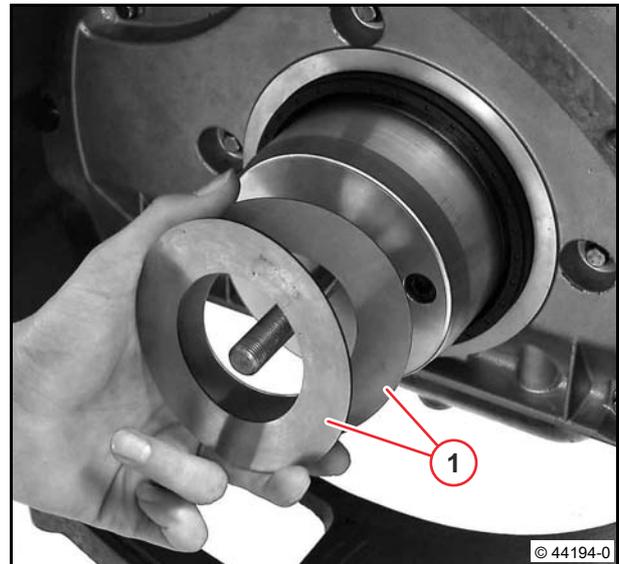


Use new crankshaft sealing ring.
The sealing lip faces the crankcase.



6

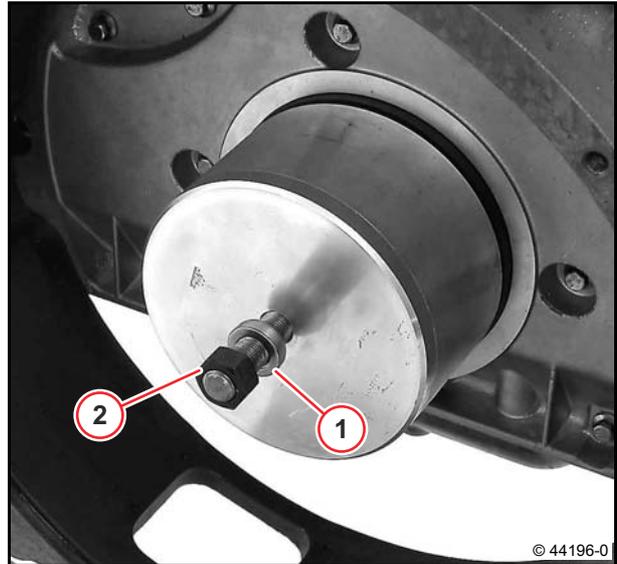
- Mount shims (1).
- Pay attention to installation depth of crankshaft sealing ring and select shim accordingly.
 - First assembly = 2 shims
 - 1. Repair installation depth = 1 shim
 - Maximum installation depth = without washers



- Mount assembly sleeve (1).
- Press on the crankshaft sealing ring to the stop.



- Plug in the bearing (1).
- Screw on nut (2).



6

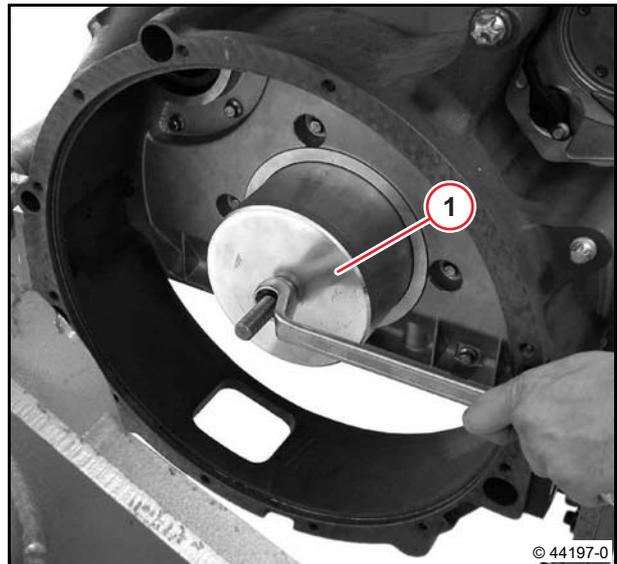
- Tighten nut to the stop of the assembly sleeve (1).



The crankshaft sealing ring is now at the pre-selected installation depth.

- Remove assembly tool.
- Install flywheel.

 [W 05-03-01](#)



Removing and installing the gearcase cover



Standard tools



- Packing compound DEUTZ DW 67
- Packing compound DEUTZ DW 48

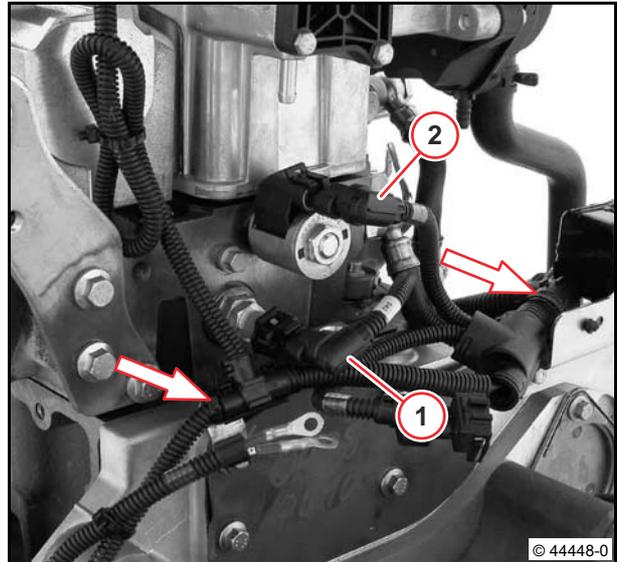


- W 02-01-01
- W 05-03-01
- W 09-01-01
- W 44-03-01
- W 48-02-03
- W 52-01-01

Removing the gearcase

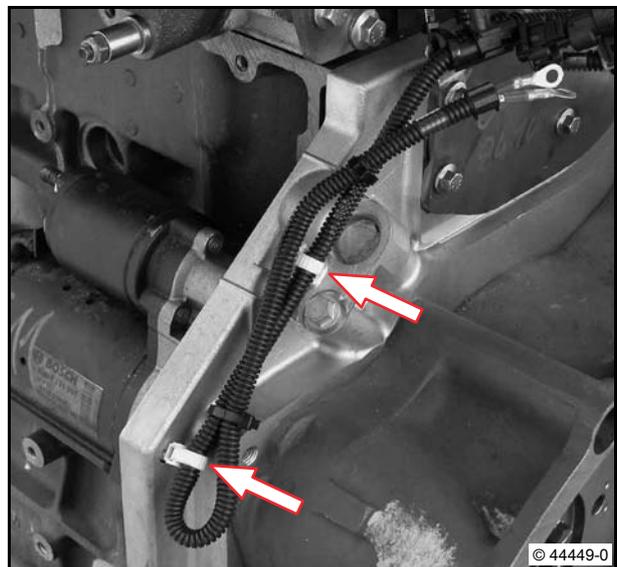
- Unlock cable plug (1) and remove.
- Unlock cable plug (2) and remove.
- Remove cable tie (arrows).
- Expose cable harness.
- Remove impulse transmitter (camshaft).

W 48-02-03

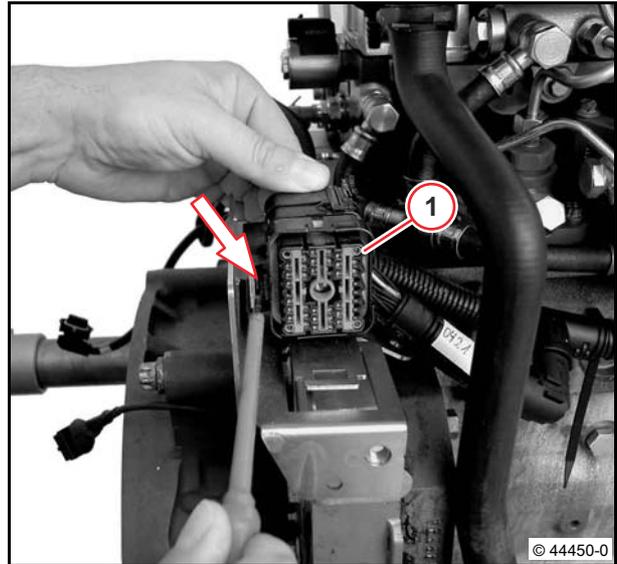


- Remove cable tie (arrows).
- Expose cable harness.
- Remove starter.

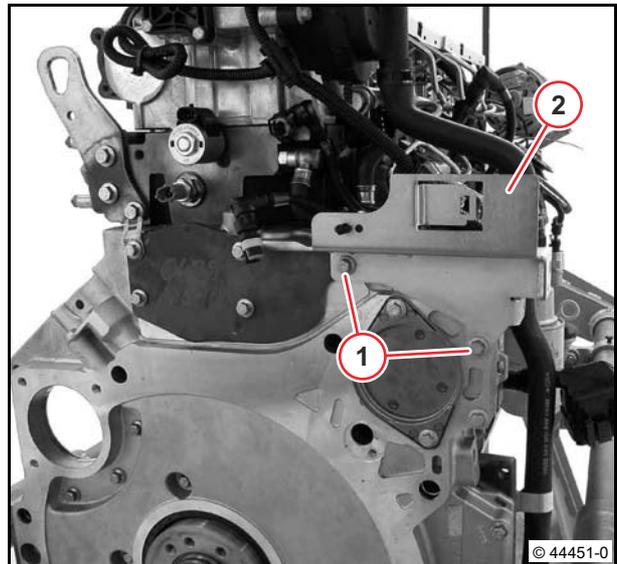
W 44-03-01



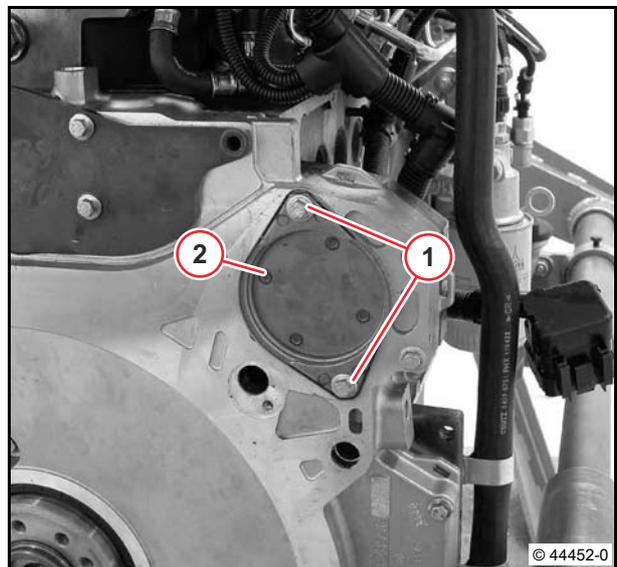
- Unlock central plug (1) (arrow) and pull off from holder.
- Remove connection housing.
 W 52-01-01
- Remove flywheel.
 W 05-03-01
- Remove lubricating oil pan.
 W 02-01-01



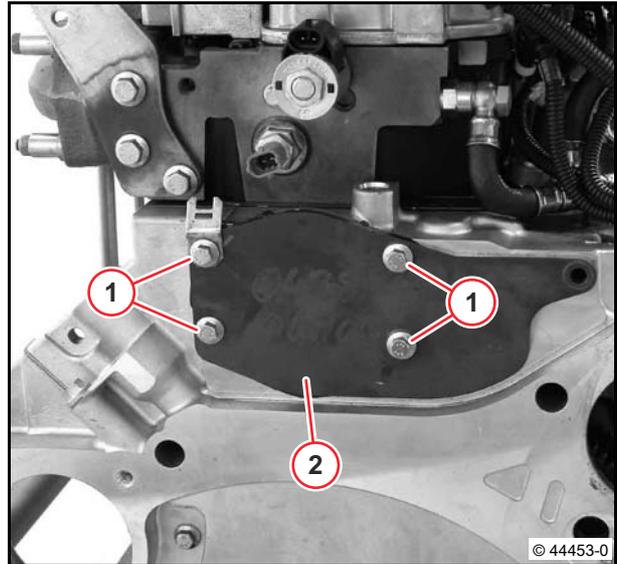
- Unscrew screws (1).
- Remove the holder (2).



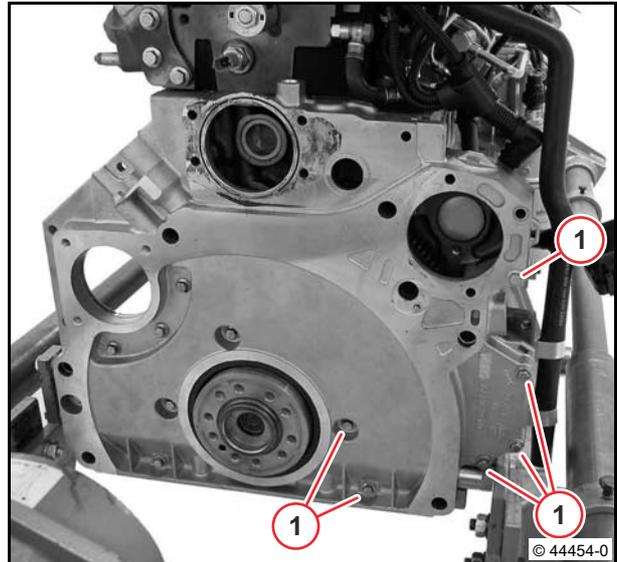
- Unscrew screws (1).
- Remove cover (2).



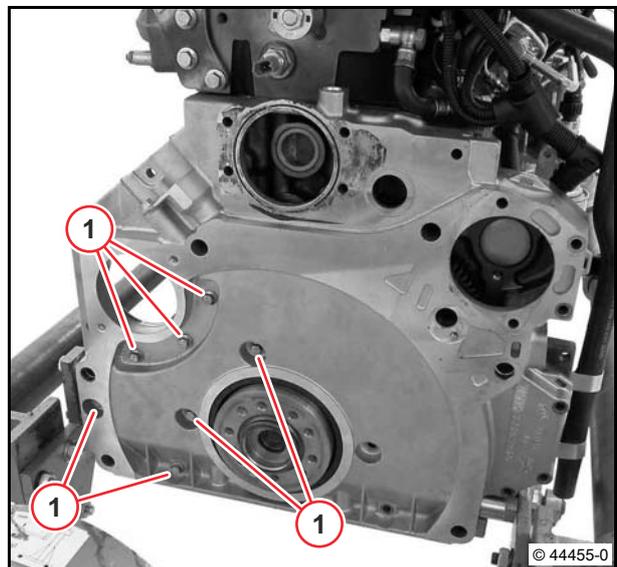
- Unscrew screws (1).
- Remove cover (2).



- Unscrew screws (1).



- Unscrew screws (1).
- Remove gearcase cover.



- Visually inspect the component.



6

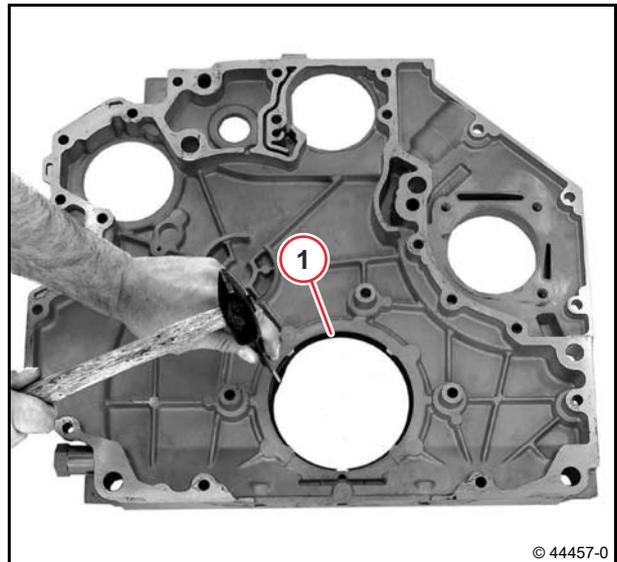
Installing the gearcase cover

- Knock out crankshaft sealing ring (1).



Attention!

Do not damage sealing surface when knocking out.



- Clean sealing surfaces.



The sealing surfaces must be dry and free from grease and dirt.



- Apply packing compound (arrow).

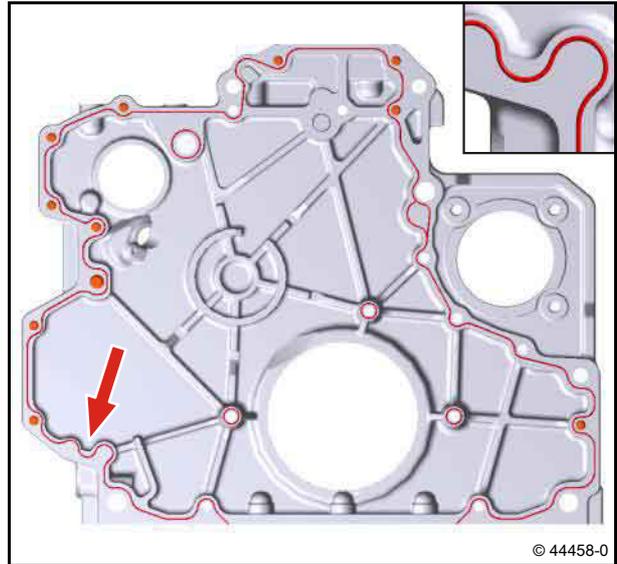


Attention!

The assembly must be completed within 1 hour at most.



Use packing compound DEUTZ DW 67.
Sealing bead thickness approx. 1.4 mm.



- Align gearcase cover.
- Mount gearcase cover.

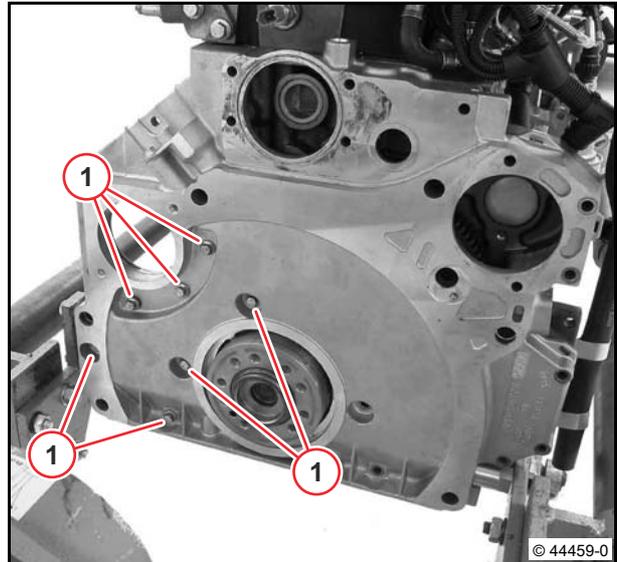


Do not move the gearcase cover after mounting.

- Tighten screws (1).



Do not tighten screws.

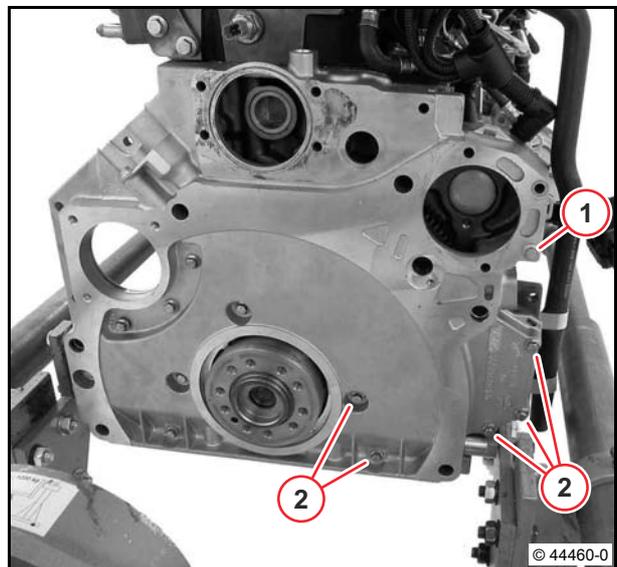


- Fasten screws.



Note different screw lengths:

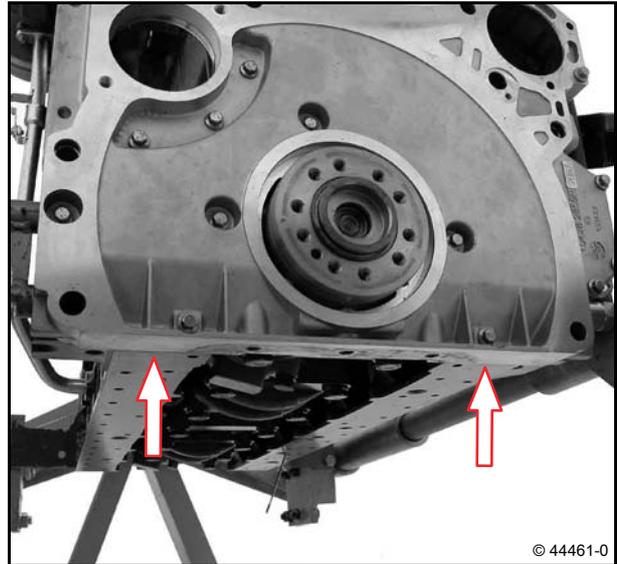
- Screw M8 x 55 mm (1)
- Screws M8 x 35 mm (2)
- Do not tighten screws.



- Press up gearcase cover and align flush with the oil tray sealing surface (arrows).



The oil tray sealing surface on the crankcase must face downwards.



© 44461-0

- Tighten the screws according to the tightening sequence.



Note different tightening values.

- Tighten screws (1) and (2).

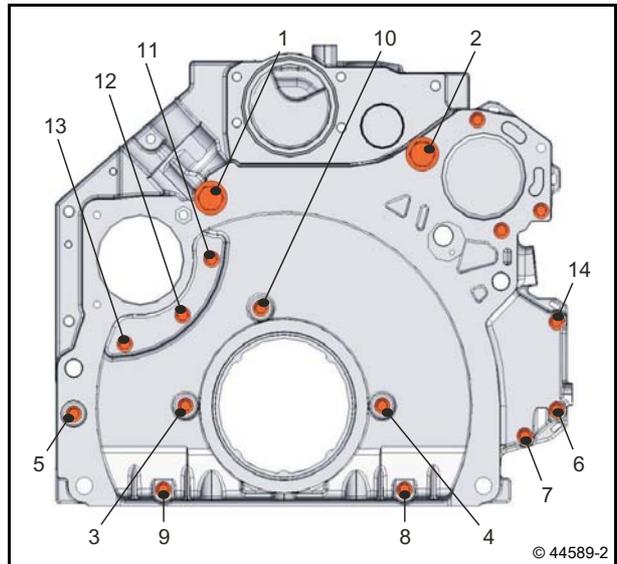
M16x60

70 Nm

- Tighten screws (3) to (14).

M8x35

30 Nm

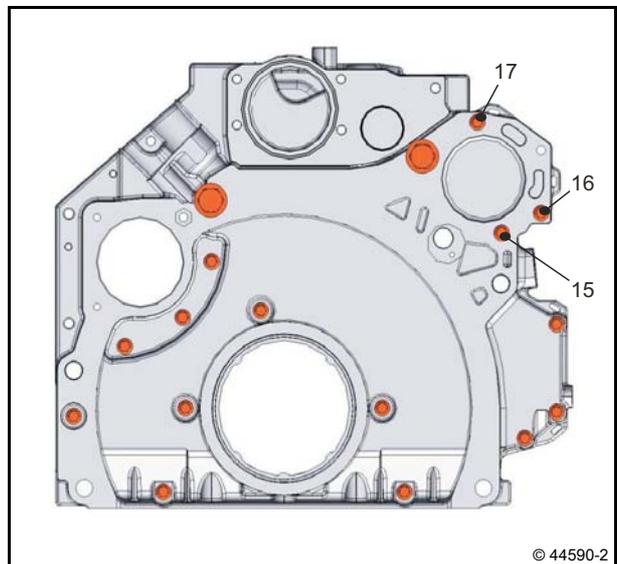


© 44589-2

- Tighten screws (15) to (17).

M8x55

20 Nm



© 44590-2

- Clean sealing surfaces.

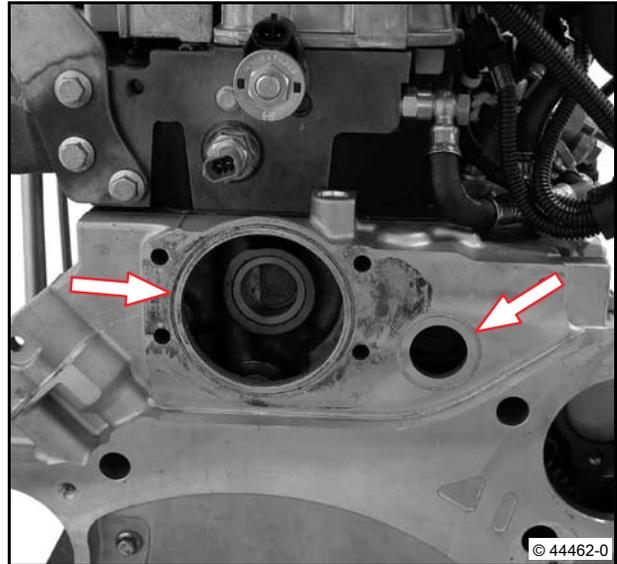


The sealing surfaces must be dry and free from grease and dirt.

- Fill the ring groove (arrows) with packing compound.



Use packing compound DEUTZ DW 48.
Sealing bead thickness approx. 1.5 mm.

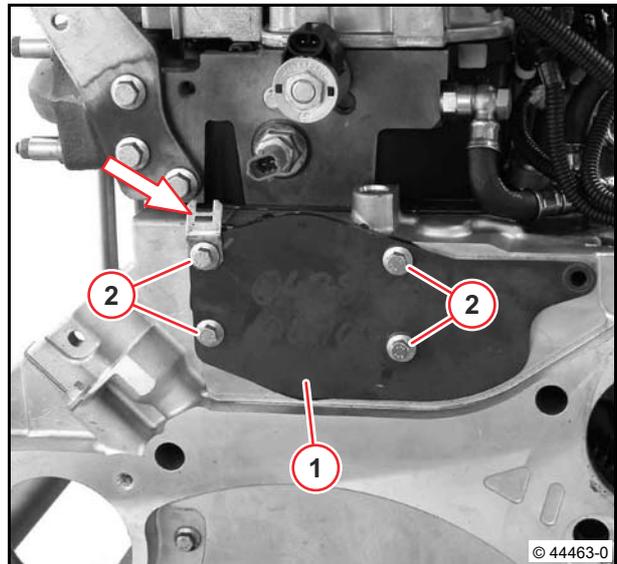


- Mount cap (1).

- Tighten screws (2).



Note the installation position of the cap (1).
Use M8 x 50 mm screws.
Mount holder (arrow).
Do not tighten screws.



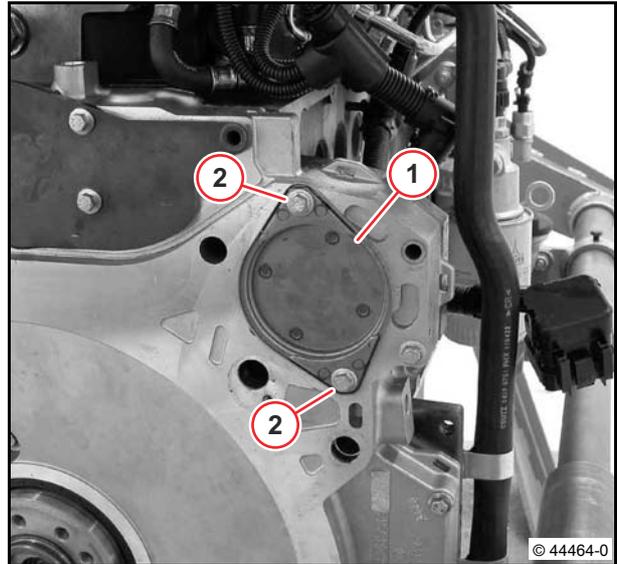
- Clean sealing surfaces.
- Mount the new O-ring.
- Lightly oil O-ring.



- Press in the cap(1) to the stop.
- Tighten screws (2).



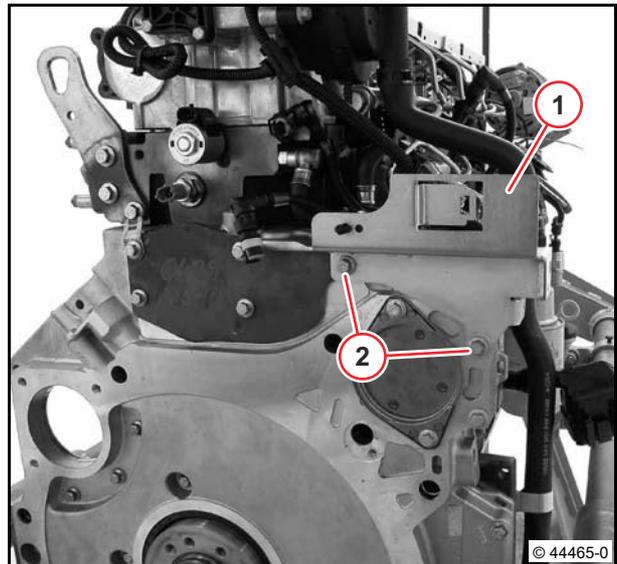
Use M8 x 60 mm screws.
Do not tighten screws.



- Mount holder (1).
- Tighten screws (2).

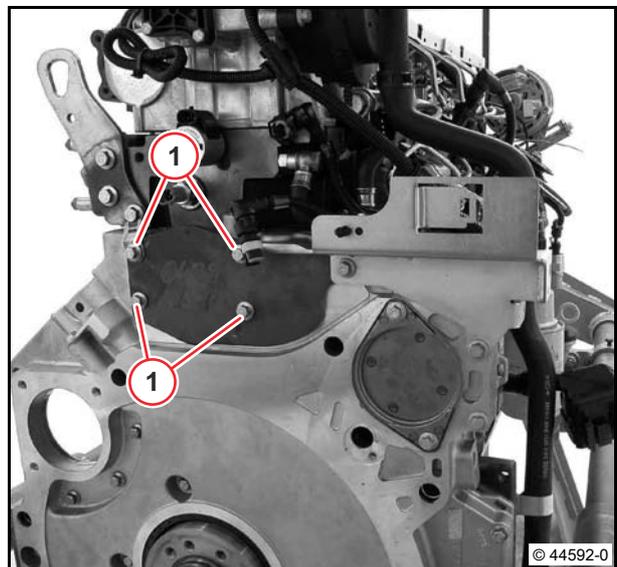


Use M8 x 55 mm screws.
Do not tighten screws.



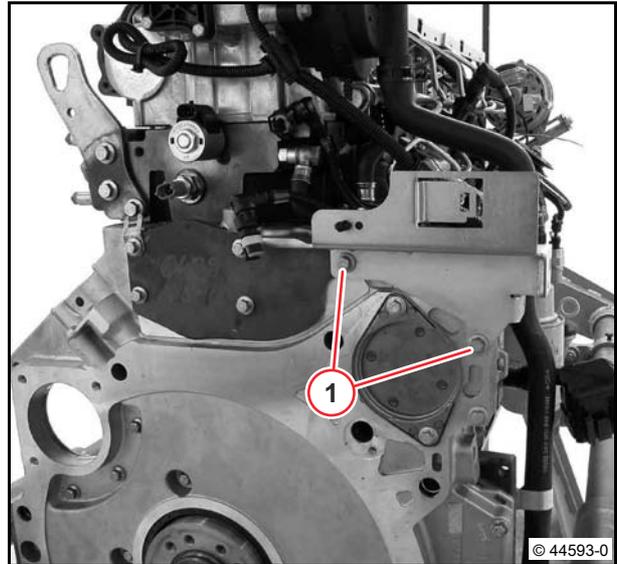
- Tighten screws (1) alternately.

 30 Nm



- Tighten screws (1) alternately.

 20 Nm



- Install new crankshaft sealing ring (flywheel side).

 W 09-01-01

- Install connection housing.

 W 52-01-01

- Install flywheel.

 W 05-03-01

- Install starter.

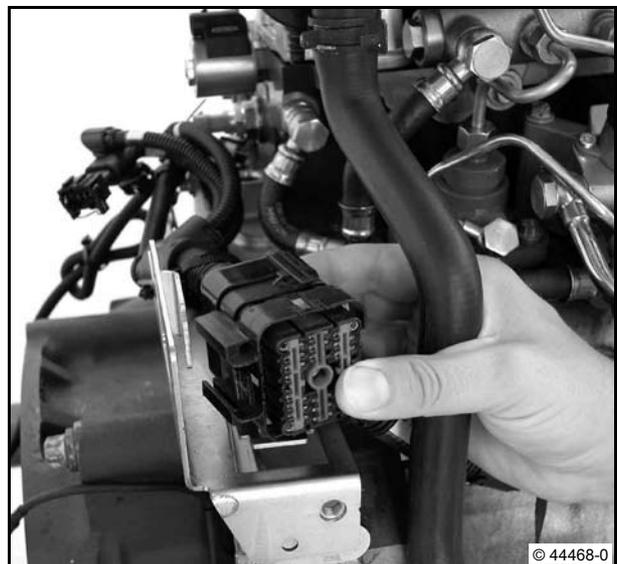
 W 44-03-01

- Install lubricating oil pan.

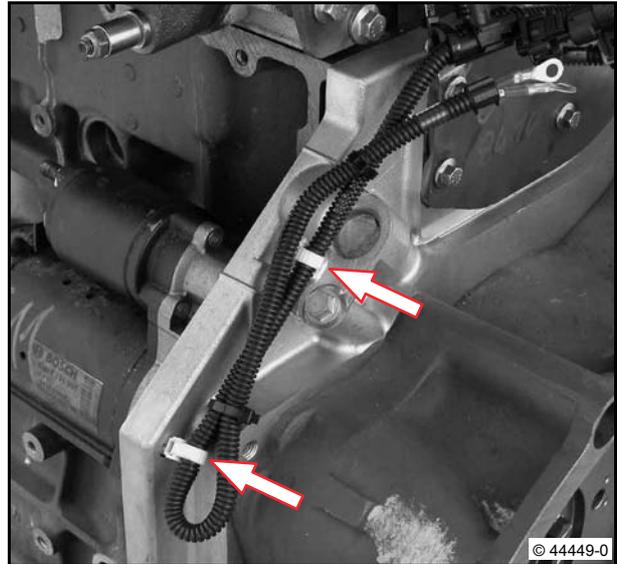
 W 02-01-01



- Push the central plug onto the holder until it snaps in.



- Lay cable harness and fix with cable ties (arrows).



6

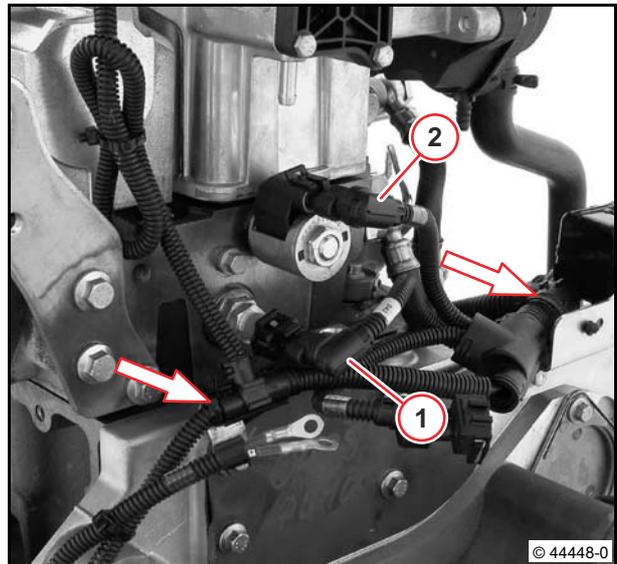
- Plug in the cable plug (1).
- Plug in the cable plug (2).



Ensure that the connection is perfect.

- Lay cable harness and fix with cable ties (arrows).
- Install impulse transmitter (camshaft).

 [W 48-02-03](#)



Removing and installing the camshaft



Standard tools:
– Lifting gear



– W 05-05-01
– W 11-02-01
– W 17-01-04
– W 17-01-05

Removing the camshaft

- Remove high pressure pump and roller tappet (installation position A).

 W 17-01-04

- Remove high pressure pump and roller tappet (installation position B).

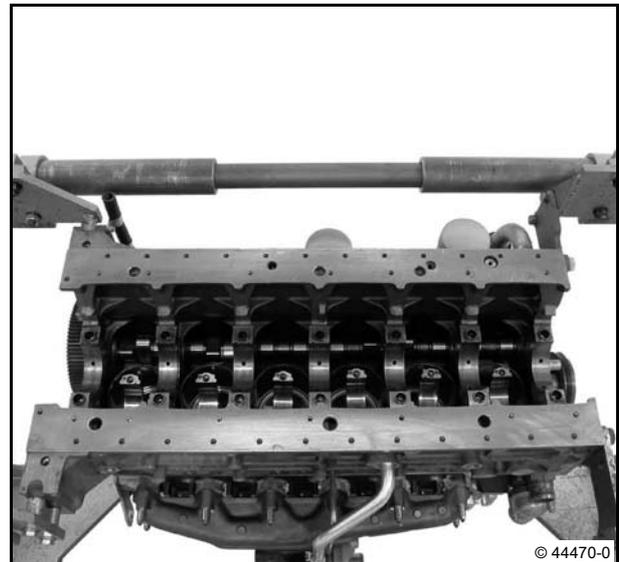
 W 17-01-05

- Remove rocker arm and rocker arm brackets.

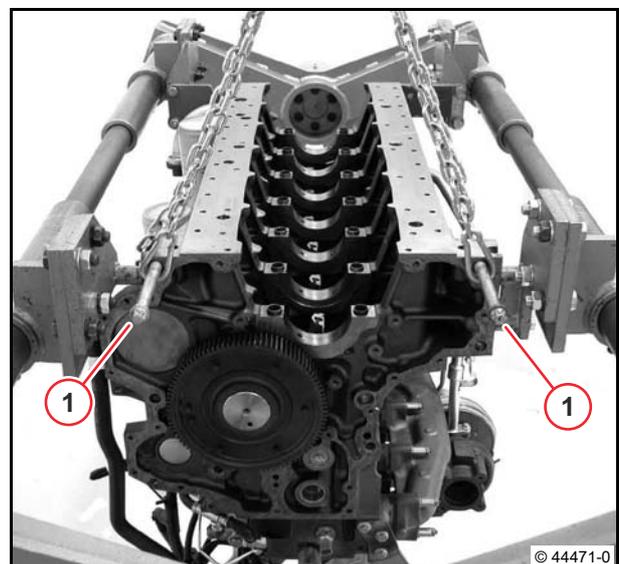
 W 11-02-01

- Remove crankshaft.

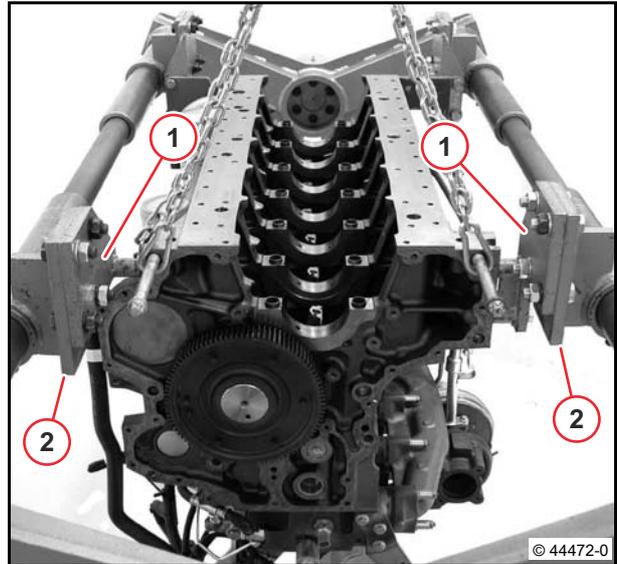
 W 05-05-01



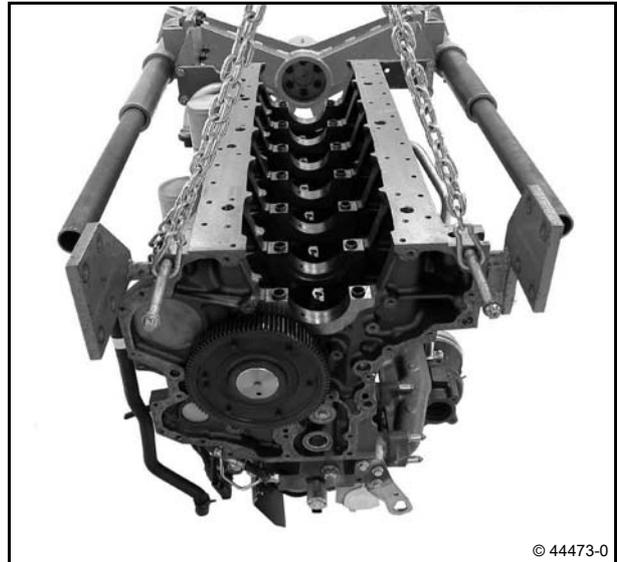
- Screw in screws (1).
- Hang crankcase on suitable workshop crane.



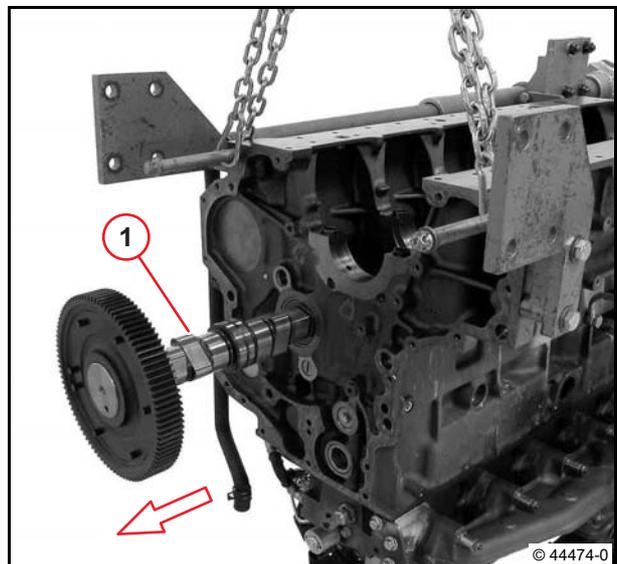
- Remove clamping bracket (1) from the adapter plates (2).



- Push away the assembly block on the flywheel side.



- Press in all tappets.
- Pull out the camshaft (1) carefully in the direction of the arrow.



Removing tappets.

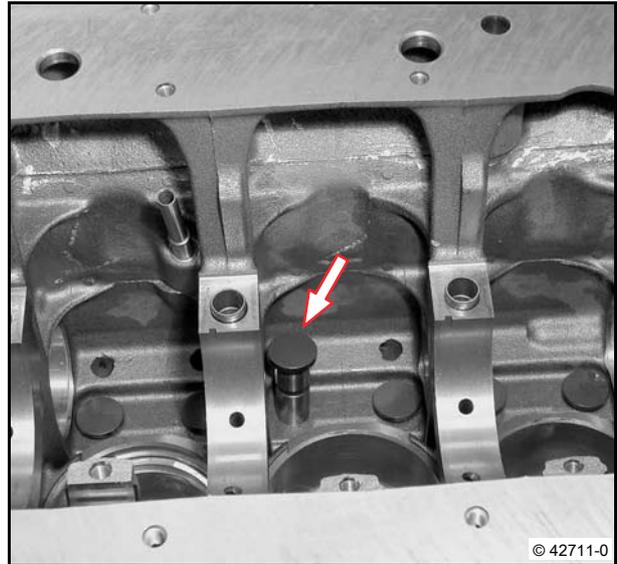
- Remove all tappets (arrow).



Lay out components in the order in which they should be installed.

Note order of cylinders.

- Visually inspect the components.



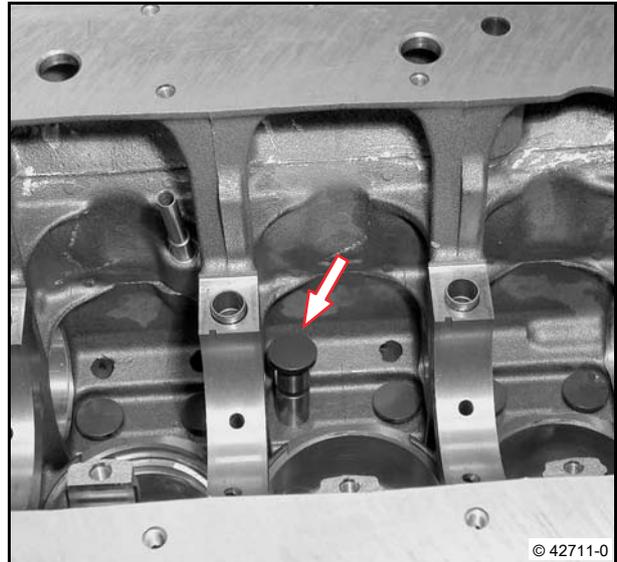
6

Installing tappets

- Oil all tappets (arrow) lightly.
- Insert all tappets.



Note assignment!

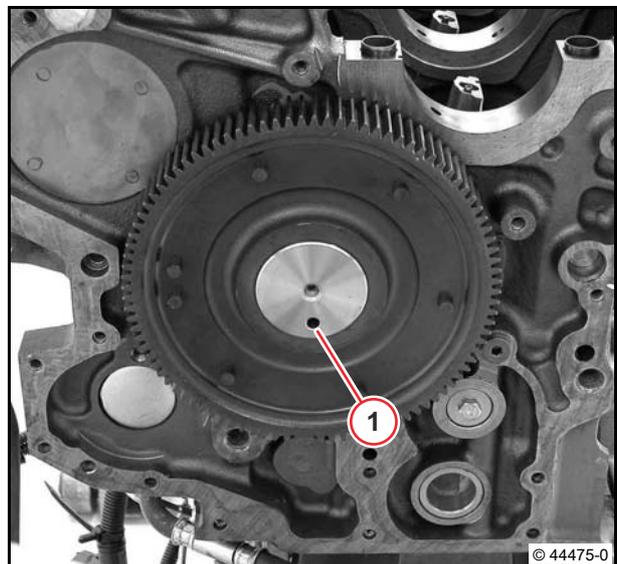


Installing the camshaft

- Oil cam shaft pin lightly.
- Oil camshaft bearing lightly.
- Insert camshaft carefully.

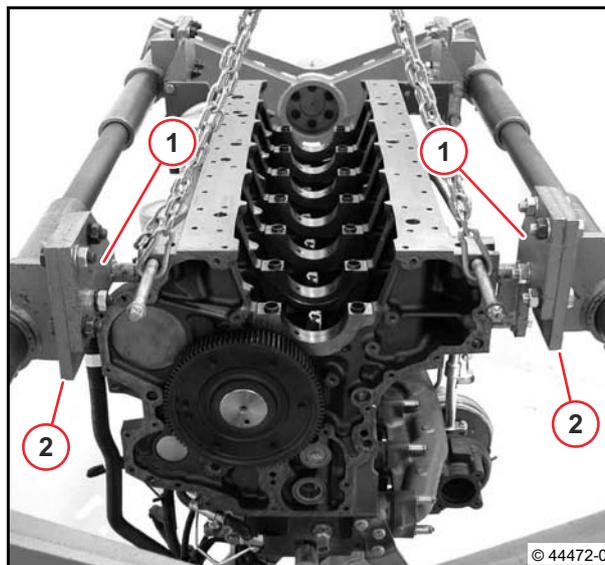


The bore (1) must be facing the cylinder head.

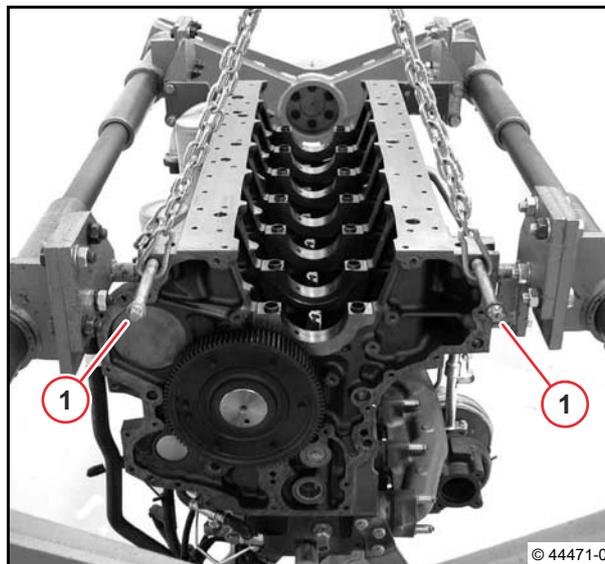


- Push on and align the flywheel side assembly block.
- Install clamping holder (1) on adapter boards (2).

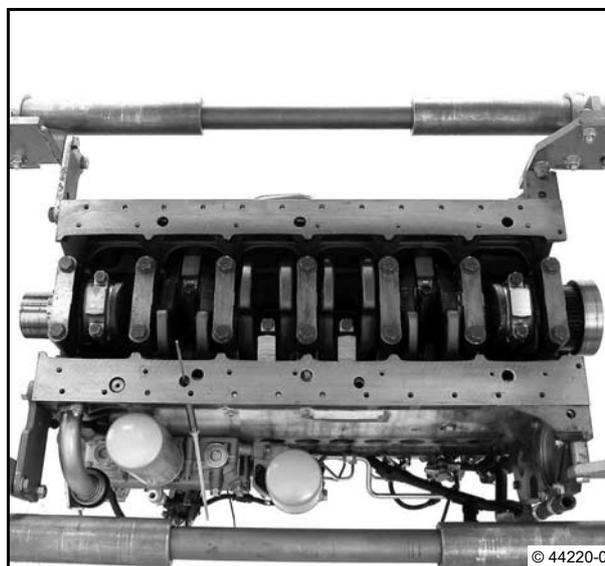
 90 Nm



- Unhook the crankcase from the workshop crane.
- Unscrew screws (1).



- Install crankshaft.
 [W 05-05-01](#)
- Install rocker arms and rocker arm brackets.
 [W 11-02-01](#)
- Install high pressure pump and roller tappet (installation position B).
 [W 17-01-05](#)
- Install high pressure pump and roller tappet (installation position A).
 [W 17-01-04](#)



Checking the camshaft



Standard tools:
– Micrometer gauge



– W 10-02-01

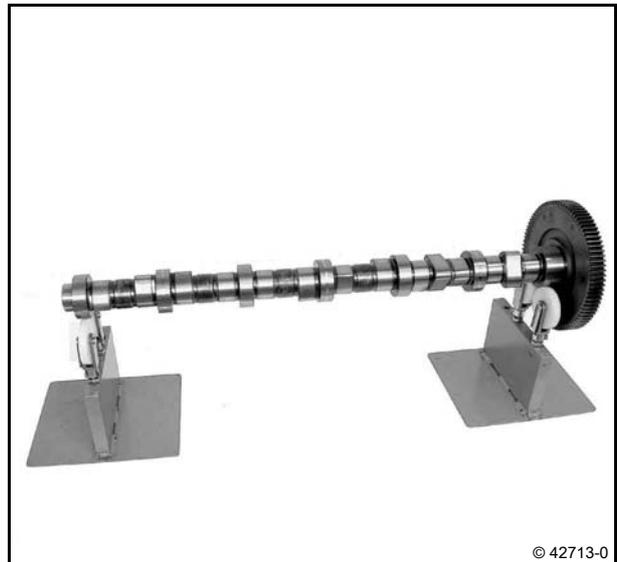
Checking the camshaft

- Remove camshaft.



W 10-02-01

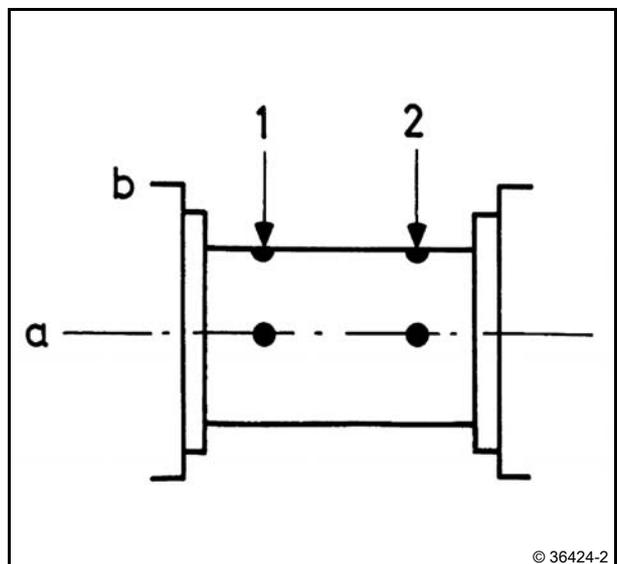
- Visually inspect cams and bearing pins for wear.



© 42713-0



Diagram for measuring the journals at the points 1 and 2 in the levels a and b.



© 36424-2

Checking the diameter of the journal

- Measure the bearing pin.

 64,2^{+0.2}_{-0.2} mm



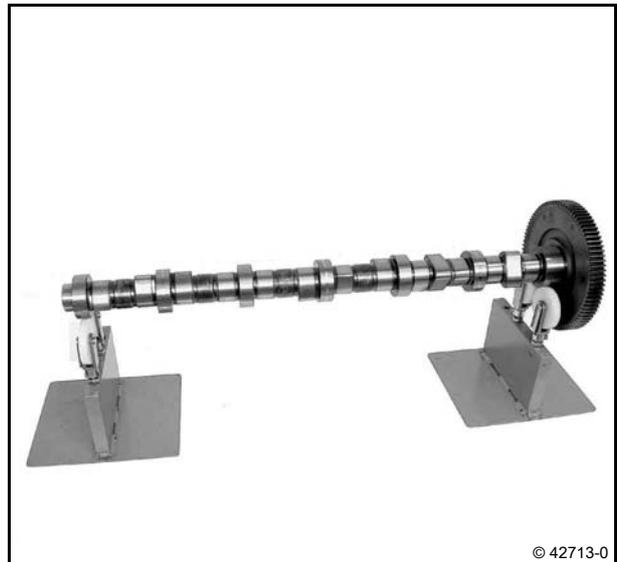
See schematic diagram for measuring points.

When the limit value is reached the camshaft must be replaced.



- Check camshaft gear wheel for visible signs of wear.
- Install the camshaft.

 [W 10-02-01](#)



Setting valve clearance (with or without removal of exhaust return module)



- Standard tools:
- Rotation angle disc 8190
 - Screwdriver insert for slotted screws 8191
 - Screwdriver insert for hexagon socket head screws (4 mm) 8194
 - Open wrench size 13 8196
- Special tools:
- Socket wrench insert spanner size 15 103050



- W 08-01-01
- W 49-02-01

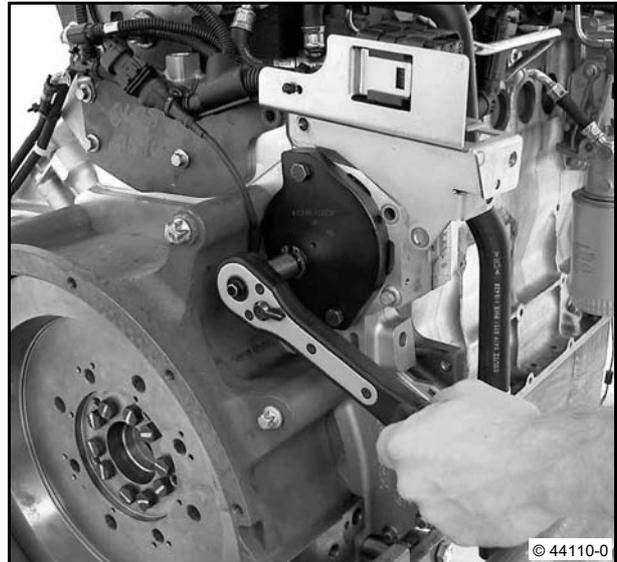


Allow the engine to cool down for at least 30 minutes before setting the valve clearance. Engine oil temperature < 80 °C

In engines without an exhaust return module, a slotted setting screw must be installed in place of a hexagon socket head screw.

Setting engine to valve overlap

- Remove the cylinder head hood.
 - W 08-01-01
- Attach turning gear.
 - W 49-02-01
- Turn crankshaft using the turning gear until the valve overlap of cylinder 1 is reached.



Set valve clearance.

- 4 cylinders

Ignition sequence:	1 - 3 - 4 - 2
--------------------	---------------

Valves	Cylinders			
overlap	1	3	4	2
set to	4	2	1	3



Valve overlap: Outlet valve is not yet closed, inlet valve begins to open.

When the outlet valve is fully open, the inlet valve opens briefly approx. 2 mm. This is not the valve overlap!

Set valve clearance.

– 6-cylinder

Ignition sequence:	1 - 5 - 3 - 6 - 2 - 4
--------------------	-----------------------

Valves	Cylinders					
overlap	1	5	3	6	2	4
set to	6	2	4	1	5	3

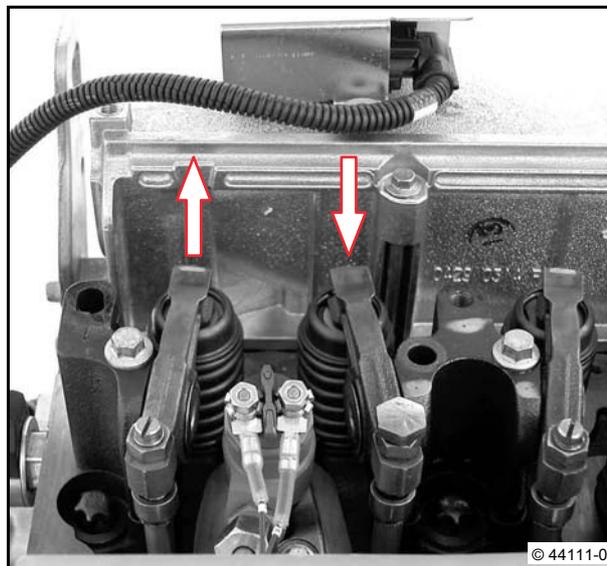


Valve overlap: Outlet valve is not yet closed, inlet valve begins to open.

When the inlet valve is fully open, the outlet valve opens briefly approx. 2 mm. This is not the valve overlap!



Valve overlap means:
The inlet valve starts opening, exhaust valve closes.



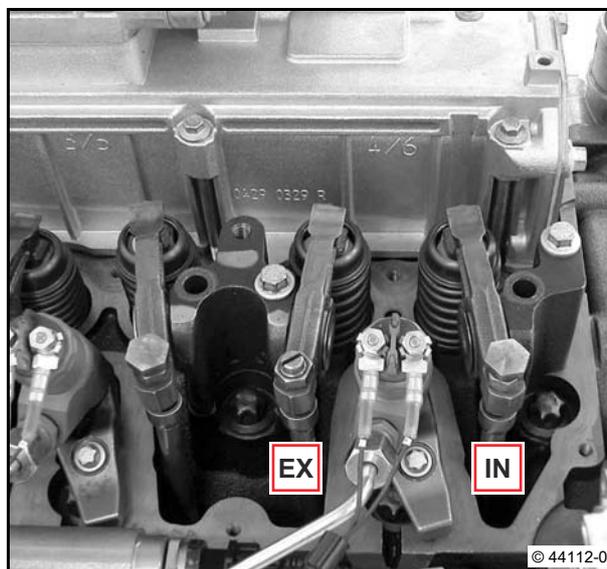
Arrangement of the inlet and exhaust valves.

IN = inlet valve
EX = exhaust valve



Attention!

Different version of the setting screws:
slotted screws or hexagon socket head screws.

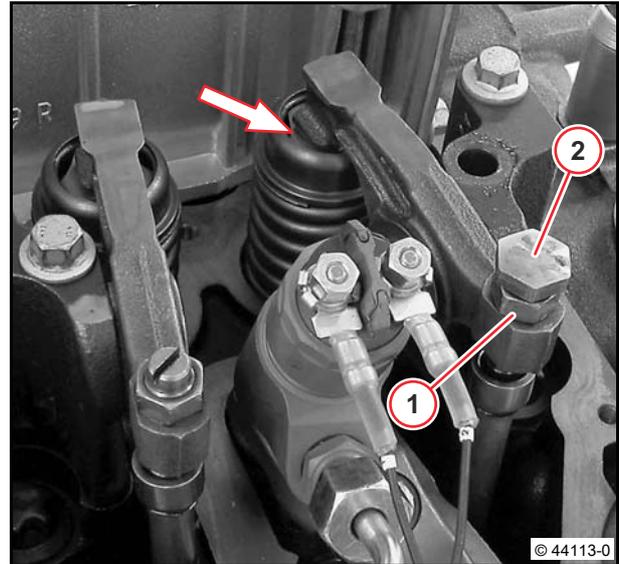


Setting the inlet valve clearance

- Loosen lock nut (1).
- Press in the adjusting screw (2) to the stop.



The rocker arm must touch the thrust washer of the spring cap (arrow).

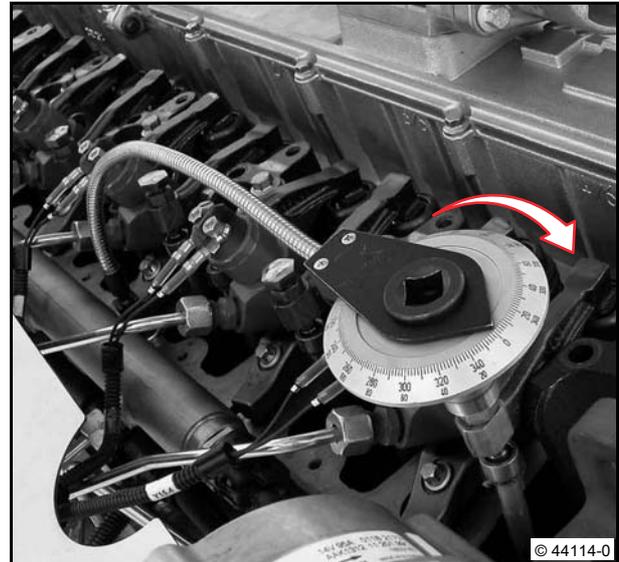


6

- Set the rotation angle disc with a socket wrench insert at the adjusting screw.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to „0“.

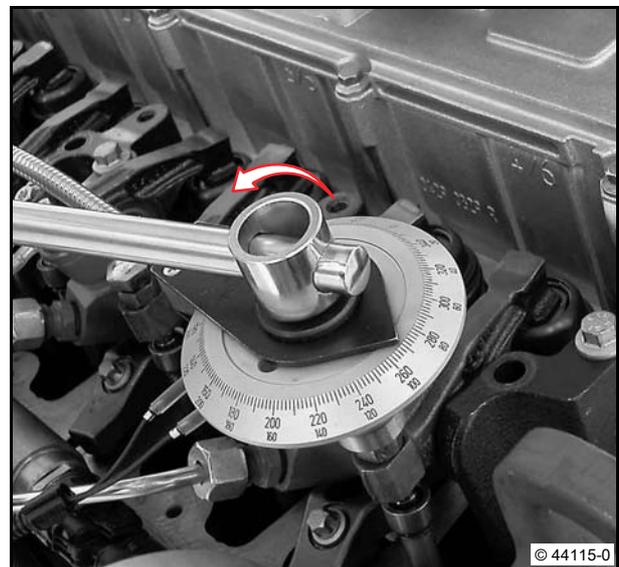


Do not rotate adjusting screw.



- Turn back setting screw 90° in direction of arrow.

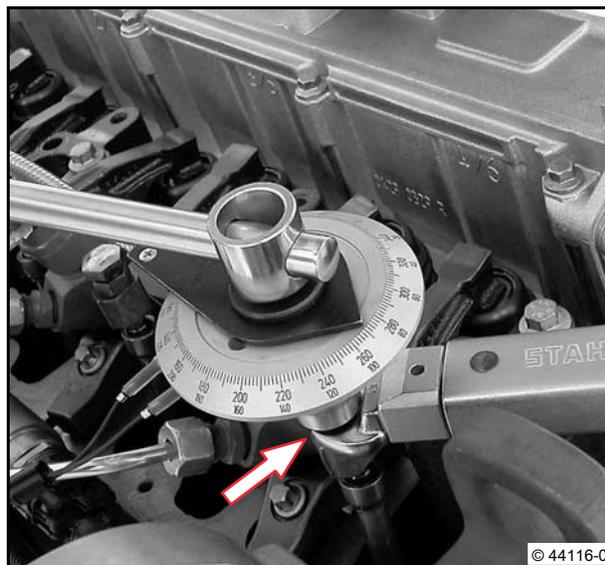
 90°



- Hold adjusting screw.
- Tighten locking nut (arrow) with box spanner.

 20 Nm

- Remove rotation angle disc.



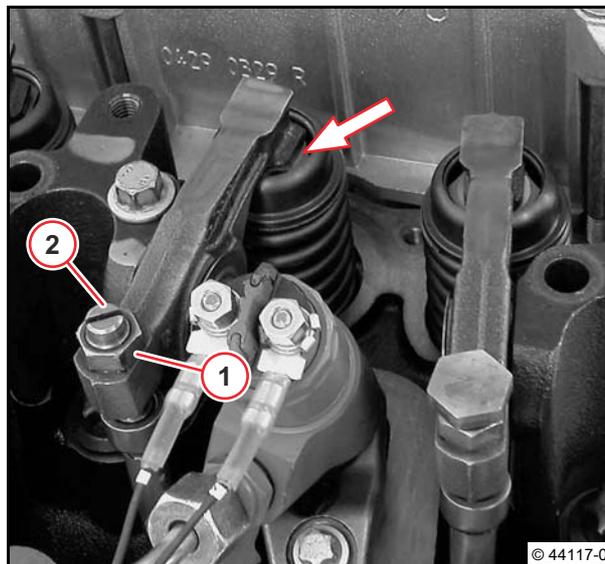
6

Setting the exhaust valve clearance

- Loosen lock nut (1).
- Press in the adjusting screw (2) to the stop.



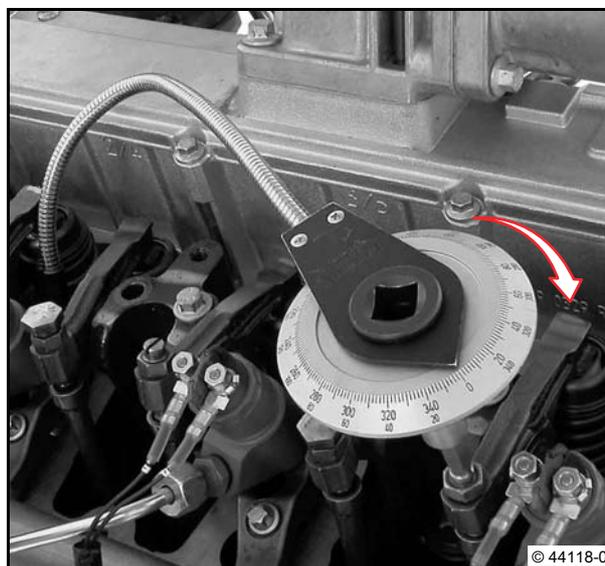
The rocker arm must touch the thrust washer of the spring cap (arrow).



- Set the rotation angle disc on the adjusting screw with a screwdriver insert for slotted screws.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to „0“.

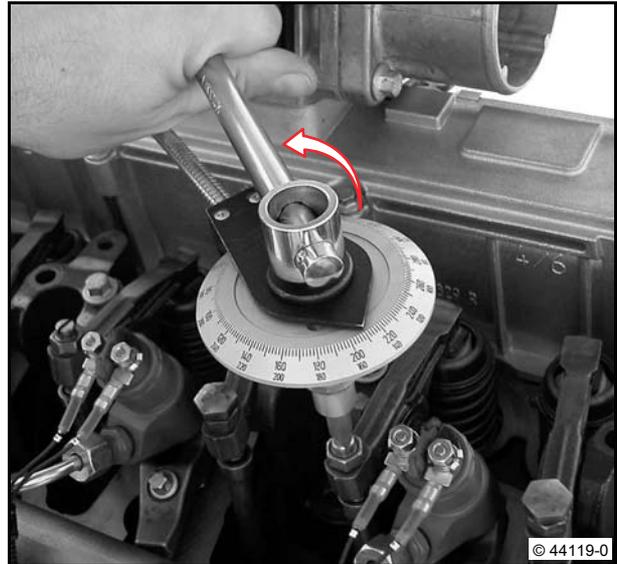


Do not rotate adjusting screw.



- Turn back setting screw 150° in direction of arrow.

 150°



6

- Hold adjusting screw.
- Tighten locking nut (arrow) with box spanner.

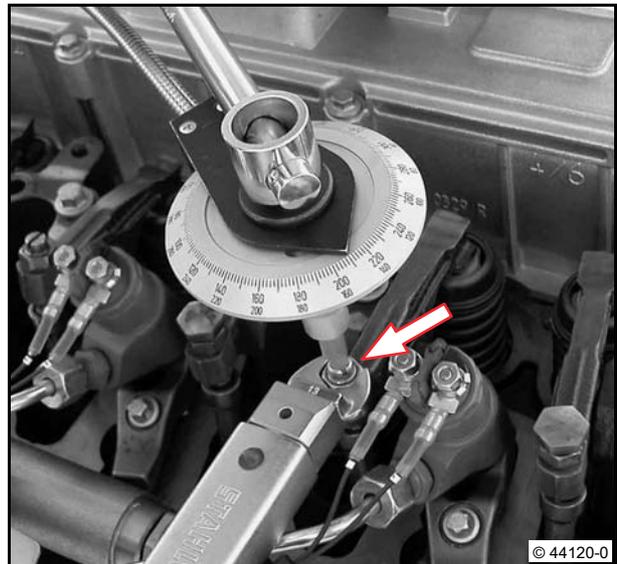
 20 Nm

- Remove rotation angle disc.
- Set all other valves.
 - see page:
 - 1, [4 cylinders](#)
 - 2, [6-cylinder](#)
- Mount cylinder head cover.

 [W 08-01-01](#)

- Remove turning gear.

 [W 49-02-01](#)



Technical Data

Testing and setting data

ID no.	Name	Additional information	Value
P01 61	Valve clearance (inlet)	with rotary angle disc	90°
P01 62	Valve clearance (outlet)	with rotary angle disc	150°

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A01 003	Locking nut, valve clearance setting screw			20 Nm
A01 012	Locking nut, setting screw control piston (exhaust gas return)			20 Nm

6



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

Setting valve clearance (with exhaust return module installed)



- Standard tools:
- Rotation angle disc 8190
 - Screwdriver insert for slot-
ted screws 8191
 - Screwdriver insert for
hexagon socket head
screws (4 mm) 8194
 - Open wrench size 13 8196
- Special tools:
- Crowfoot wrench size 15 103140



- W 08-01-01
- W 49-02-01

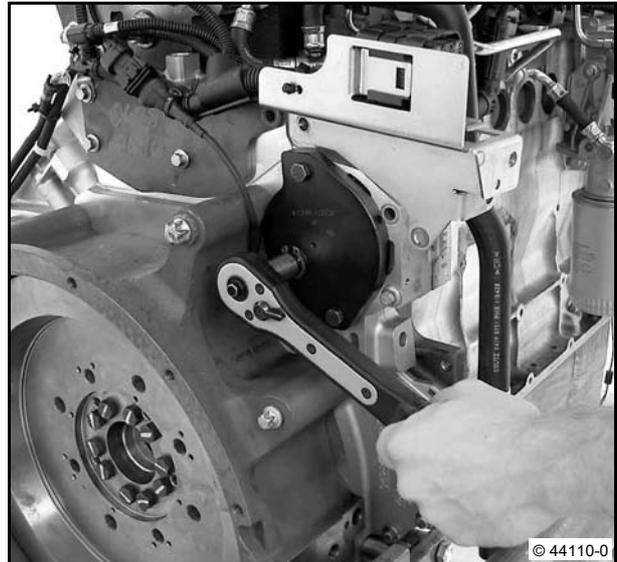


Allow the engine to cool down for at least 30 minutes before setting the valve clearance. Engine oil temperature < 80 °C

The control piston clearance of the exhaust return line must be set after setting the valve clearance.

Setting engine to valve overlap

- Remove the cylinder head hood.
 W 08-01-01
- Attach turning gear.
 W 49-02-01
- Turn crankshaft using the turning gear until the valve overlap of cylinder 1 is reached.



Setting valve and control piston clearance

- 4-cylinder

Ignition sequence:	1 - 3 - 4 - 2
--------------------	---------------

Valves	Cylinders			
overlap	1	3	4	2
set to	4	2	1	3



Valve overlap: Outlet valve is not yet closed, inlet valve begins to open.

When the outlet valve is fully open, the inlet valve opens briefly approx. 2 mm. This is not the valve overlap!

Setting valve and control piston clearance

– 6-cylinder

Ignition sequence:	1 - 5 - 3 - 6 - 2 - 4
--------------------	-----------------------

Valves	Cylinders					
overlap	1	5	3	6	2	4
set to	6	2	4	1	5	3



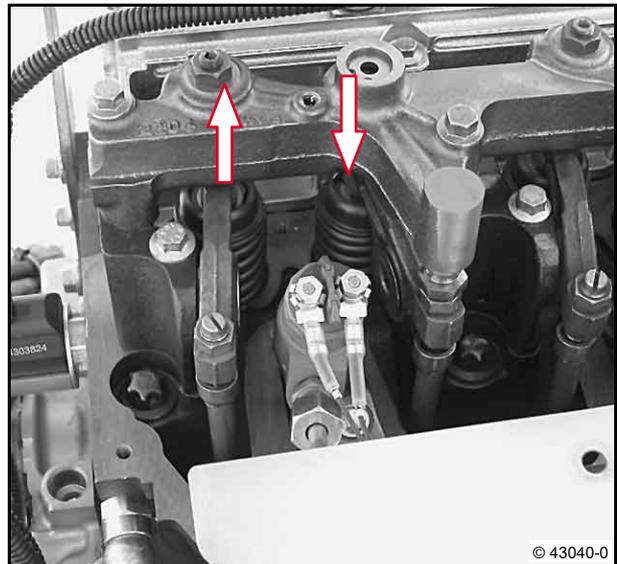
Valve overlap: Outlet valve is not yet closed, inlet valve begins to open.

When the inlet valve is fully open, the outlet valve opens briefly approx. 2 mm. This is not the valve overlap!

6



Valve overlap means:
The inlet valve starts opening, exhaust valve closes.



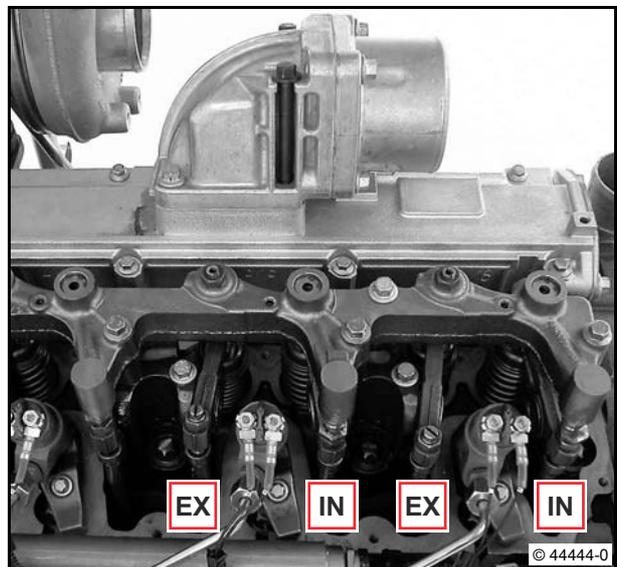
Arrangement of the inlet and exhaust valves.

IN = inlet valve
EX = exhaust valve



Attention!

Different version of the setting screws:
slotted screws or hexagon socket head screws.

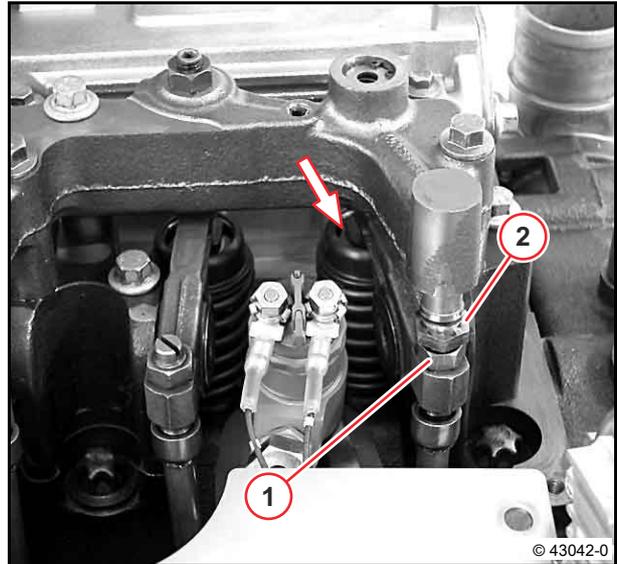


Setting the inlet valve clearance

- Loosen lock nut (1).
- Press in the adjusting screw (2) to the stop.



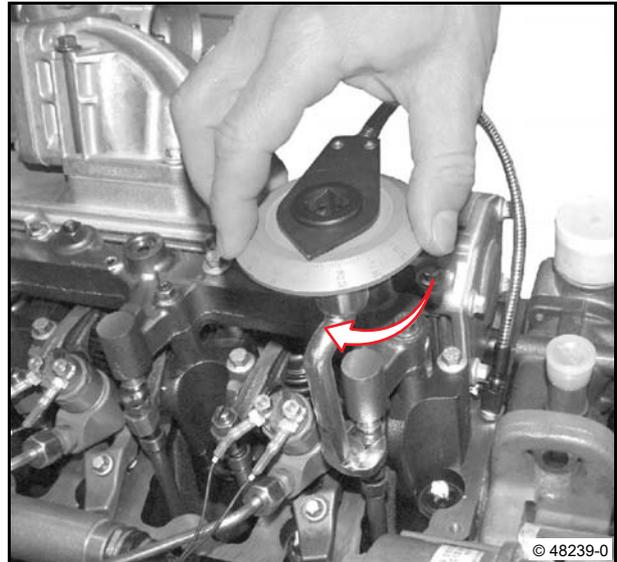
The rocker arm must touch the thrust washer of the spring cap (arrow).



- Set the rotation angle disc on the adjusting screw with the crowfoot wrench.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to „0“.

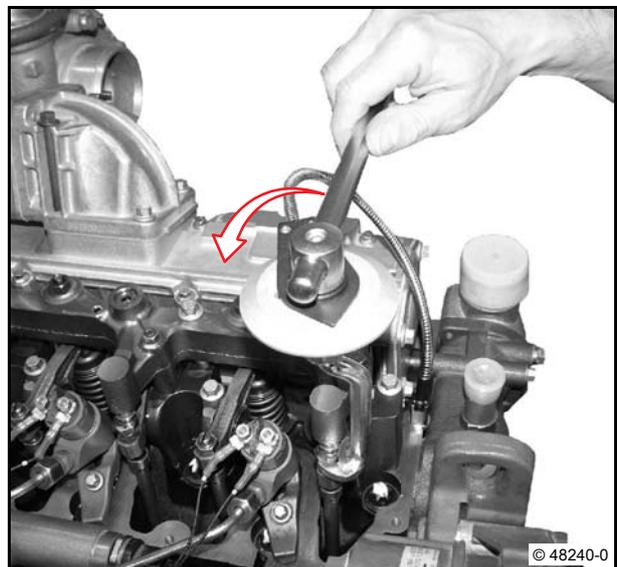


Do not rotate adjusting screw.



- Turn back setting screw 90° in direction of arrow.

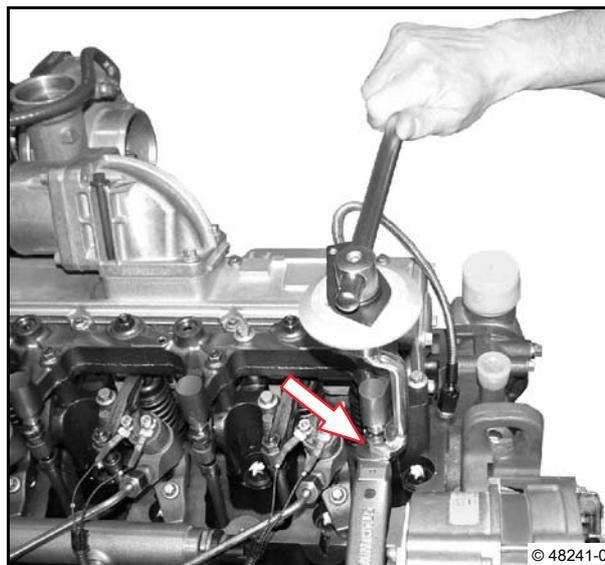
 90°



- Hold adjusting screw.
- Tighten locking nut (arrow) with box spanner.

 20 Nm

- Remove rotation angle disc.



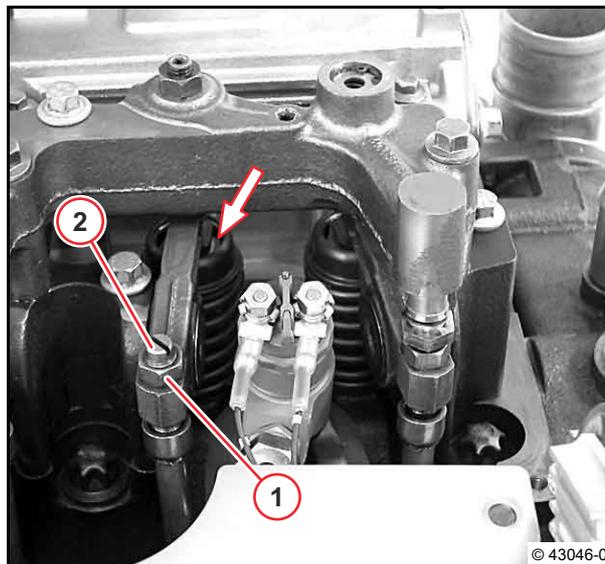
6

Setting the exhaust valve clearance

- Loosen lock nut (1).
- Press in the adjusting screw (2) to the stop.



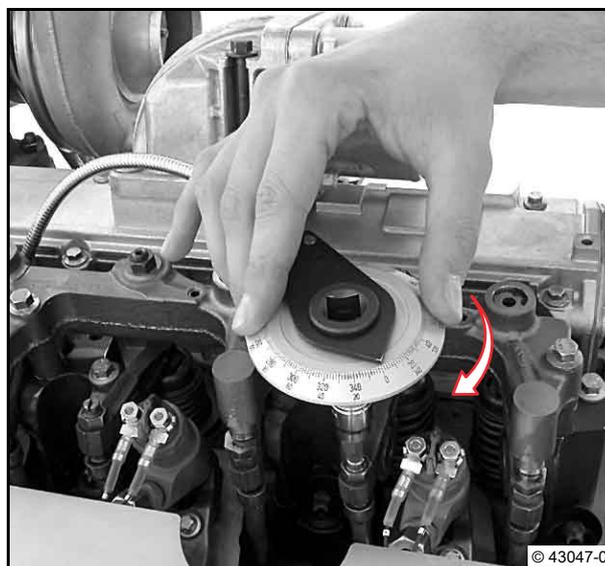
The rocker arm must touch the thrust washer of the spring cap (arrow).



- Set the rotation angle disc on the adjusting screw with a screwdriver insert for slotted screws.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to „0“.

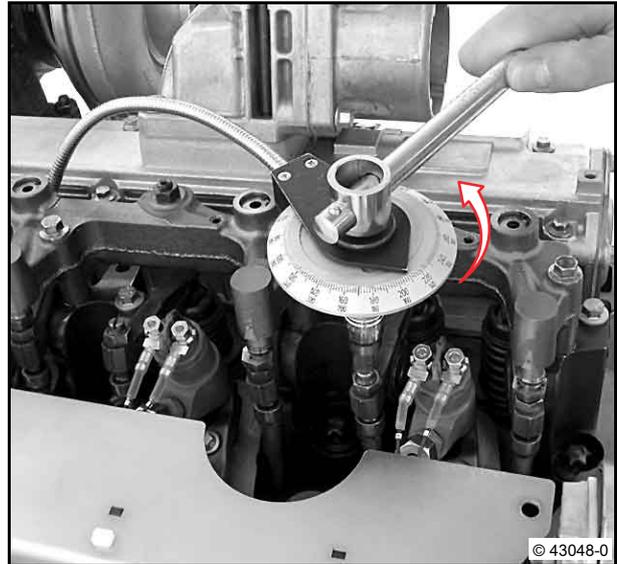


Do not rotate adjusting screw.



- Turn back setting screw 150° in direction of arrow.

150°

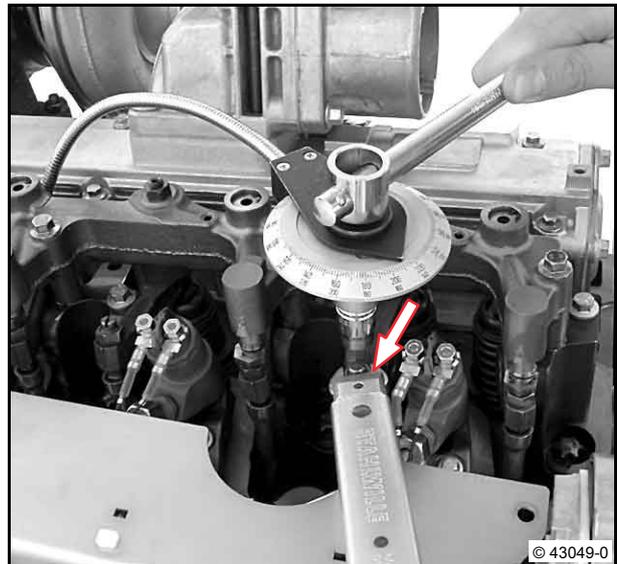


6

- Hold adjusting screw.
- Tighten locking nut (arrow) with box spanner.

20 Nm

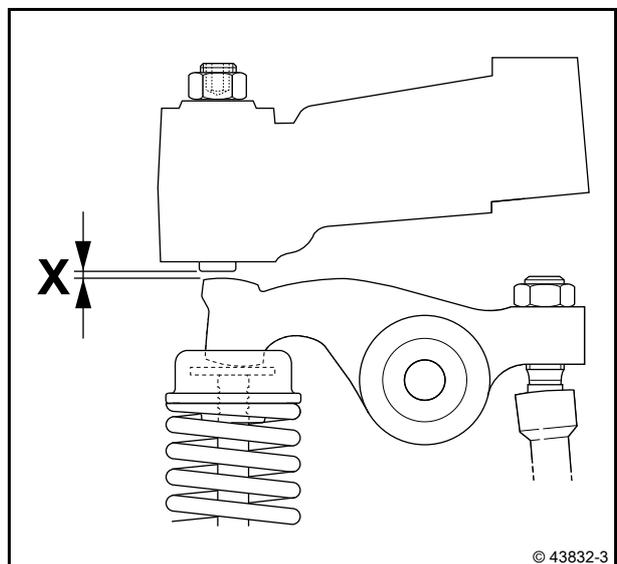
- Remove rotation angle disc.
- Set all other valves.
 - see page:
 - 1, 4-cylinder
 - 2, 6-cylinder



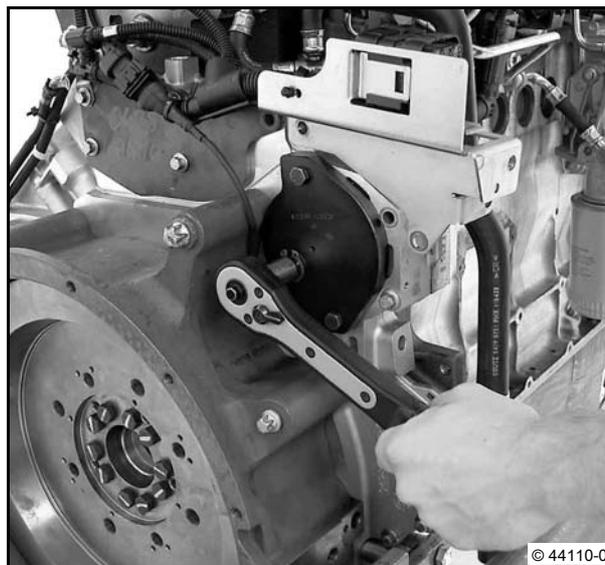
Setting the control piston clearance



The control piston clearance (X) must be set after setting the valve clearance.



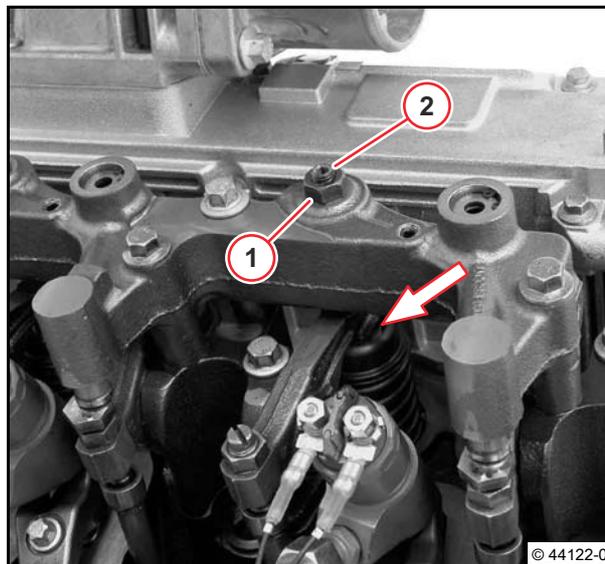
- Turn crankshaft using the turning gear until the valve overlap of cylinder 1 is reached.
- Set control piston according to order of setting.
 - see page:
 - 1, [4-cylinder](#)
 - 2, [6-cylinder](#)



- Loosen lock nut (1).
- Press in the adjusting screw (2) to the stop.



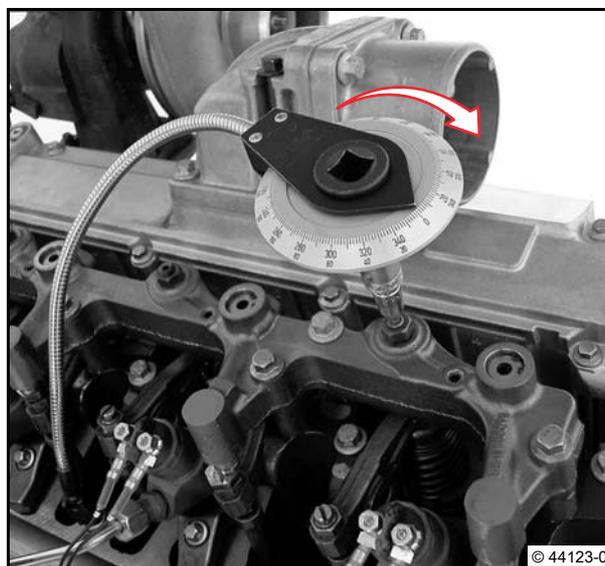
The rocker arm must touch the thrust washer of the spring cap (arrow).



- Set the rotation angle disc on the adjusting screw with a screwdriver insert for hexagon socket head screw.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to „0“.

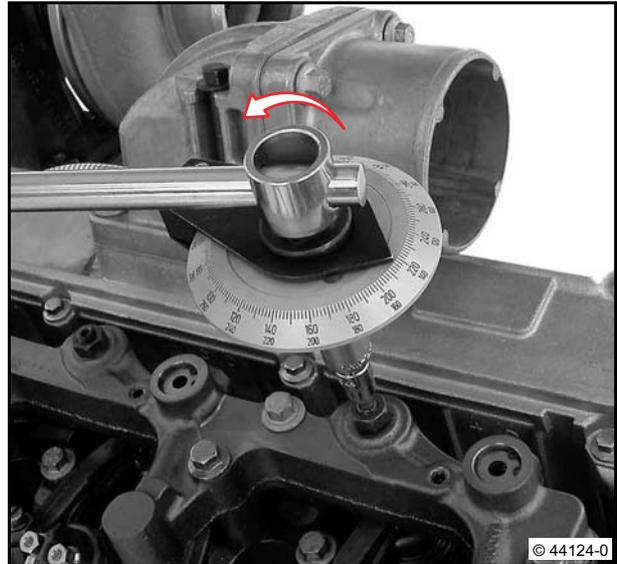


Do not rotate adjusting screw.



- Turn back setting screw 144° in direction of arrow.

 144°



- Hold adjusting screw.
- Tighten locking nut (arrow) with box spanner.

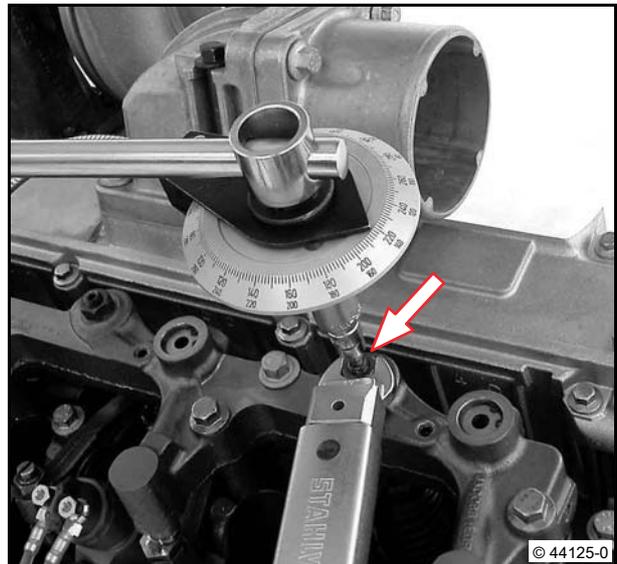
 20 Nm

- Remove rotation angle disc.
- Set all other control pistons.
 - see page:
 - 1, [4-cylinder](#)
 - 2, [6-cylinder](#)
- Mount cylinder head cover.

 [W 08-01-01](#)

- Remove turning gear.

 [W 49-02-01](#)



Technical Data

Testing and setting data

ID no.	Name	Additional information	Value
P01 61	Valve clearance (inlet)	with rotary angle disc	90°
P01 62	Valve clearance (outlet)	with rotary angle disc	150°
P01 64	Clearance between control piston and rocker arm	with rotary angle disc	144°

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A01 003	Locking nut, valve clearance setting screw			20 Nm
A01 012	Locking nut, setting screw control piston (exhaust gas return)			20 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

Removing and installing the rocker arm and rocker arm bracket



Standard tools



- W 08-02-01
- W 11-01-01
- W 49-02-01

Removing the rocker arm and rocker arm bracket

- Attach turning gear.

W 49-02-01

- Remove exhaust gas return module.

W 08-02-01

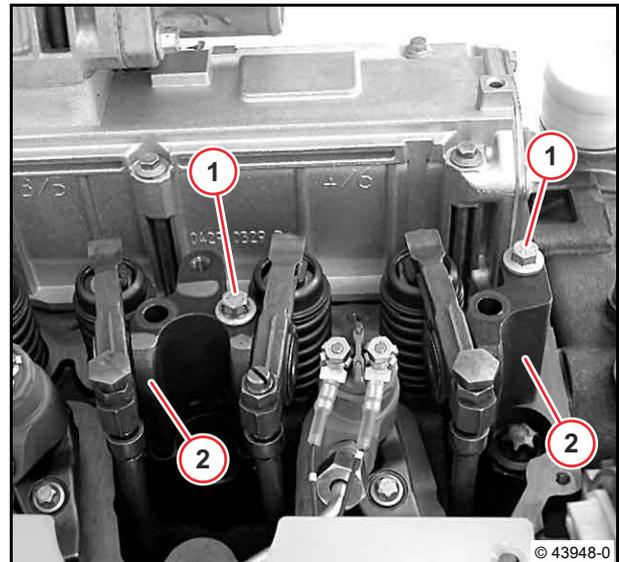
- Unscrew screws (1).

- Remove rocker arm brackets (2).



Lay out components in the order in which they should be installed.

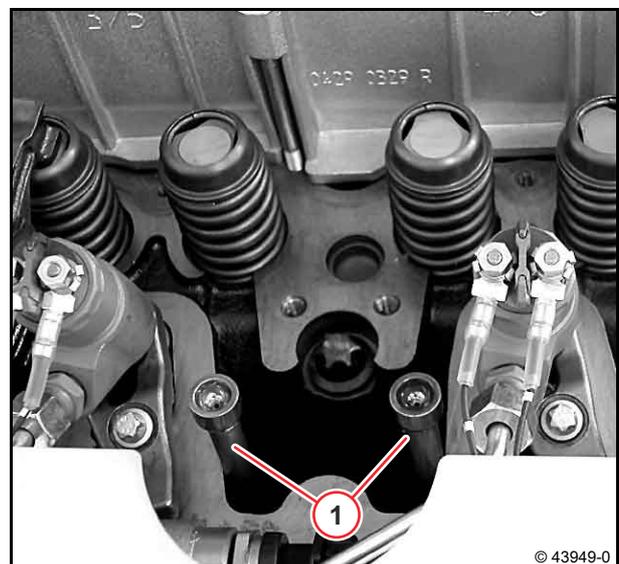
Note order of cylinders.



- Remove push rods (1).



Lay out components in the order in which they should be installed.



- Visually inspect the components.

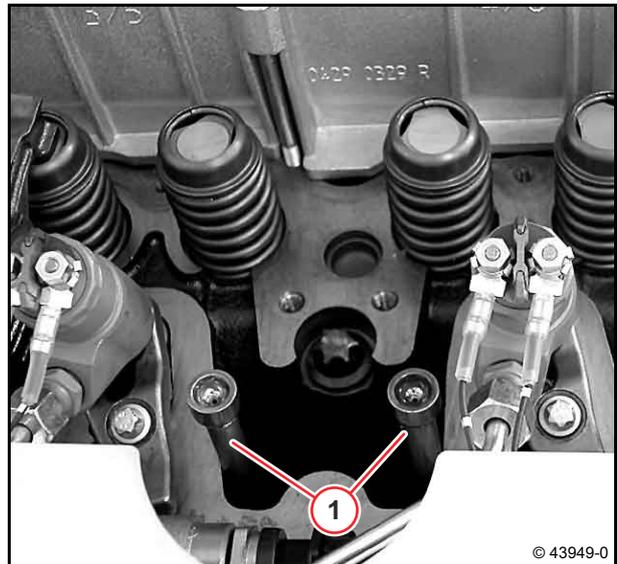


Installing the rocker arm and rocker arm bracket

- Insert stop rods (1).



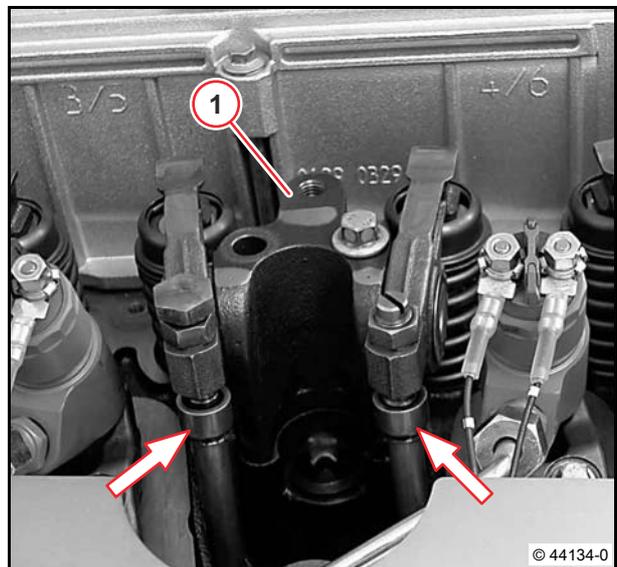
Note the assignment of the stop rods.
The stop rod must be seated with the ball head in the ladle of the tappet.



- Mount rocker arm bracket (1).



The ball heads must be seated in the ladles of the pushrods (arrows).



- Align rocker arm bracket symmetrically with the valve axles.



The bore (arrow) in the rocker arm bracket must be in line with the threaded bore in the cylinder head.

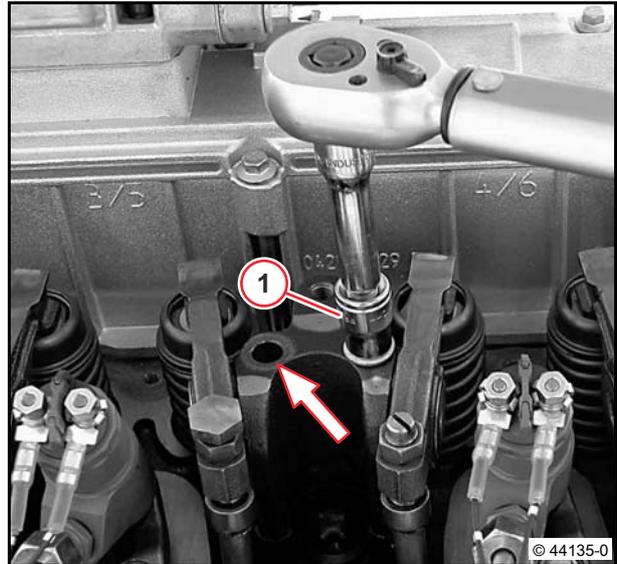
- Tighten screw (1).



30 Nm

**Attention!**

Make sure that the stop rods are not under stress due to valve overlap when fastening the screw.



- Setting the valve clearance (with or without removal of exhaust return module).



W 11-01-01

- Install exhaust gas return module.



W 08-02-01

- Remove turning gear.



W 49-02-01



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A01 002	Rocker arm support on the cylinder head		Assembly note: Rocker arm symmetrical to the valve centre axes.	30 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

Disassembling, assembling and checking the rocker arm and rocker arm bracket



Standard tools:

- Internal measuring device
- Micrometer gauge

Special tools:

- Dial gauge 100400



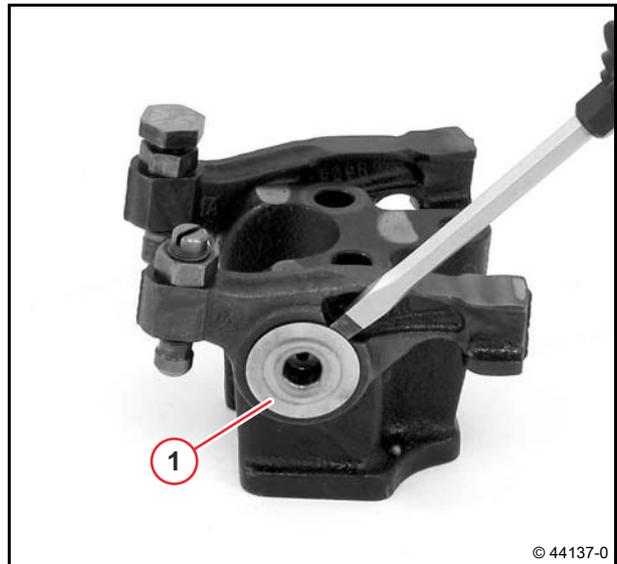
- W 11-02-01

Disassembling the rocker arm bracket

- Remove rocker arm and rocker arm bracket.

W 11-02-01

- Remove lockwashers (1).



- Remove rocker arm.



Lay out components in the order in which they should be installed.



Checking the rocker arm

- Measure rocker arm bore.

– Inlet

$21,02_0^{+0.033}$ mm

– Outlet

$21,02_0^{+0.033}$ mm



When the wear limit is reached the rocker arm must be renewed.



© 39032-1

6

- Loosen lock nut (1).
- Hold adjusting screw (2).
- Unscrew adjusting screw (2).
- Loosen lock nut (3).
- Hold adjusting screw (4).
- Unscrew adjusting screw (4).

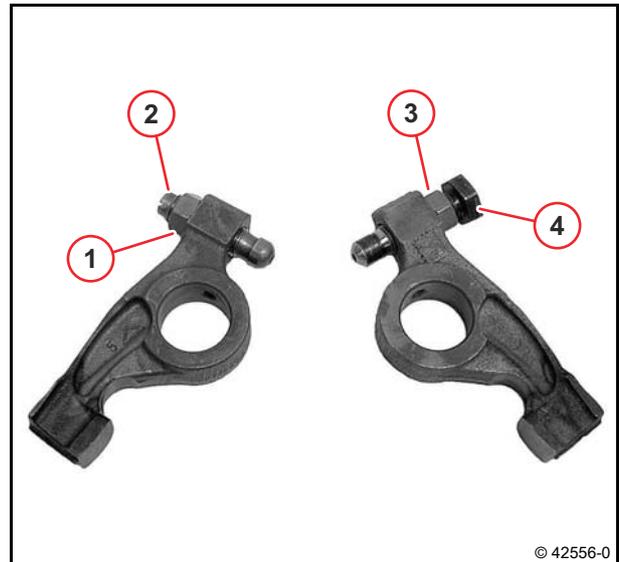


Attention!

Pay attention to versions of the adjusting screws (slotted, hexagonal, hexagonal socket).

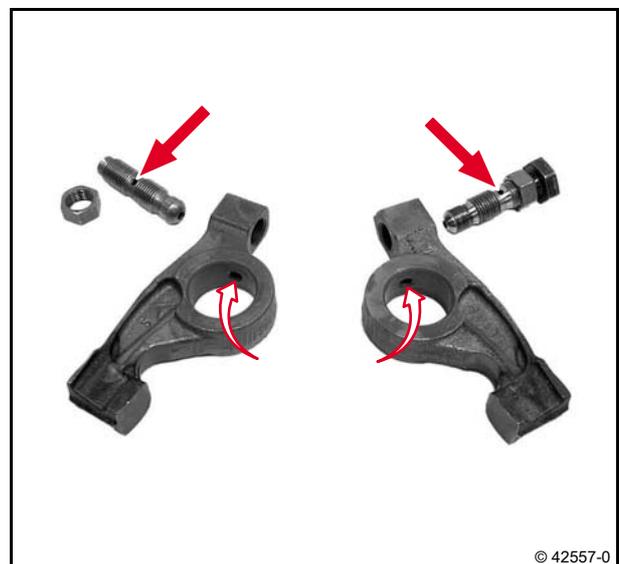


Lay out components in the order in which they should be installed.



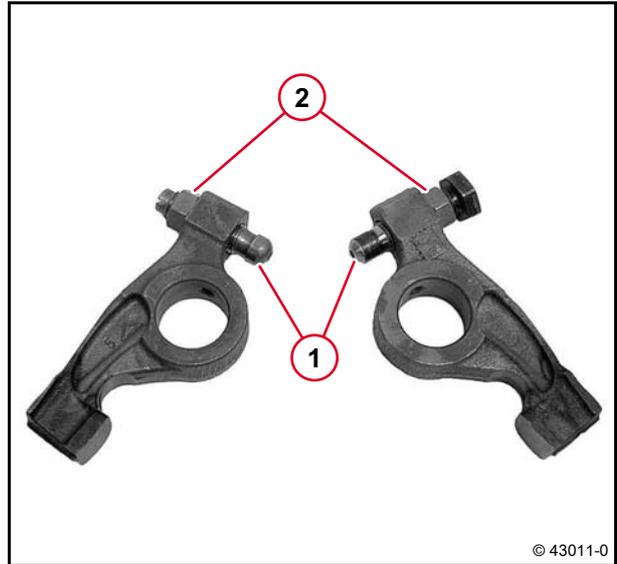
© 42556-0

- Check components for visible signs of wear.
- Check oil channels (arrows) for free passage.



© 42557-0

- Screw in setting screw (1).
- Loosen lock nuts (2).



Checking the rocker arm pin

- Measure the diameter of journals with the micrometer gauge.

21⁰_{-0.021} mm



When the wear limit is reached the rocker arm bracket must be replaced.



Assembling the rocker arm bracket

- Lightly oil the rocker arm pin.
- Push rocker arm (1) onto rocker arm pin.
- Push rocker arm (2) onto rocker arm pin.



The rocker arm's sliding surface (3) must face the threaded bore (arrow).
Mount the rocker arm (1) on the outlet side.
Mount the rocker arm (2) on the inlet side.



- Press new lockwashers (1) into the rocker arm pin up to the stop.
- Install rocker arm and rocker arm bracket.

 [W 11-02-01](#)



Removing and installing the lubricating oil cooler



Standard tools



– Fitting compound
DEUTZ AP1908



– W 15-02-02



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

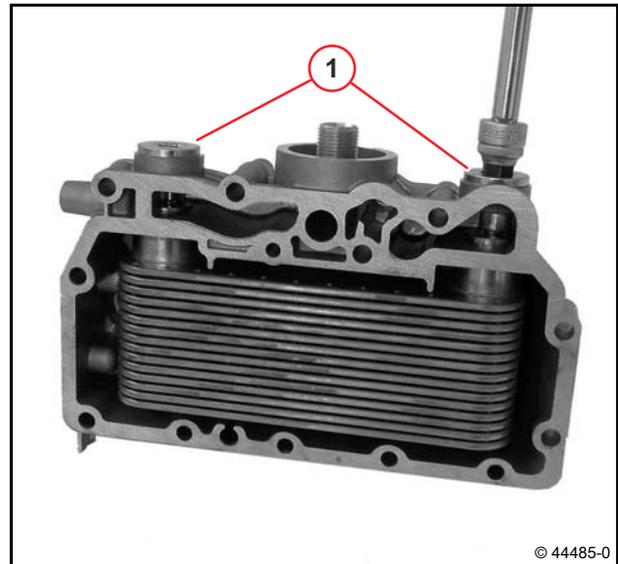
Observe the appropriate operating instructions for emptying and filling the engine.

Removing the lubricating oil cooler

- Remove oil cooler housing.

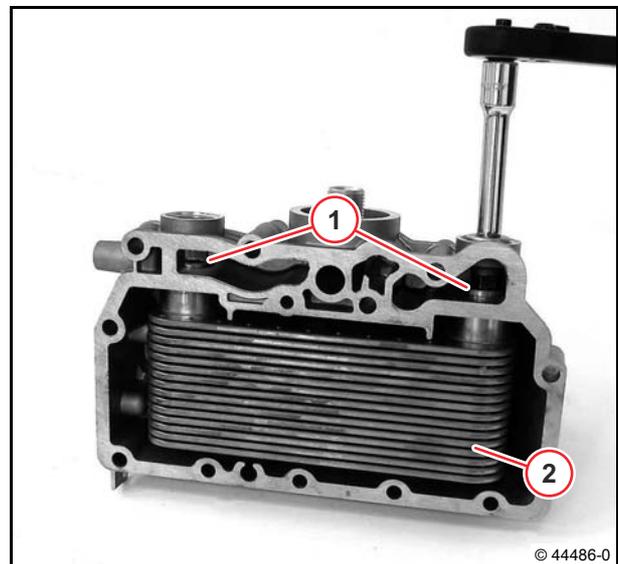
W 15-02-02

- Unscrew screws (1).
- Remove sealing rings.



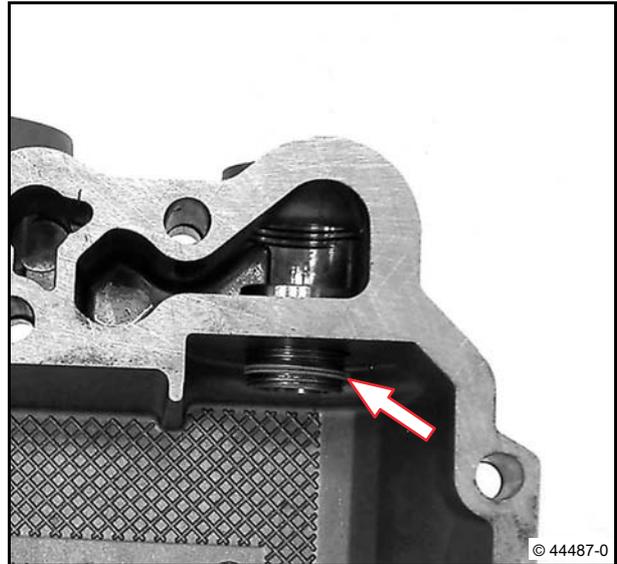
© 44485-0

- Unscrew collar screws (1).
- Remove lubricating oil cooler (2).



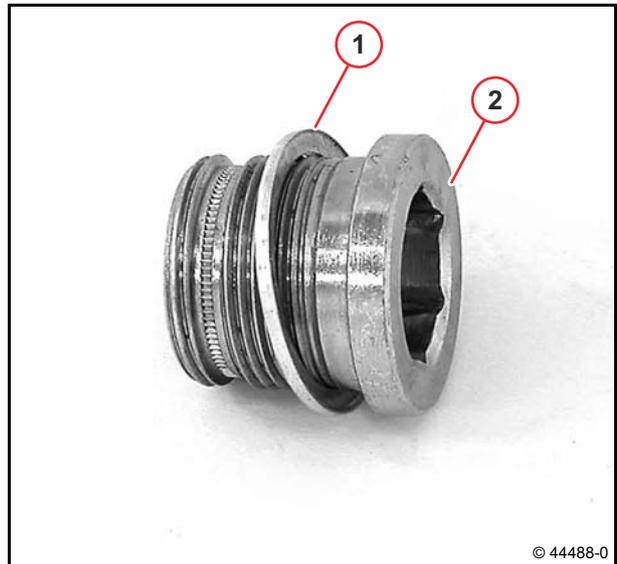
© 44486-0

- Remove the sealing ring (arrows) of both collar screws.
- Remove collar screws.

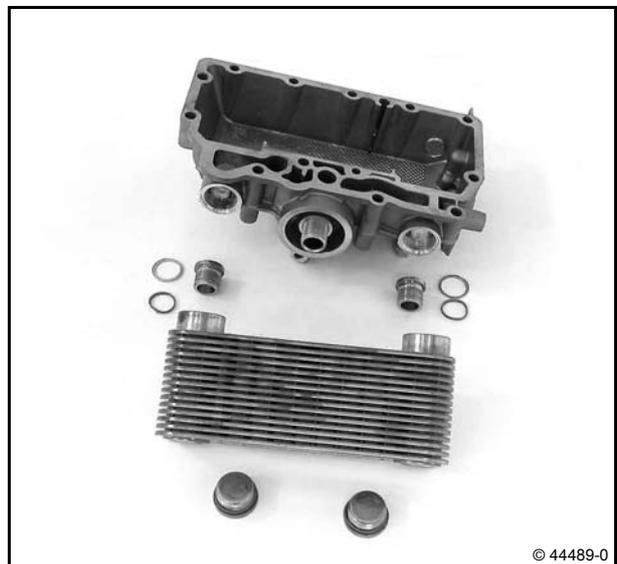


6

- Remove sealing ring (1).
- Clean collar screw (2).

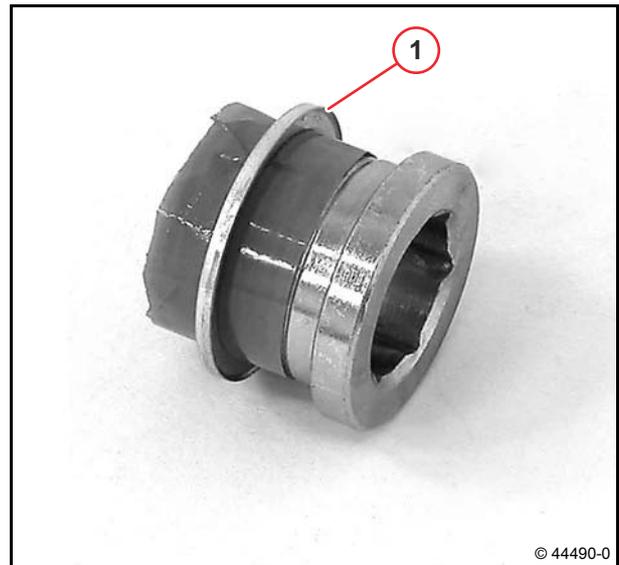


- Visually inspect the components.



Installing the lubricating oil cooler

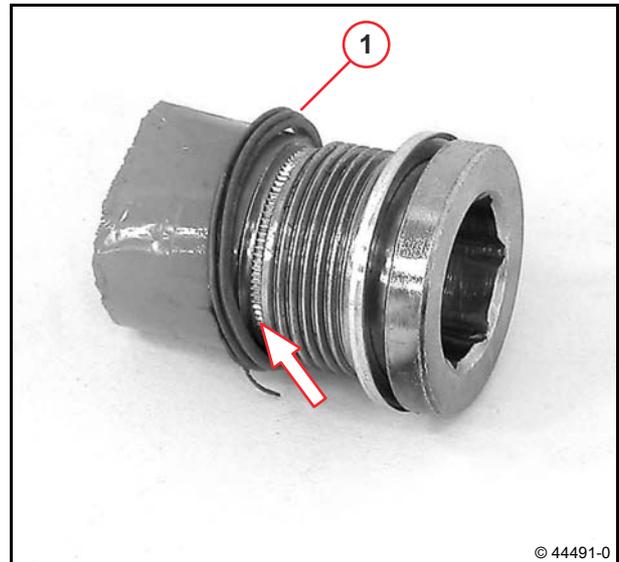
- Clean sealing surfaces.
- Cover thread with adhesive film.
- Push on new sealing ring (1).



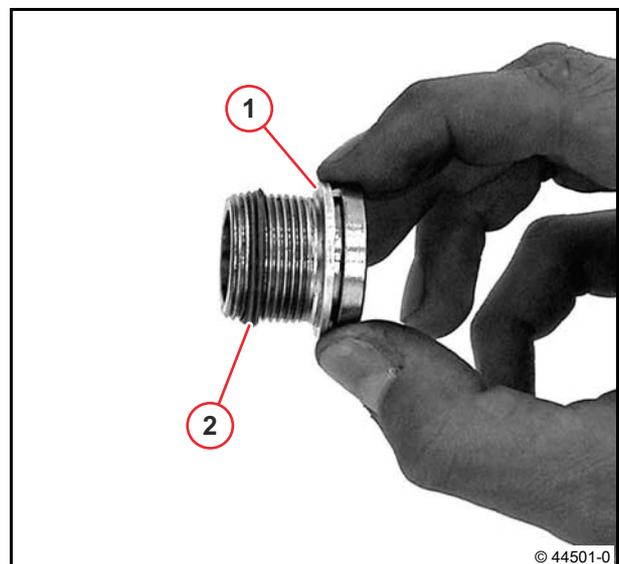
- Cover thread with adhesive film.
- Push on new sealing ring (1).



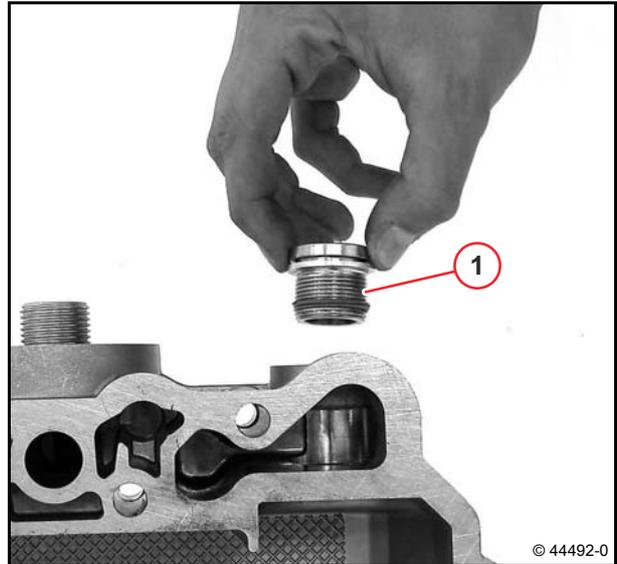
The sealing ring must fit in the groove (arrow).



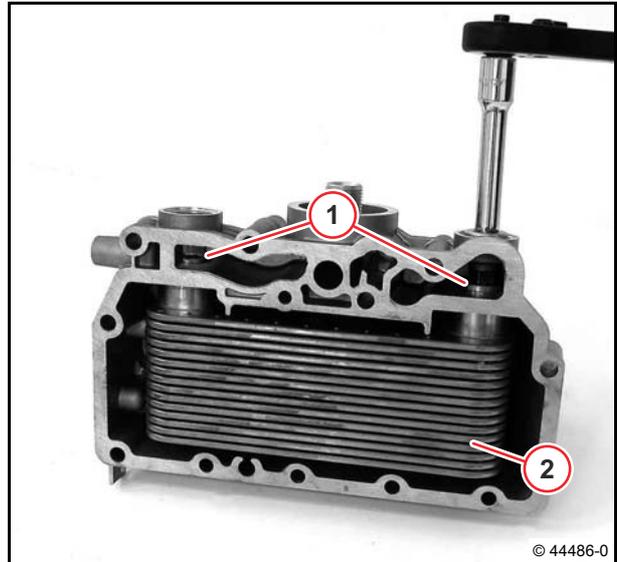
- Coat the sealing ring (1) lightly with fitting compound.
- Oil sealing ring (2).



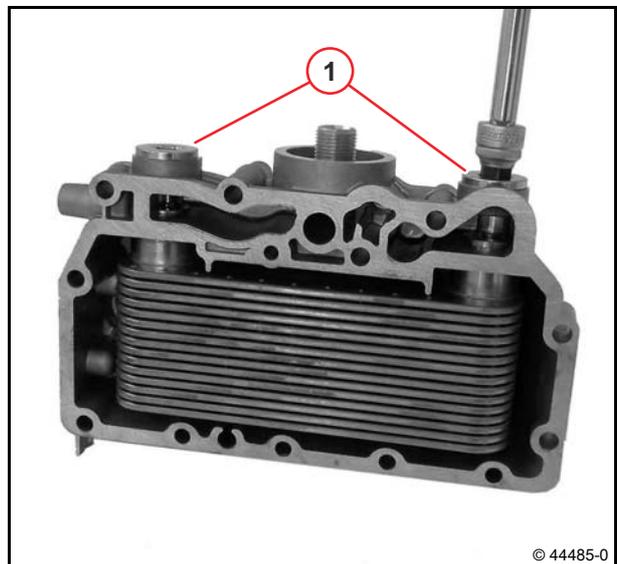
- Insert both collar screws (1).



- Insert oil cooler (2).
- Tighten collar screws (1).
 - Stage 1:
 80 Nm
 - Stage 2:
 160 Nm



- Coat new sealing rings with fitting compound .
- Tighten screw plug (1).
 80 Nm
- Install oil cooler housing.
 [W 15-02-02](#)



Removing and installing the lubricating oil cooler housing



Standard tools



– Operation manual
– [W 20-01-01](#)



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing the lubricating oil cooler housing

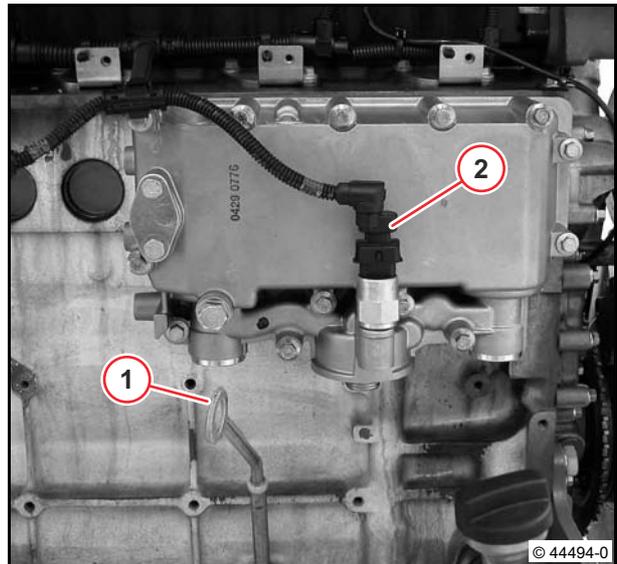
- Remove fuel filter console.

[W 20-01-01](#)

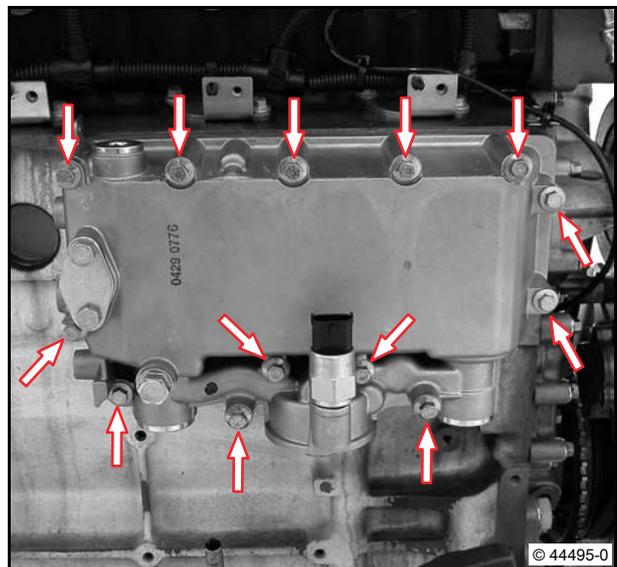
- Remove oil filter cartridge.

Operation manual

- Pull out oil dipstick (1).
- Pull out cable plug (2).



- Unscrew screws (arrows).
- Remove oil cooler housing (1).



- Visually inspect the components.



© 44496-0

Installing the lubricating oil cooler housing

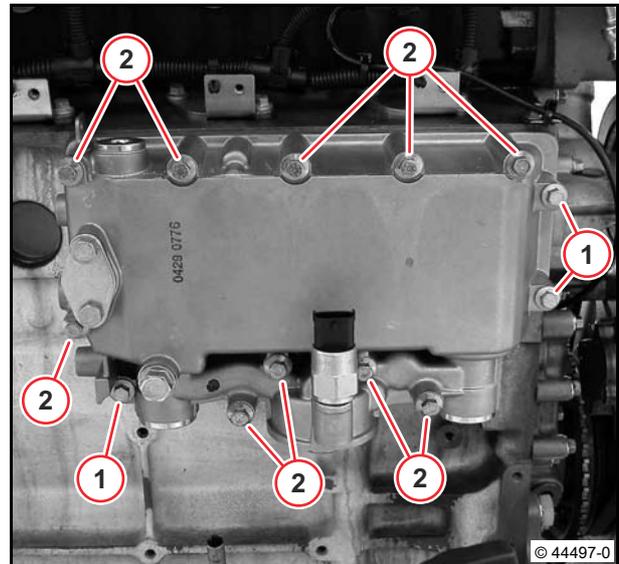
- Clean sealing surfaces.
- Mount new gasket.
- Mount the lubricating oil cooler housing.
- Tighten screws alternately.



Pay attention to different screw lengths.

M8 x 50 mm (1)

M8 x 80 mm (2).



© 44497-0

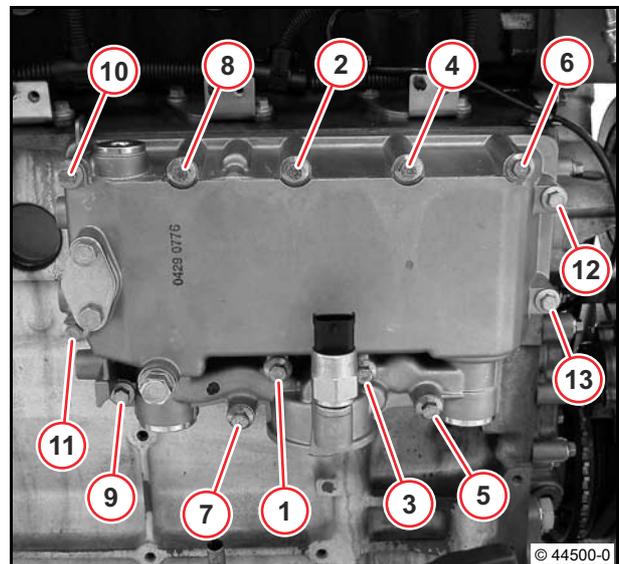
- Tighten the screws according to the tightening sequence.

– Stage 1:

3 Nm

– Stage 2:

30 Nm



© 44500-0

- Insert oil dipstick (1).
- Plug in the cable plug (2).



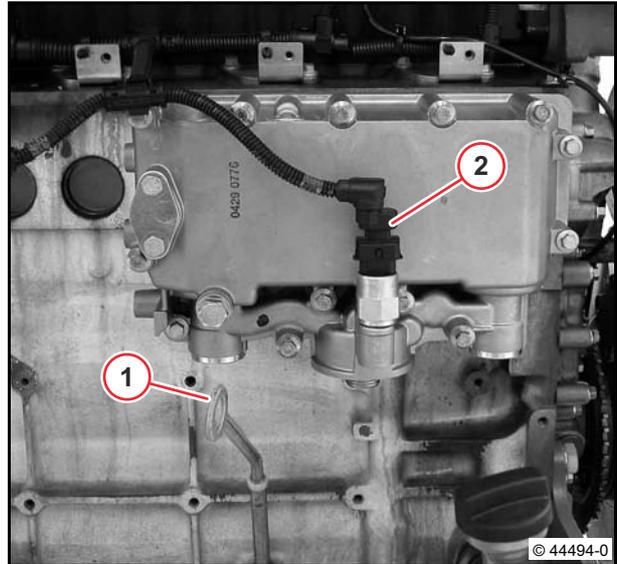
Ensure that the connection is perfect.

- Install oil filter cartridge.

 Operation manual

- Install the fuel filter console.

 [W 20-01-01](#)





Removing and installing the oil suction pipe



Standard tools



- W 02-01-01

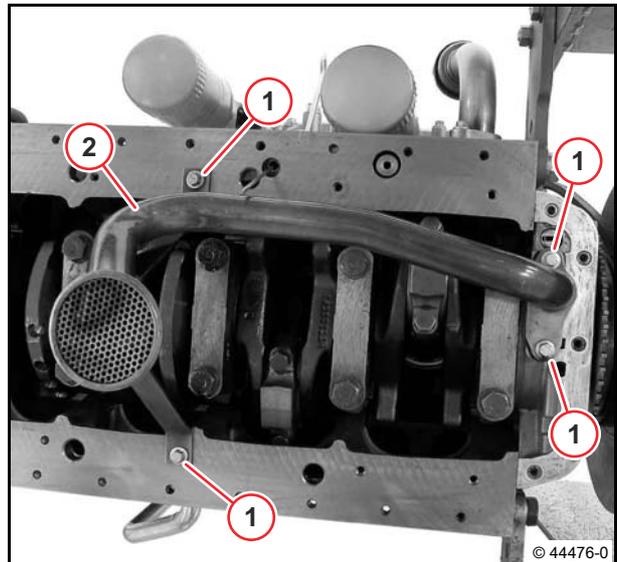
Removing the oil suction pipe

- Remove lubricating oil pan.



W 02-01-01

- Unscrew screws (1).
- Remove oil suction pipe (2).
- Remove gasket.



- Visually inspect the components.



Installing the oil suction pipe

- Clean sealing surfaces.
- Mount new gasket.
- Mount oil suction pipe.
- Fasten screws.

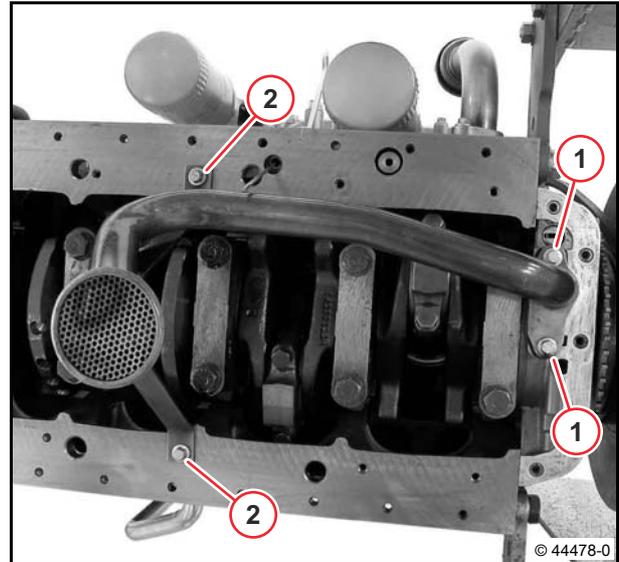


Ensure that the installation location is free from faults.

Pay attention to different screw lengths.

M8 x 25 mm (1)

M8 x 20 mm (2)

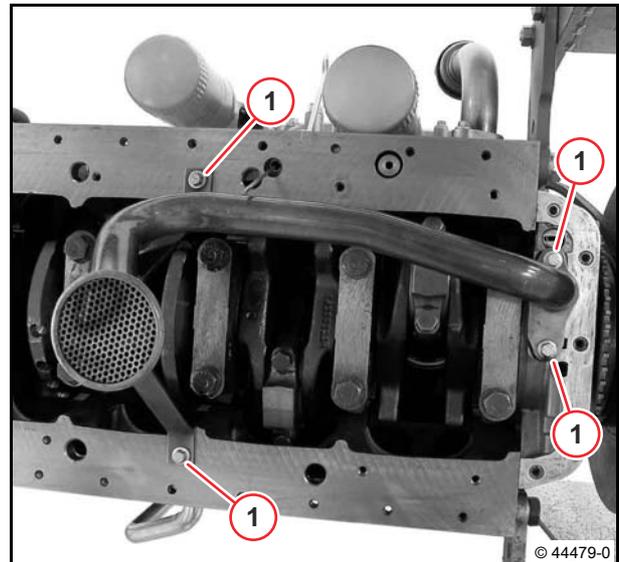


- Tighten screws (1).

 22 Nm

- Install lubricating oil pan.

 [W 02-01-01](#)



Removing and installing the control block



Standard tools

Special tools:

– Plugs/caps

170160



– [User notes](#)

– Operation manual



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

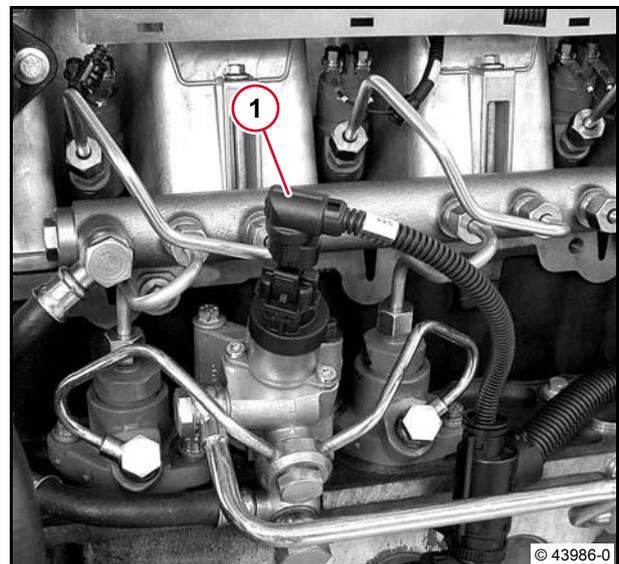
Removing the control block



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

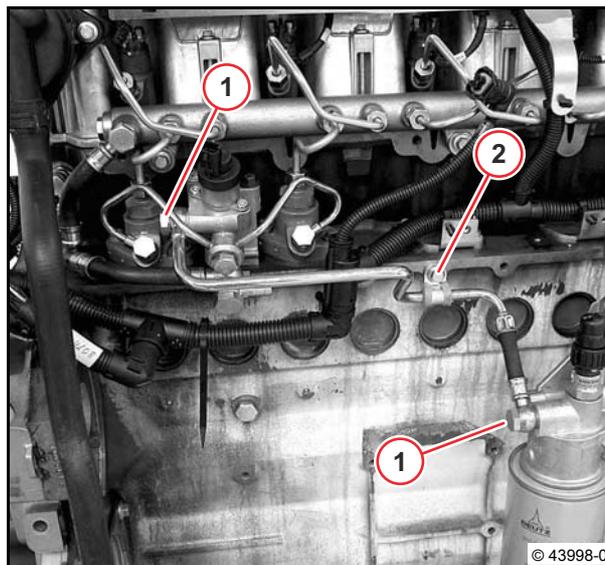
- Unlock cable plug (1) and remove.



- Unscrew hollow screws (1).
- Remove sealing rings.
- Unscrew screw (2).
- Loosen pipe clip.
- Remove fuel pipe.



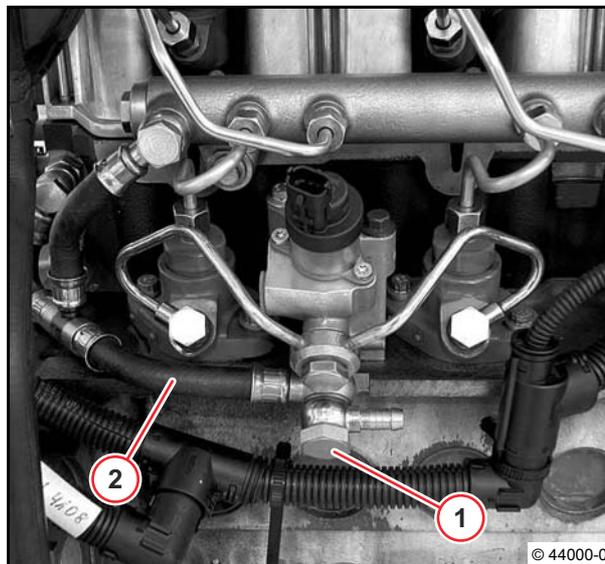
Collect draining fuel and dispose of according to regulations.



- Unscrew hollow screw (1).
- Remove fuel pipe (2), pipe connection and sealing rings.



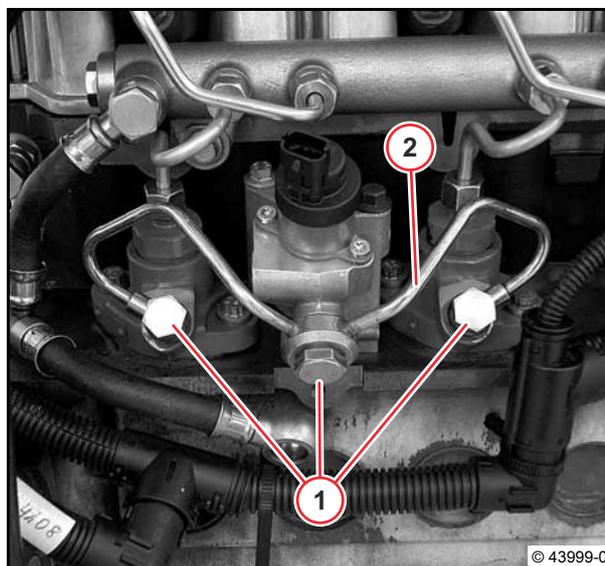
Collect draining fuel and dispose of according to regulations.



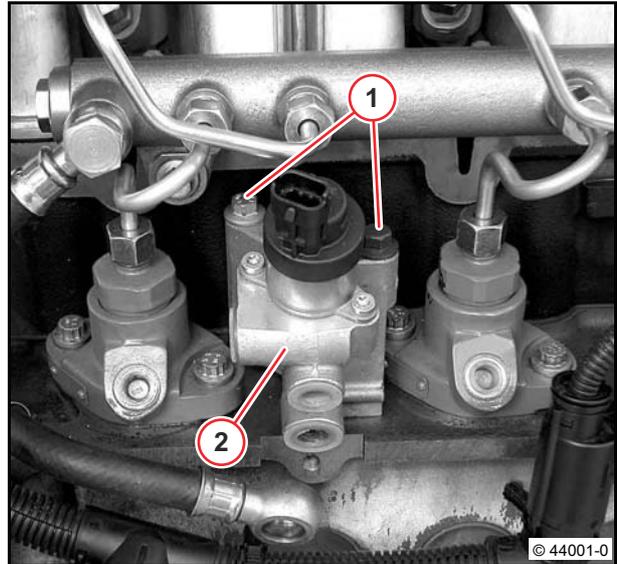
- Unscrew hollow screws (1).
- Remove fuel pipe (2) and sealing rings.



Collect draining fuel and dispose of according to regulations.



- Unscrew screws (1).
- Remove control block (2).

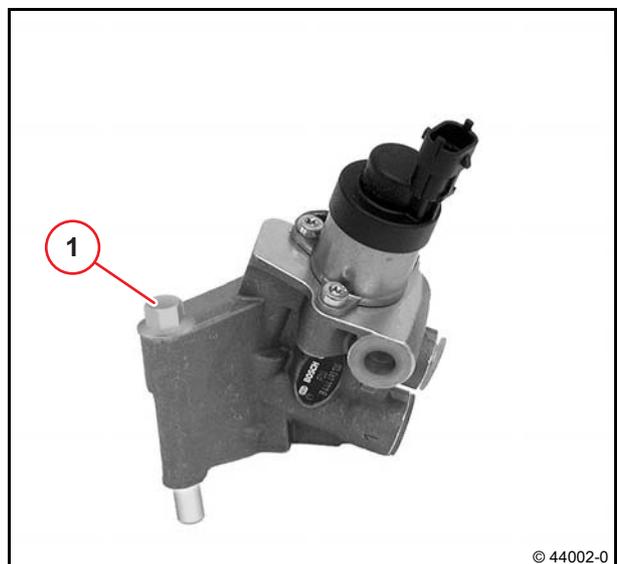


- Visually inspect the component.



Installing the control block

- Insert screw (1).



- Insert control block.
- Pre-assemble screws loosely.

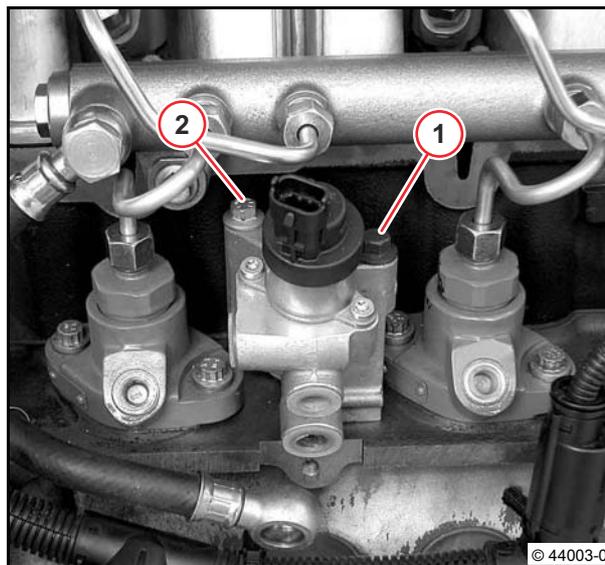


Pay attention to different screw lengths.

M8 x 75 mm (2)

M8 x 85 mm (1)

Do not tighten screws.



6

- Install fuel pipe. Insert hollow screws (1) and (2) with new sealing rings tension-free.

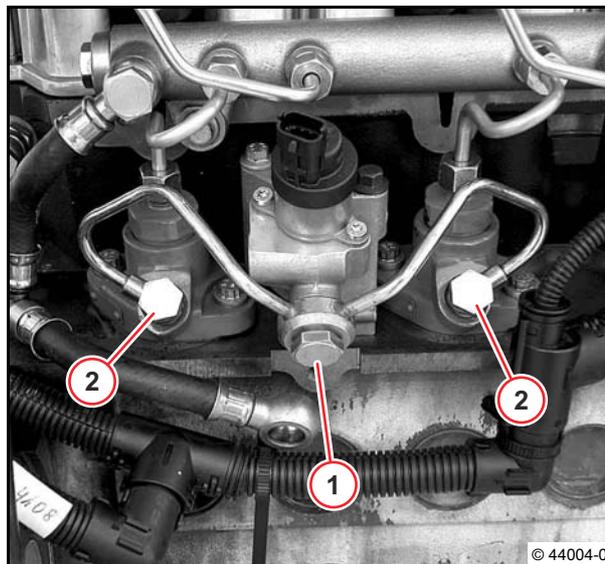


Use new sealing rings.

Pay attention to different screws:

Hollow screw M14 (1)

Hollow screws M12 (2)



- Mount fuel pipe.
- Insert hollow screws (1) with new sealing rings tension-free.



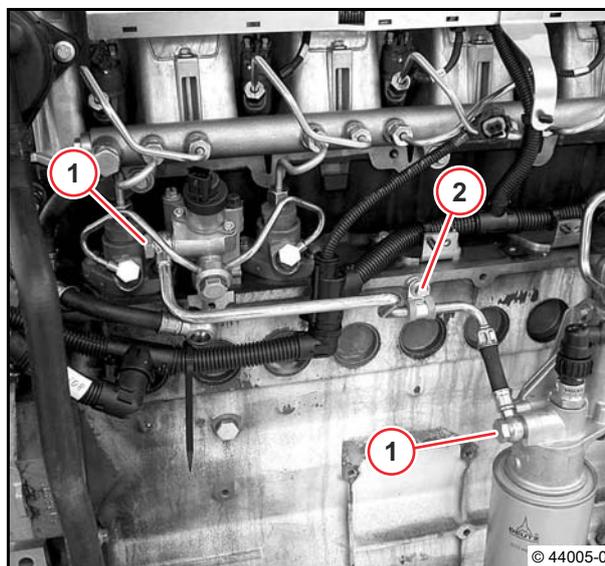
Use new sealing rings.

Do not tighten hollow screws.

- Position pipe clip.
- Fasten screw (2) tension-free.



Do not tighten the screw.

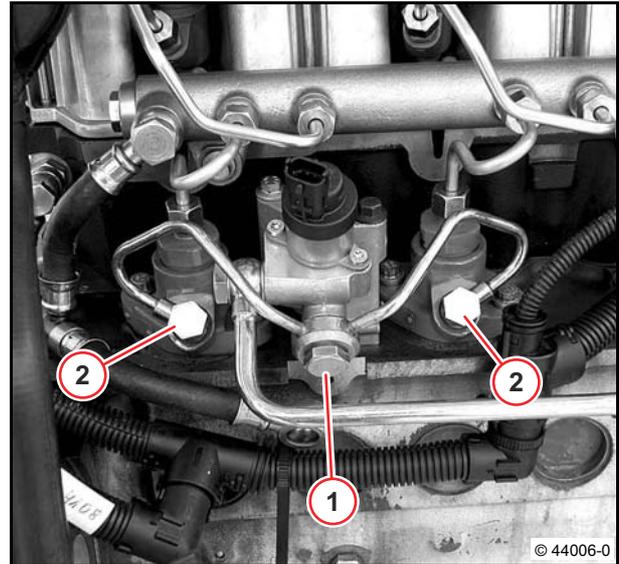


- Tighten hollow screw (1).

39 Nm

- Tighten hollow screws (2).

29 Nm



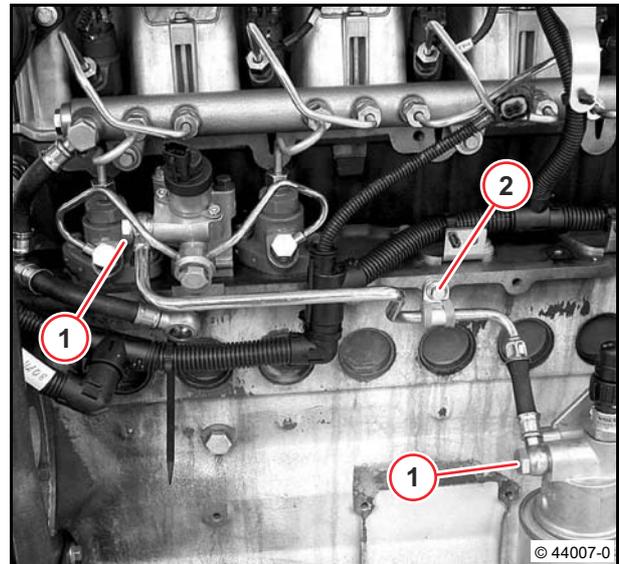
- Tighten hollow screws (1).

39 Nm

- Tighten screw (2).

20 Nm

- Check the fuel pipes for perfect installation position.



Attention!
Observe the following order of tightening.

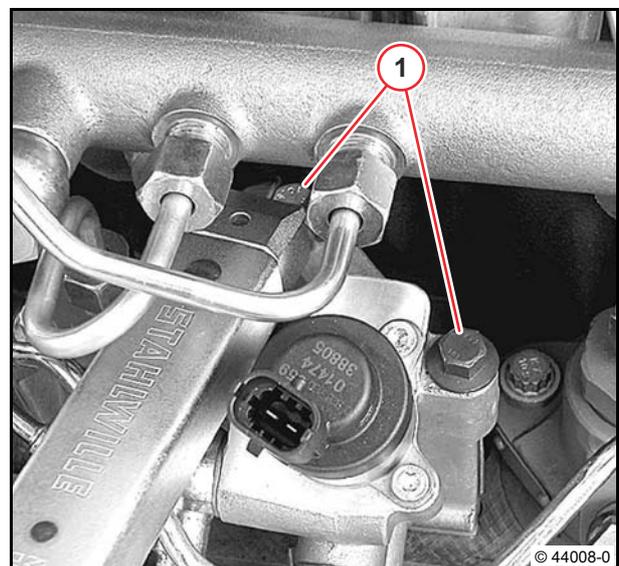
- Tighten screw (1).

20 Nm

- Tighten screw (2).

20 Nm

Attention!
Do not bend high pressure and fuel pipe.

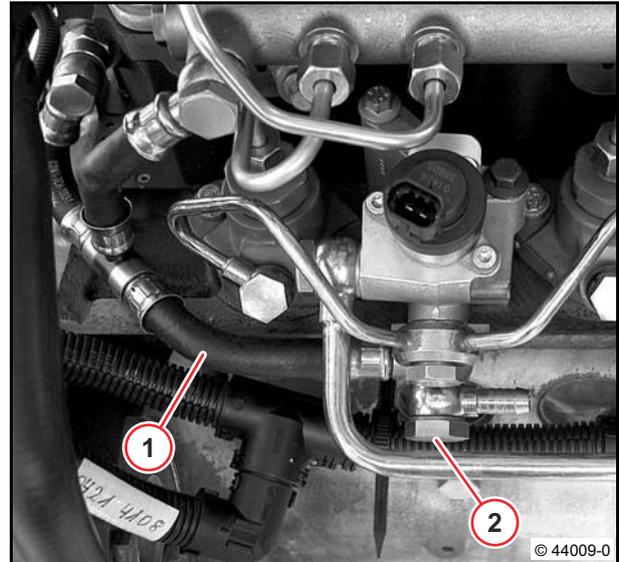


- Mount fuel return pipe (1) and pipe connection.
- Tighten hollow screw (2) with new sealing rings.

 49 Nm



Use new sealing rings.



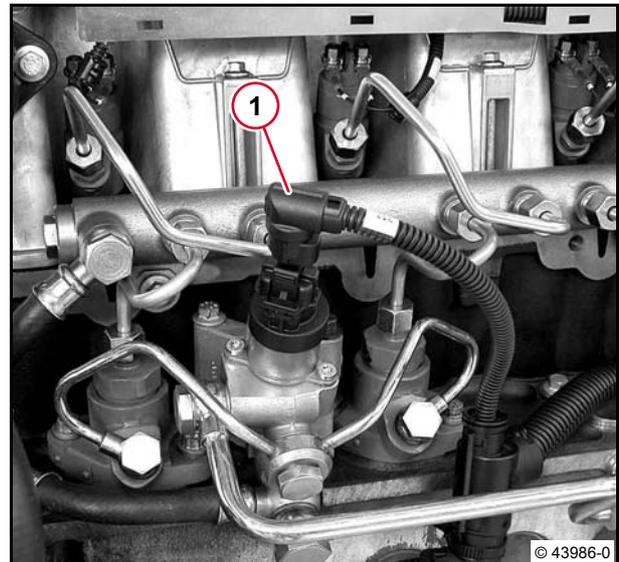
6

- Plug in the cable plug (1).



Ensure that the connection is perfect.

Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A07 003	Injection pipe on rail and injector, High pressure pipe on high pressure pump and rail	Union nut	Stage 1: Observe assembly specification. Use new pipe.	10 Nm
A07 003	Injection pipe on rail and injector, High pressure pipe on high pressure pump and rail	Union nut	Stage 2:	60° +15°
A07 031	High pressure pump to crankcase	M10x30-10.9	Stage 1: Screws oiled	10 Nm
A07 031	High pressure pump to crankcase	M10x30-10.9	Stage 2:	50 Nm
A07 032	Control block to crankcase	M8x75 M8x85	Observe tightening sequence.	20 Nm
A12 092	Pipe union, pipe diameter 8 mm, ring piece	Hollow screw M12x1.5		29 Nm
A12 093	Pipe union, pipe diameter 10 mm, ring piece	Hollow screw M14x1.5		39 Nm
A12 094	Pipe union, pipe diameter 12 mm, ring piece	Hollow screw M16x1.5		49 Nm
A12 095	Pipe clips, fastening	M8		20 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.



Removing and installing the high-pressure pump (Installation position A)



Standard tools

Special tools:

- Assembly pliers 103220
- Special wrench 110500
- Assembly case with assembly sleeves, guides and disassembly tool 110900
- Plugs/caps 170160



- Fitting compound DEUTZ AP1908



- User notes
- W 17-01-01
- W 49-02-01



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

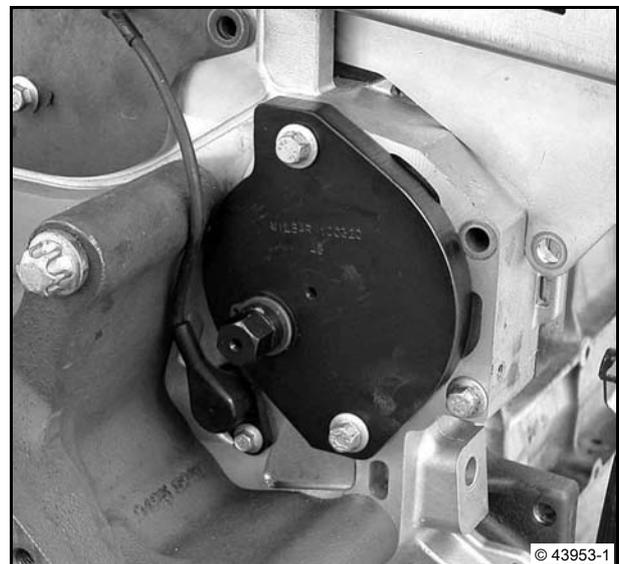
After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

Removing the high-pressure pump

- Attach turning gear.



W 49-02-01





Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Remove control block.

 [W 17-01-01](#)

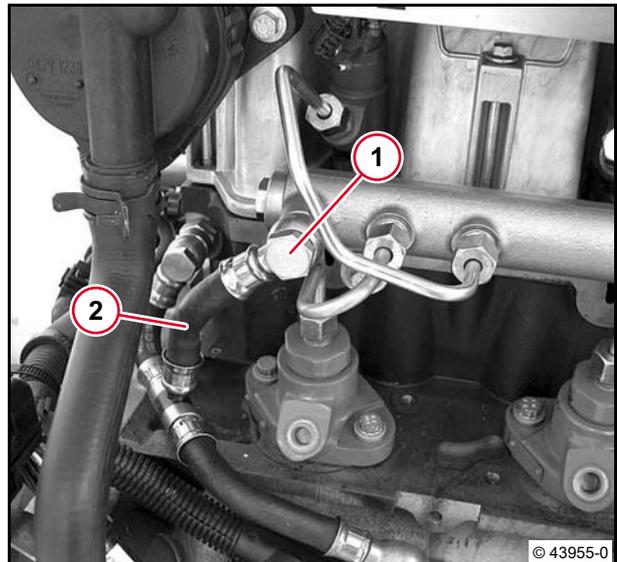


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- Unscrew hollow screws (1).
- Remove fuel pipe (2) and sealing rings.



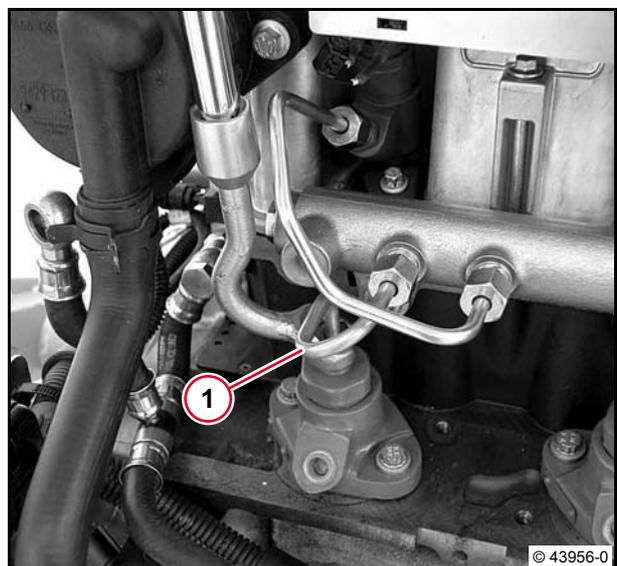
Collect draining fuel and dispose of according to regulations.



Collect draining fuel and dispose of according to regulations.

Support the pipe connection of the high pressure pump.

- Remove high pressure pipe (1) with special wrench.



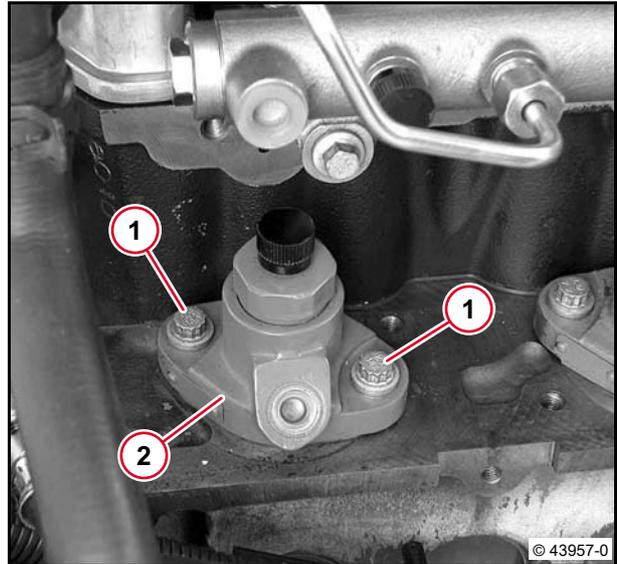
- Loosen screws (1) evenly



Loosen screws evenly to avoid jamming the high-pressure pump.

If necessary, turn the crankshaft with turn-over gear in the direction of rotation of the engine until the high-pressure pump is felt to release.

- Unscrew screws (1) evenly.
- Remove high-pressure pump (2).



- Carefully remove the O-ring (1) from the high-pressure pump with the disassembly tool.



Attention!

Do not damage the high-pressure pump.



- Pull out roller tappet (1) with special pliers.



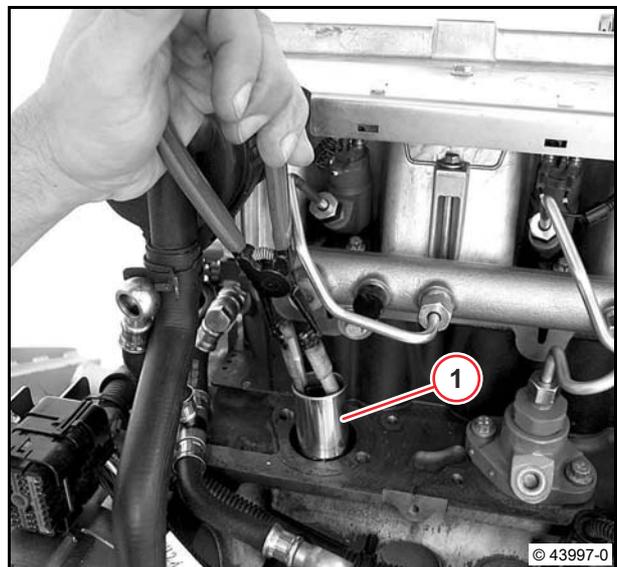
Attention!

Do not damage the roller tappet!



Do not use magnetic tools for removing the roller tappet.

- Visually inspect the components.

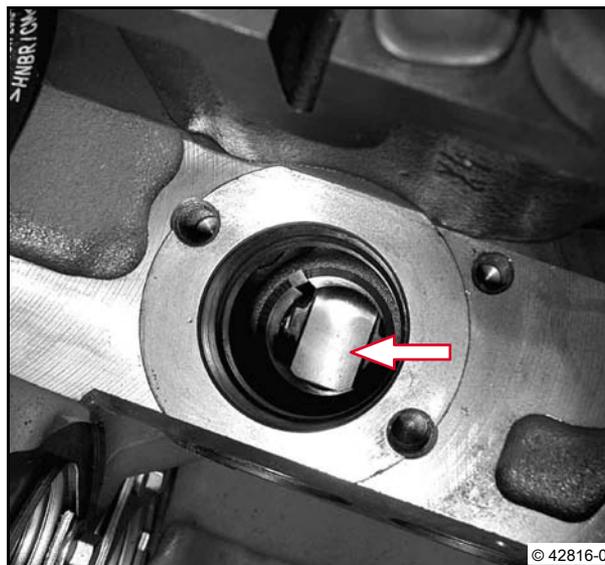


Installing the high-pressure pump

- Turn the crankshaft with the turn-over gear until the cam for the high-pressure pump is on the cam base circle (arrow).



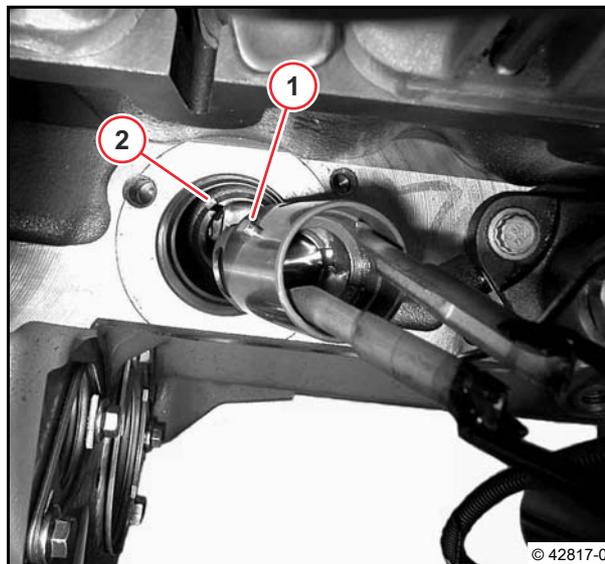
Roller tappet stroke is less than 0.5 mm.



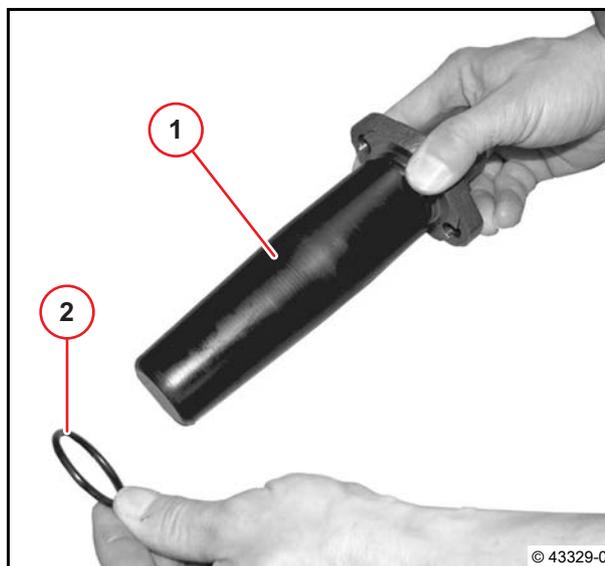
- Oil roller tappet lightly and insert carefully with special pliers.



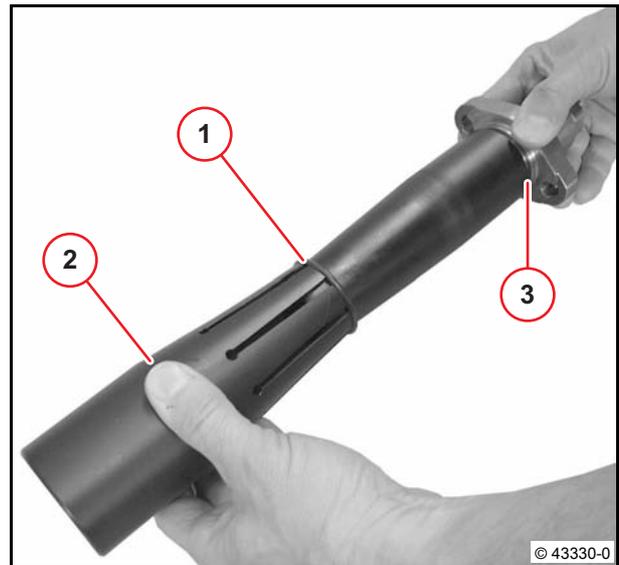
The guide pin (1) on the roller tappet must grip in the groove (2).



- Push assembly guide (1) onto high-pressure pump.
- Push the new O-ring (2) onto the assembly guide.



- Push the O-ring (1) with assembly sleeve (2) up to the groove (3).
- Coat the O-ring, mounting bore and chamfers in the crankcase with fitting compound.



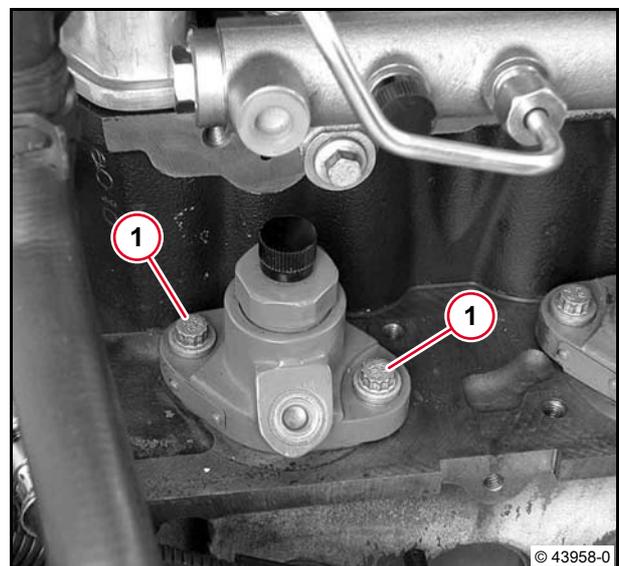
- Insert the high-pressure pump carefully in the crankcase.



- Oil the screws (1) lightly and tighten alternately until the high-pressure pump is flush with the crankcase.



Do not tighten the screws yet.



- Install control block.

W 17-01-01

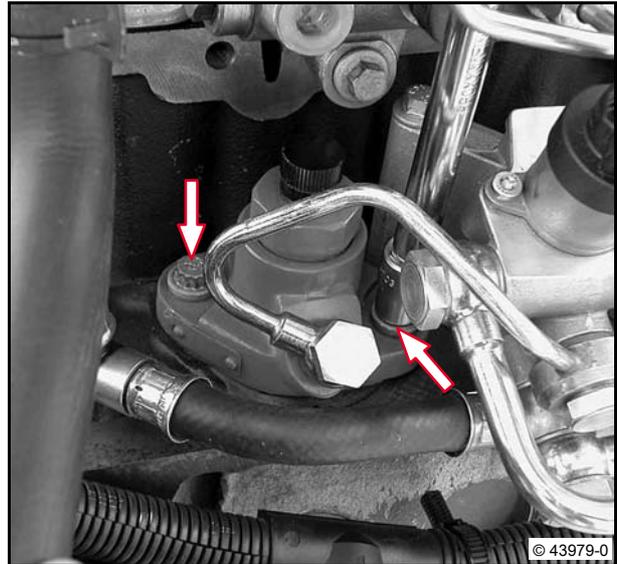
- Tighten screws (arrows).

- Stage 1:

10 Nm

- Stage 2:

50 Nm



6



Attention!

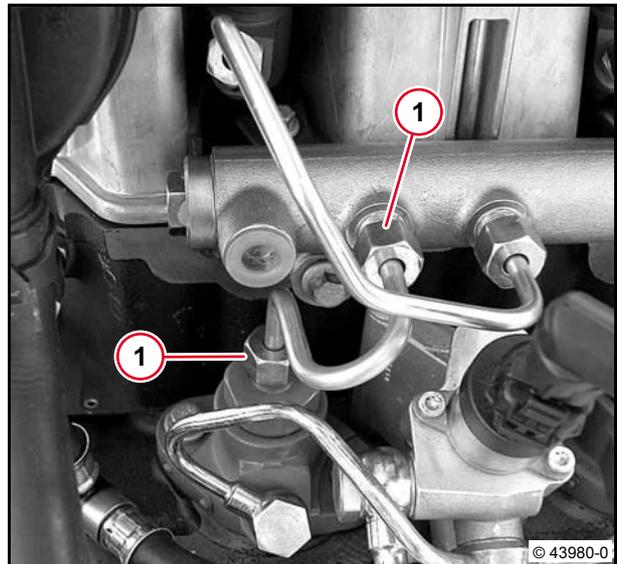
The high-pressure line must always be renewed after disassembly.
Install high pressure line without tension.

- Mount new high-pressure line on high-pressure pump and rail.
- Screw on union nuts (1).



Do not tighten union nuts.

- Check the high-pressure line for perfect installation position.



- Installation position of vibration damper.



Attention!

Pay attention to installation position.
Do not turn vibration damper (1).

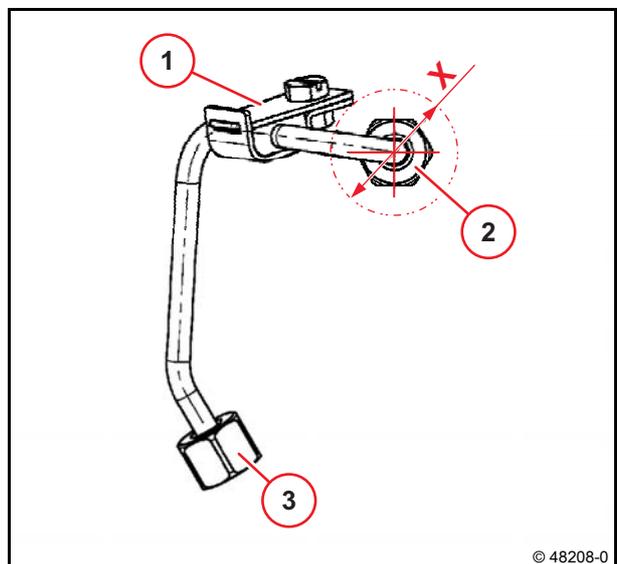
- (1) Vibration damper

- Dimension X

Diameter: 32 mm

- (2) Connection rail

- (3) Connection high pressure pump



(1) Vibration damper

- Dimension I

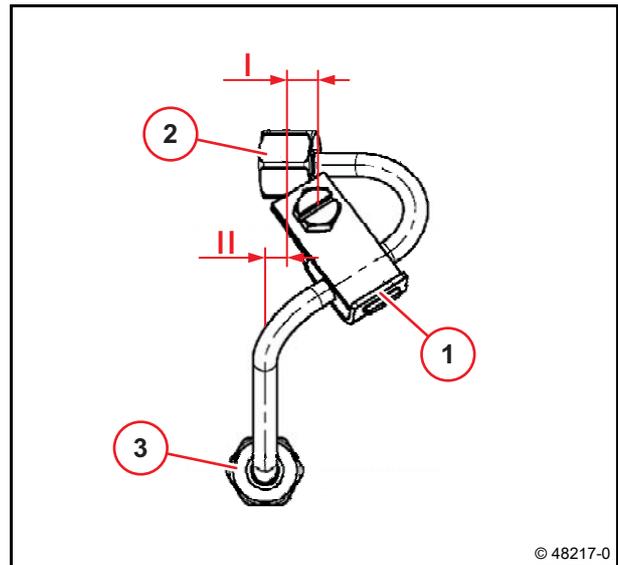
 7,6 ± 1.5 mm

- Dimension II

 5,4 ± 0.5 mm

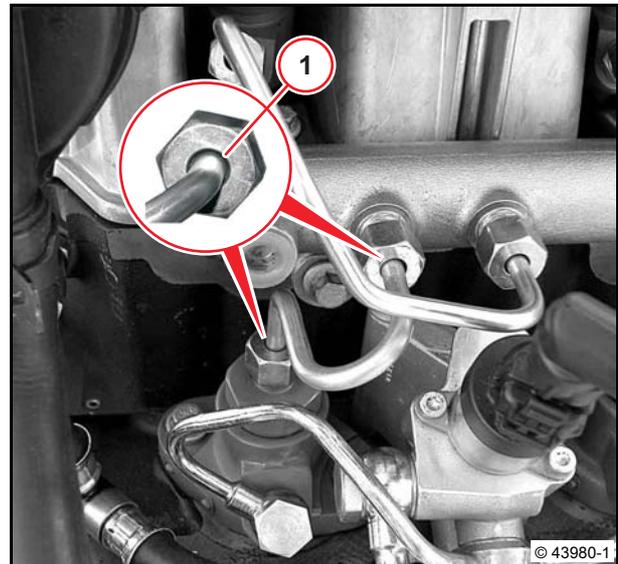
(2) Connection rail

(3) Connection high pressure pump



Attention!

Install high pressure line without tension. Pay attention to alignment of the high pressure pipes. Pipes which touch the bore (1) of the union nut must be renewed.



- Tighten union nuts (arrows) with special wrench.

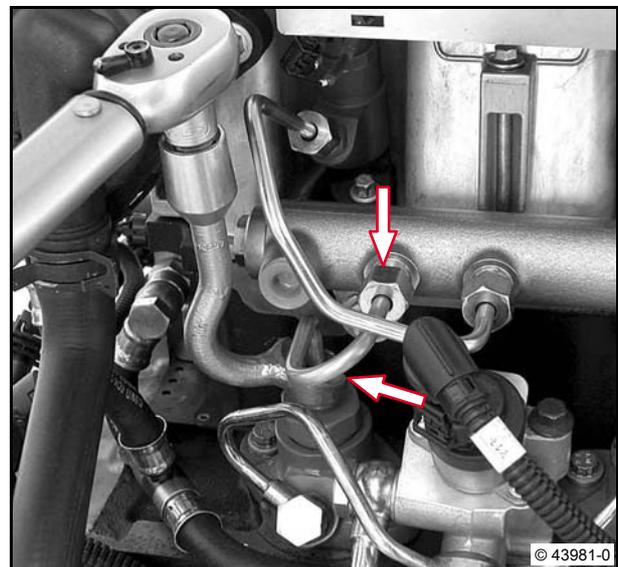
- Stage 1:

 10 Nm

- Stage 2:

 60° $\pm 15^\circ$

- Check the high-pressure line for perfect installation position.

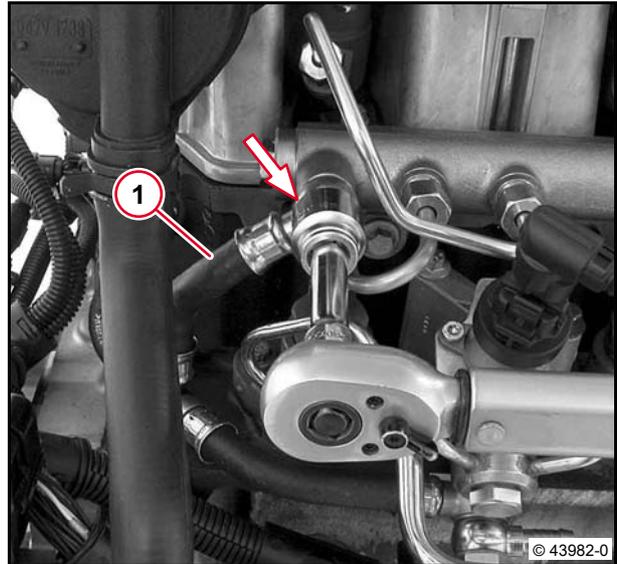


- Mount fuel return pipe (1).
- Tighten hollow screw (arrow) with new sealing rings.

 39 Nm



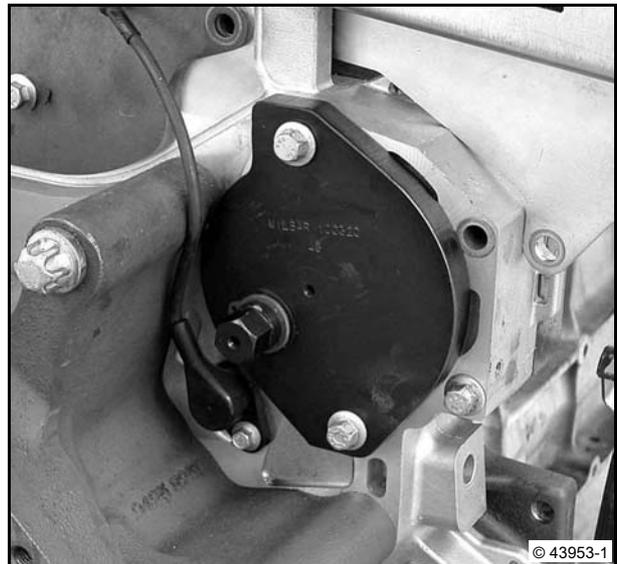
Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.



6

- Remove turning gear.

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Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A07 003	Injection pipe on rail and injector, High pressure pipe on high pressure pump and rail	Union nut	Stage 1: Observe assembly specification. Use new pipe.	10 Nm
A07 003	Injection pipe on rail and injector, High pressure pipe on high pressure pump and rail	Union nut	Stage 2:	60° +15°
A07 031	High pressure pump to crankcase	M10x30-10.9	Stage 1: Screws oiled	10 Nm
A07 031	High pressure pump to crankcase	M10x30-10.9	Stage 2:	50 Nm
A12 093	Pipe union, pipe diameter 10 mm, ring piece	Hollow screw M14x1.5		39 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.



Removing and installing the high-pressure pump (Installation position B)



Standard tools

Special tools:

- Assembly pliers 103220
- Special wrench 110500
- Assembly case with assembly sleeves, guides and disassembly tool 110900
- Plugs/caps 170160



- Fitting compound
DEUTZ AP1908



- [User notes](#)
- [W 49-02-01](#)



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

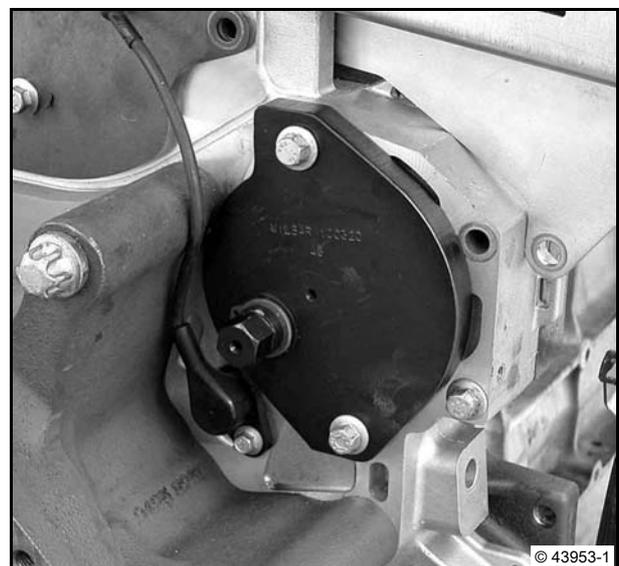
After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

Removing the high-pressure pump

- Attach turning gear.



[W 49-02-01](#)

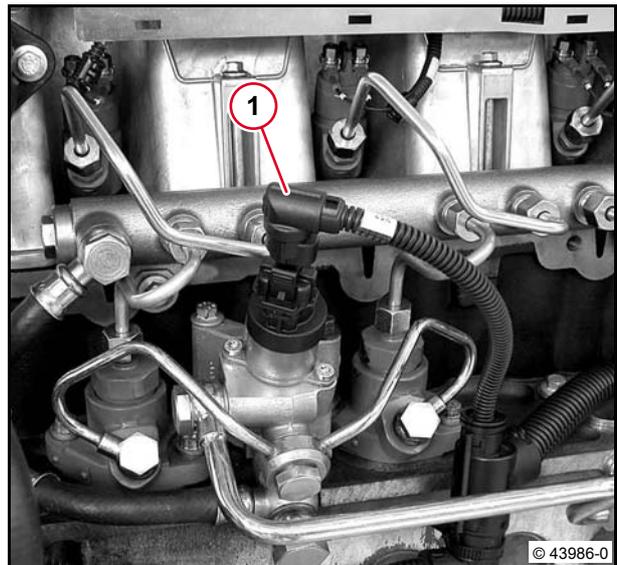




Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

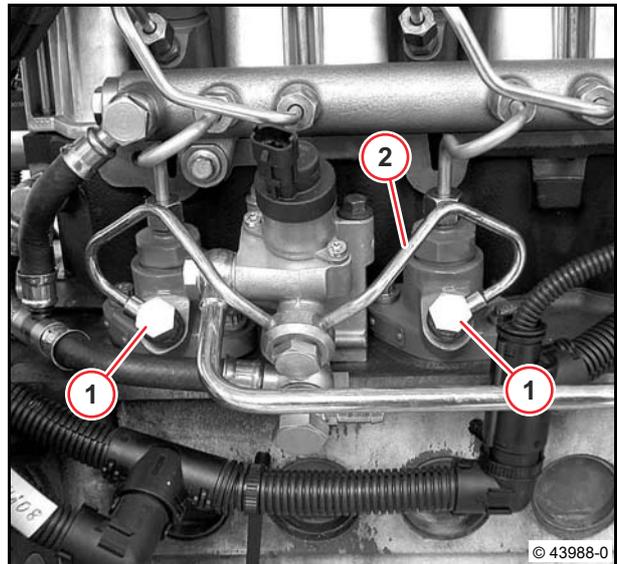
- Unlock cable plug (1) and remove.



- Unscrew hollow screws (1).
- Remove fuel pipe (2) and sealing rings.



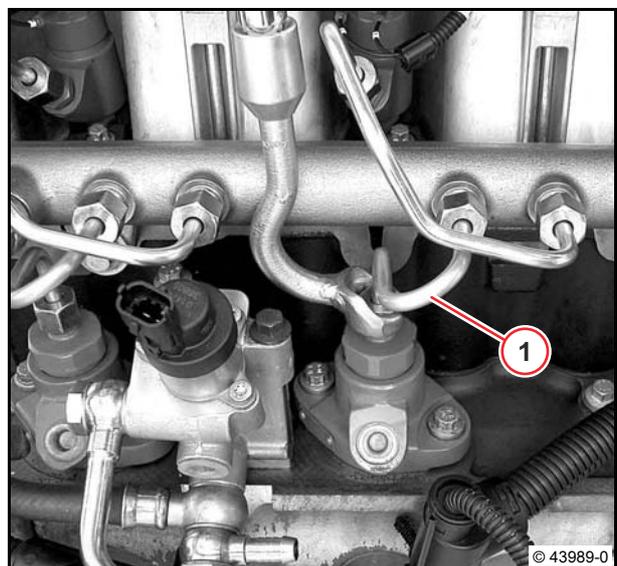
Collect draining fuel and dispose of according to regulations.



Collect draining fuel and dispose of according to regulations.

Support the pipe connection of the high pressure pump.

- Remove high pressure pipe (1) with special wrench.

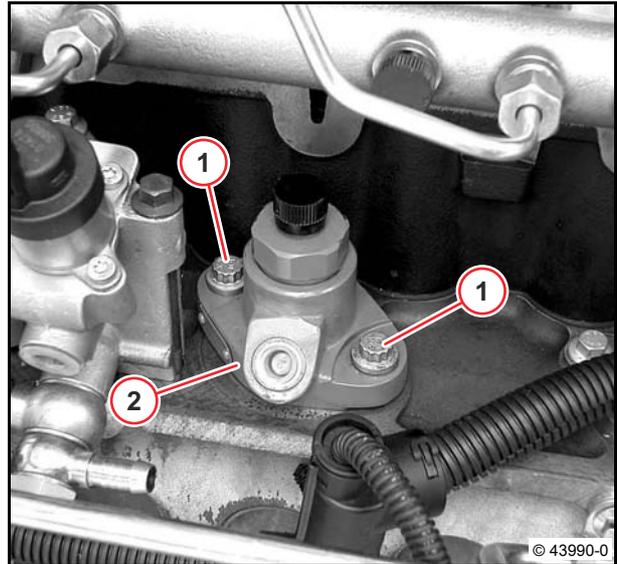


- Unscrew screws (1).
- Remove high-pressure pump (2).



Loosen screws evenly to avoid jamming the high-pressure pump.

If necessary, turn the crankshaft with turn-over gear in the direction of rotation of the engine until the high-pressure pump is felt to release.

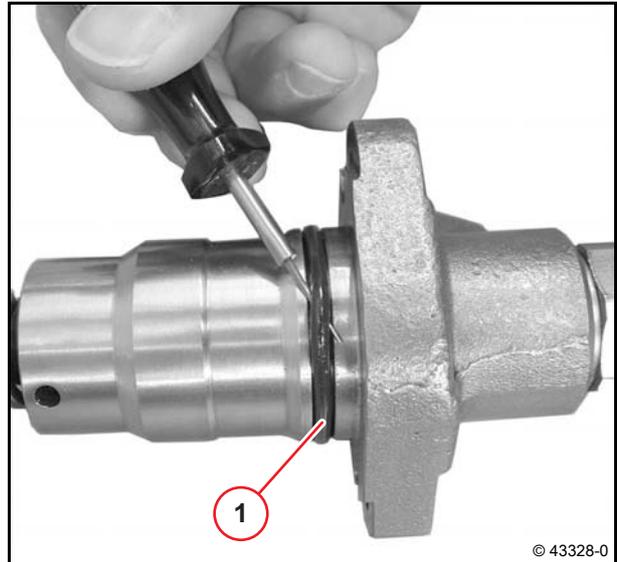


- Carefully remove the O-ring (1) from the high-pressure pump with the disassembly tool.



Attention!

Do not damage the high-pressure pump.



- Pull out roller tappet (1) with special pliers.



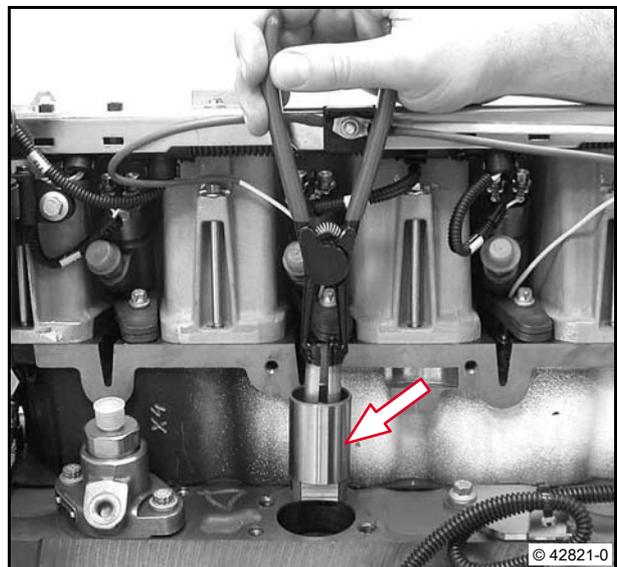
Attention!

Do not damage the roller tappet!



Do not use magnetic tools for removing the roller tappet.

- Visually inspect the components.

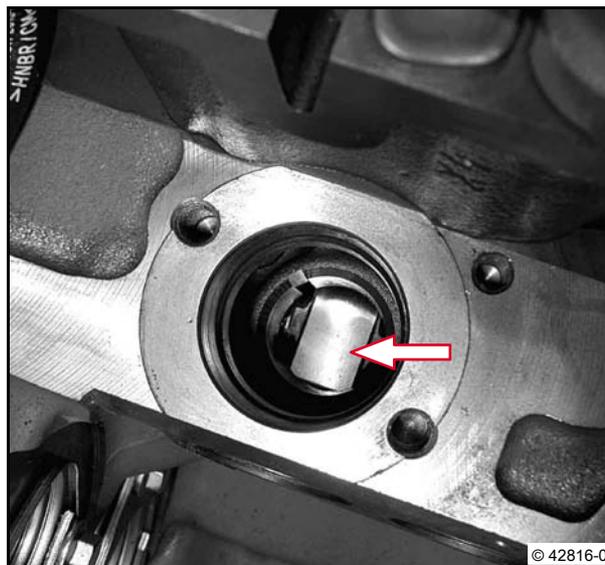


Installing the high-pressure pump

- Turn the crankshaft with the turn-over gear until the cam for the high-pressure pump is on the cam base circle (arrow).



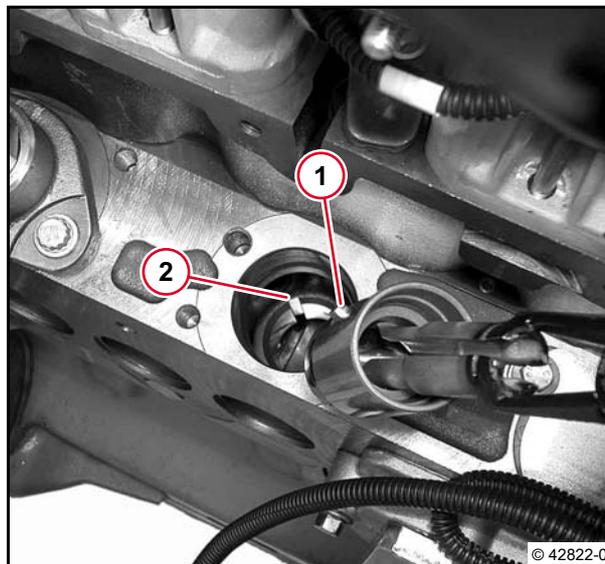
Roller tappet stroke is less than 0.5 mm.



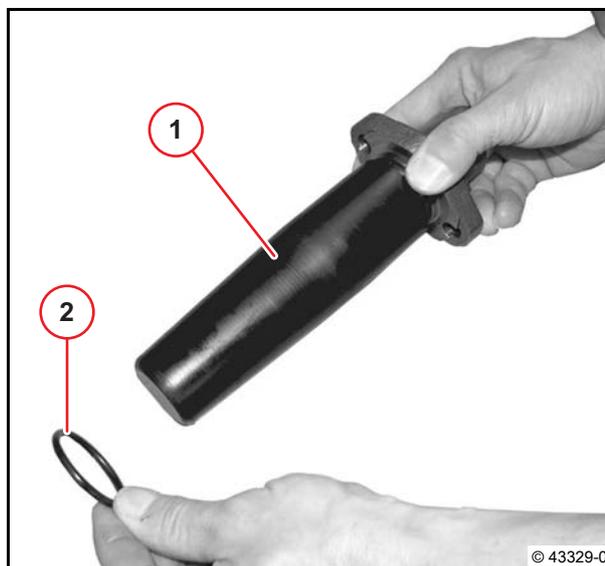
- Oil roller tappet lightly and insert carefully with special pliers.



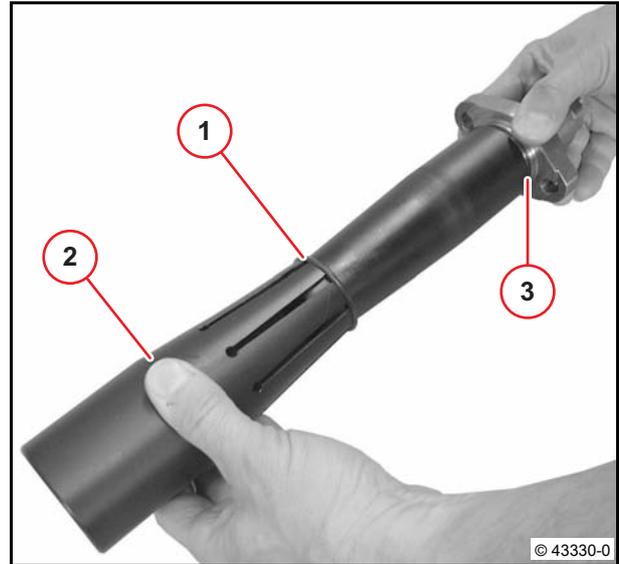
The guide pin (1) on the roller tappet must grip in the groove (2).



- Push assembly guide (1) onto high-pressure pump.
- Push the new O-ring (2) onto the assembly guide.



- Push the O-ring (1) with assembly sleeve (2) up to the groove (3).
- Coat the O-ring, mounting bore and chamfers in the crankcase with fitting compound.



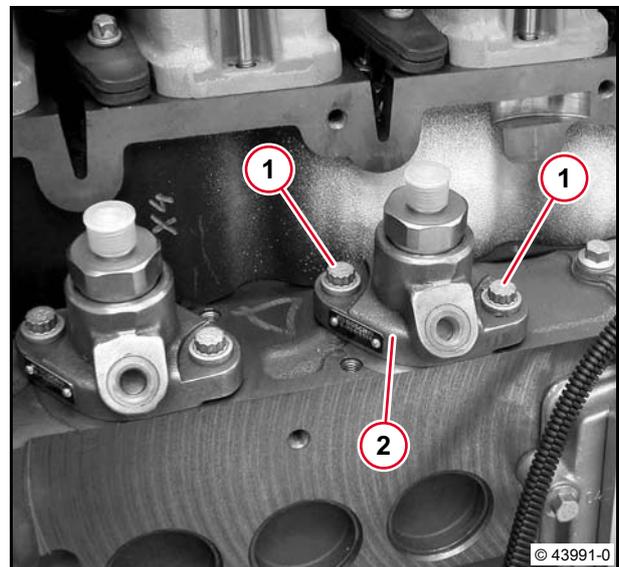
- Insert the high-pressure pump carefully in the crankcase.



- Oil the screws (1) lightly and tighten alternately until the high-pressure pump is flush with the crankcase.



Do not tighten the screws yet.



- Mount the fuel pipe between the high-pressure pumps and the control block.
- Fasten hollow screws with new O-rings without tension.

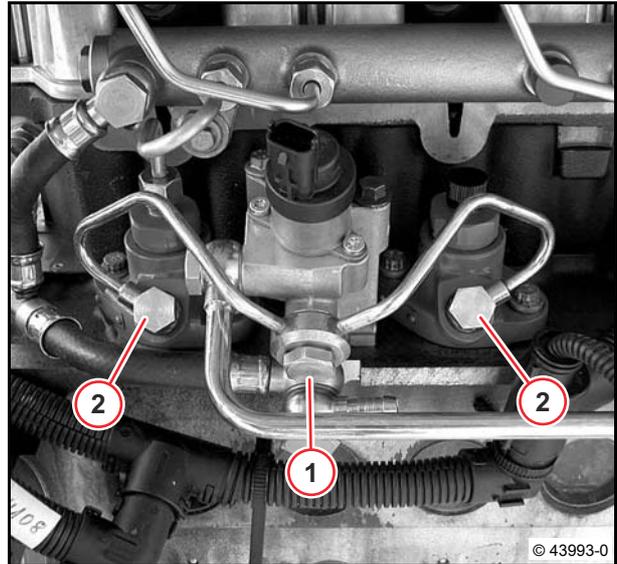


Use new sealing rings.

Pay attention to different screws:

Hollow screw M14 (1)

Hollow screws M12 (2)

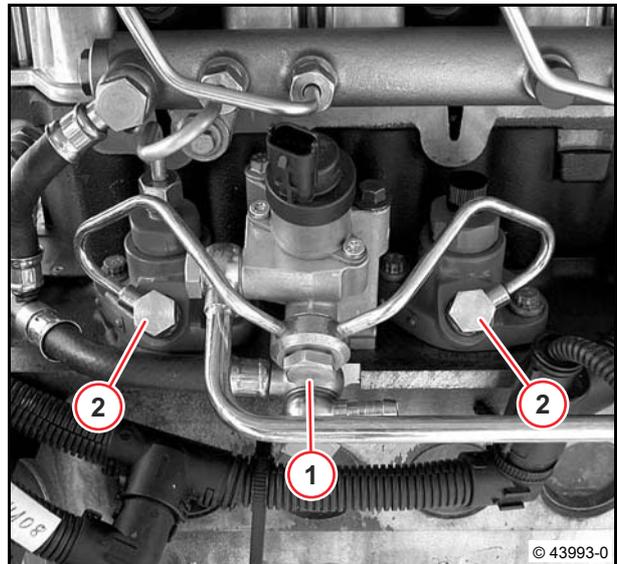


- Tighten hollow screw (1).

39 Nm

- Tighten hollow screws (2).

29 Nm



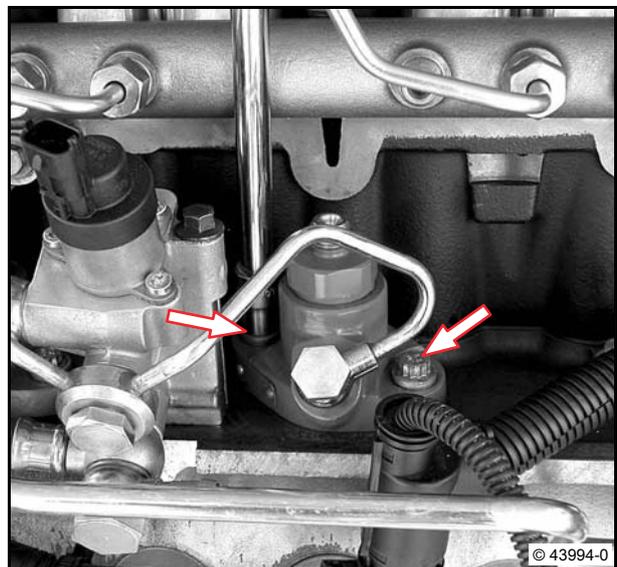
- Tighten screws (arrows).

– Stage 1:

10 Nm

– Stage 2:

50 Nm





Attention!

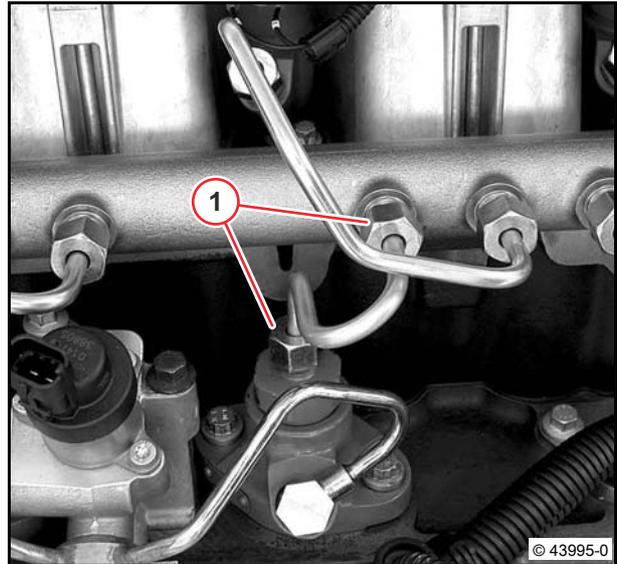
The high-pressure line must always be renewed after disassembly.
Install high pressure line without tension.

- Mount new high-pressure line on high-pressure pump and rail.
- Screw on union nuts (1).



Do not tighten union nuts.

- Check the high-pressure line for perfect installation position.



– Installation position of vibration damper.



Attention!

Pay attention to installation position.
Do not turn vibration damper (1).

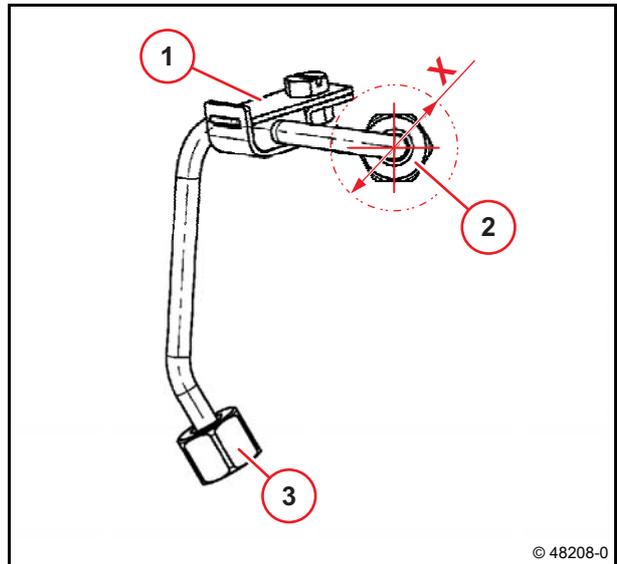
- (1) Vibration damper

– Dimension X

Diameter: 32 mm

- (2) Connection rail

- (3) Connection high pressure pump



- (1) Vibration damper

– Dimension I

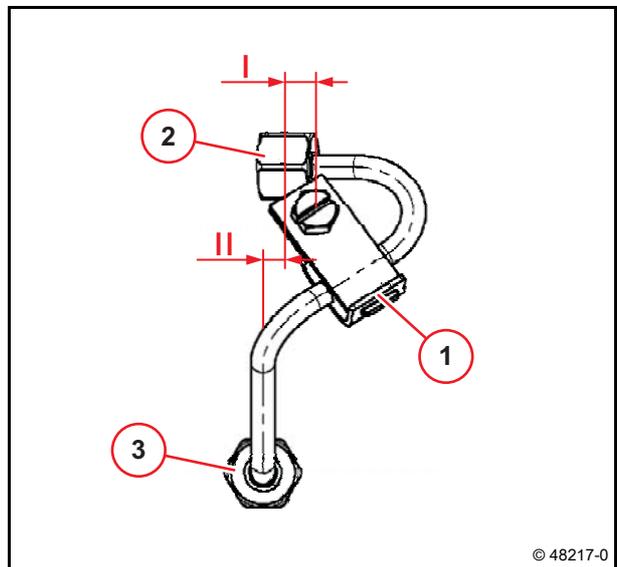
7,6 $\begin{matrix} +1.5 \\ -1.5 \end{matrix}$ mm

– Dimension II

5,4 $\begin{matrix} +0.5 \\ -0.5 \end{matrix}$ mm

- (2) Connection rail

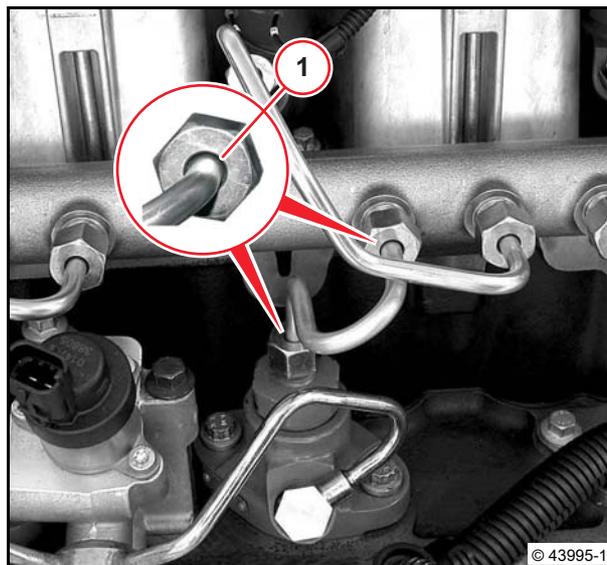
- (3) Connection high pressure pump





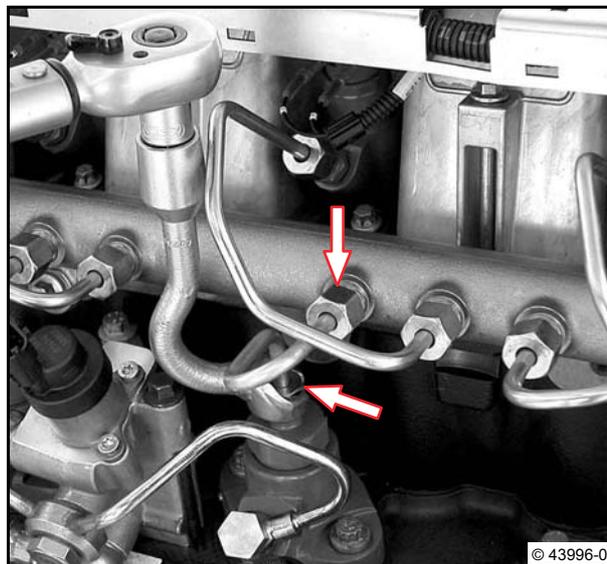
Attention!

Install high pressure line without tension.
Pay attention to alignment of the high pressure pipes.
Pipes which touch the bore (1) of the union nut must be renewed.

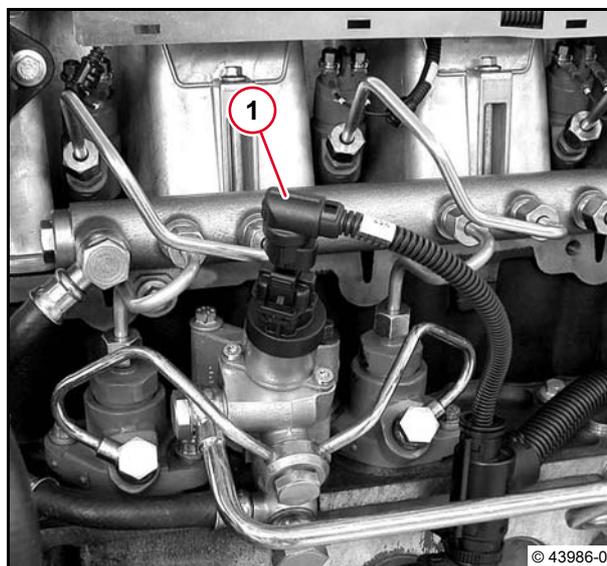


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- Tighten union nuts (arrows) with special wrench.
 - Stage 1:
 10 Nm
 - Stage 2:
 60° +15°
- Check the high-pressure line for perfect installation position.



- Plug in the cable plug (1).
 - Ensure that the connection is perfect.
 - Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.



- Remove turning gear.

 [W 49-02-01](#)



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A07 003	Injection pipe on rail and injector, High pressure pipe on high pressure pump and rail	Union nut	Stage 1: Observe assembly specification. Use new pipe.	10 Nm
A07 003	Injection pipe on rail and injector, High pressure pipe on high pressure pump and rail	Union nut	Stage 2:	60° +15°
A07 031	High pressure pump to crankcase	M10x30-10.9	Stage 1: Screws oiled	10 Nm
A07 031	High pressure pump to crankcase	M10x30-10.9	Stage 2:	50 Nm
A12 092	Pipe union, pipe diameter 8 mm, ring piece	Hollow screw M12x1.5		29 Nm
A12 093	Pipe union, pipe diameter 10 mm, ring piece	Hollow screw M14x1.5		39 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

Removing and installing the injector



Standard tools:

- Assembly pliers 8024
- Torx tool set 8189

Special tools:

- Special wrench 110500
- Lever tool 110620
- Assembly case with assembly sleeves, guides and disassembly tool 110900
- Extraction tool 120680
- Slide hammer 150800
- Plugs/caps 170160



- [User notes](#)



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

Removing the injector



The following work procedure describes the removal and installation of an injector.

Proceed in the same way to remove further injectors.



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

With oil dipstick guide pulled up on the side of the rail:

- Pull out oil dipstick.
- Close opening.



- Unscrew lock nuts (1) with special wrench.

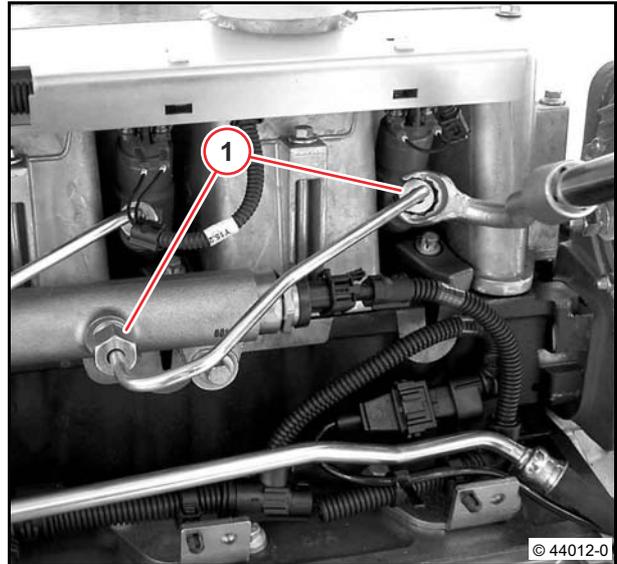


Support the pipe connection of the injector.

- Remove injection line.

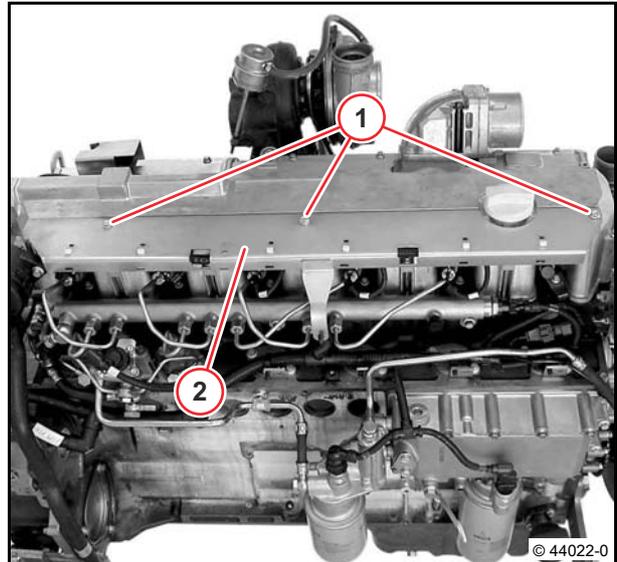


Collect draining fuel and dispose of according to regulations.



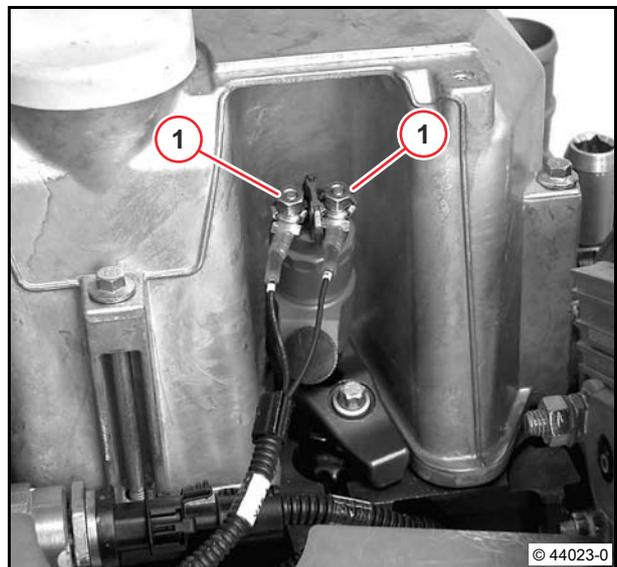
© 44012-0

- Unscrew screws (1).
- Remove the cover (2).



© 44022-0

- Unscrew nuts (1).
- Remove cable from injector.

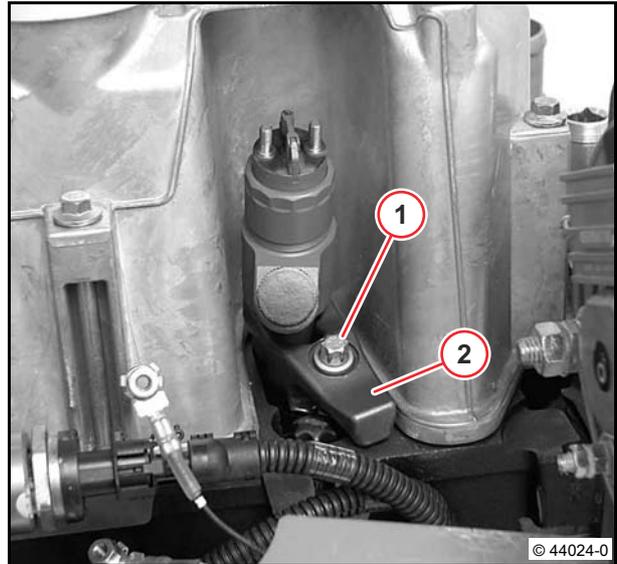


© 44023-0

- Unscrew screw (1).
- Remove clamping shoe (2).



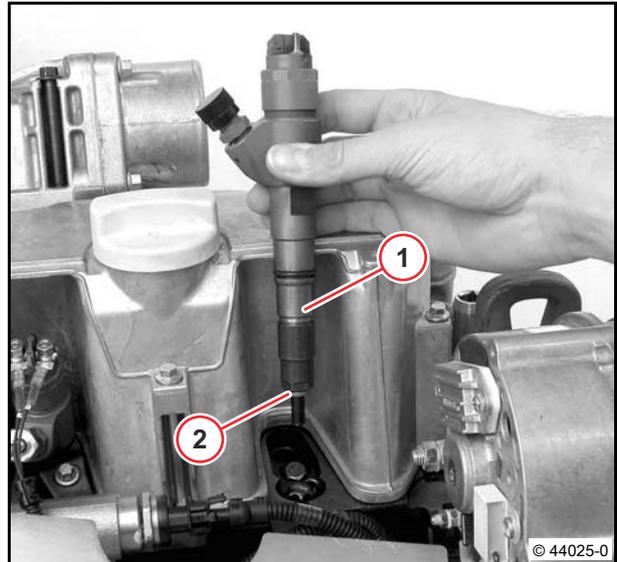
When removing the injectors on cylinders 1 to 5, the clamping shoe can only be removed together with the injector.



Attention!

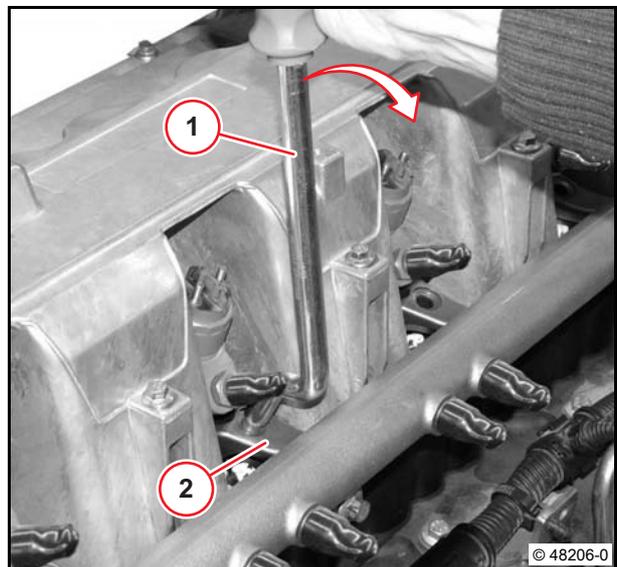
Remove residue paint and particles of dirt from the injector before removing it. Carefully clean the area around the injector.

- Pull out injector (1) and sealing ring (2).



Removing a tightly fixed injector

- Insert lever tool (1) in the clamping claw (2).
- Loosen the injector by pulling the lever in the direction of the arrow.
- Remove injector and sealing ring.



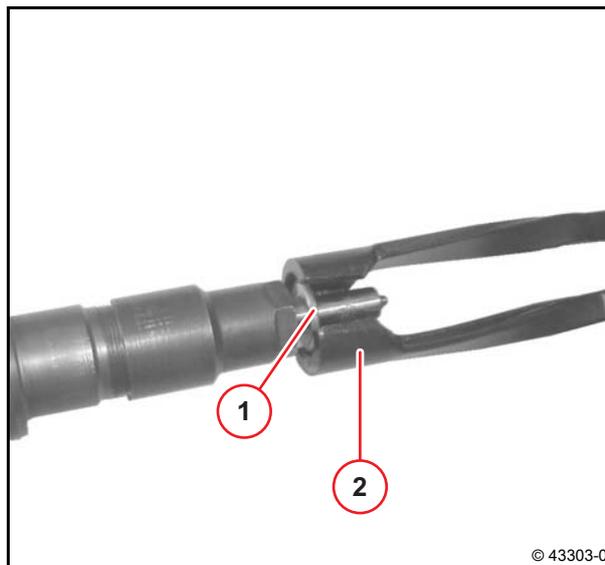


Attention!

Do not brush off the nozzle tip of the injector.

Do not damage the nozzle tip of the injector when removing the sealing ring (1).

- Grip a tight sealing ring (1) with the assembly pliers (2) and pull off, turning slightly.



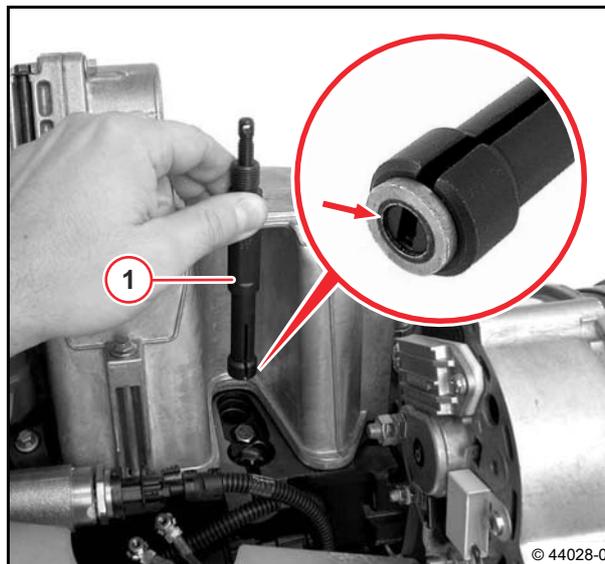
© 43303-0

Removing a tightly fixed sealing ring from the cylinder head

- Insert extraction device (1).



The holders (arrow) must sit in the bore of the sealing ring.

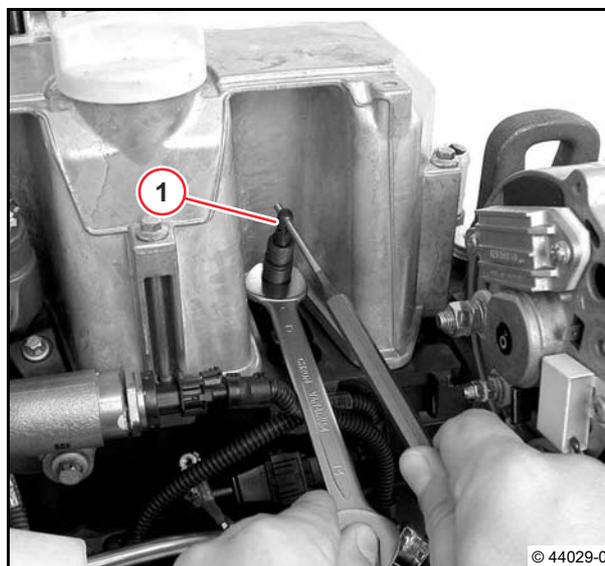


© 44028-0

- Turn in the spindle (1) until the sealing ring is fixed to the extraction device.

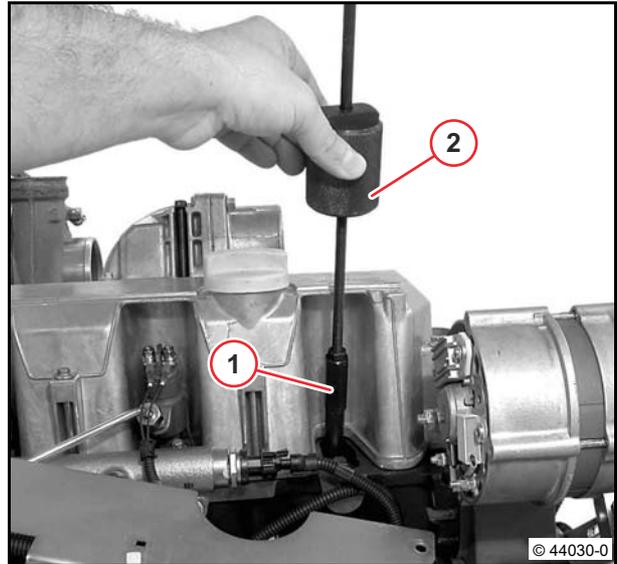


Hold extraction device against the flats.



© 44029-0

- Mount adapter (1) and slide hammer (2) on extraction device.
- Remove tight sealing ring.

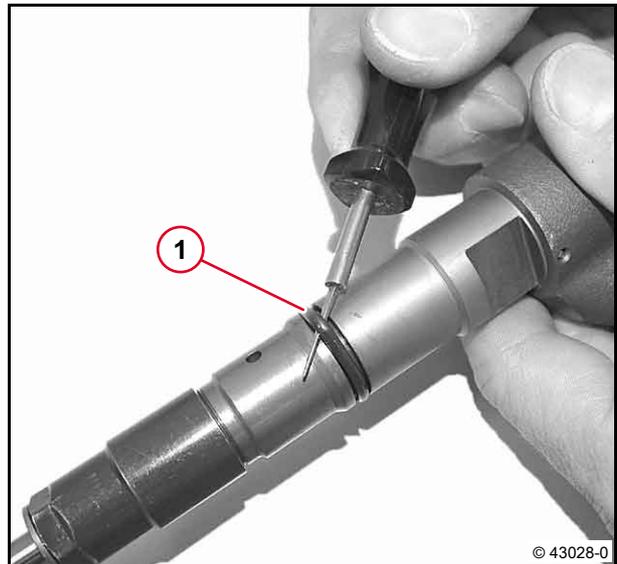


- Remove the round sealing ring (1) carefully from the injector with the disassembly tool.



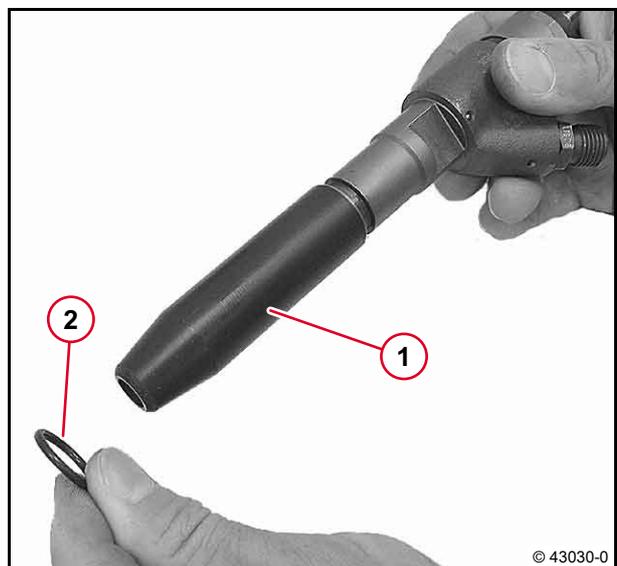
Attention!

Do not damage the injector.

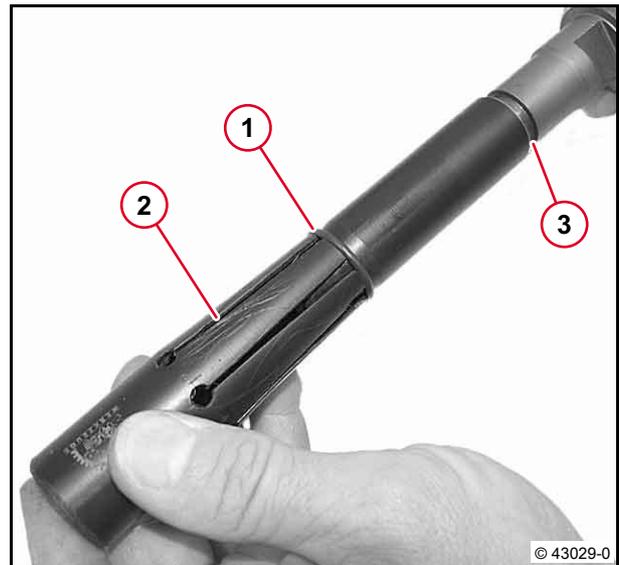


Installing the injector

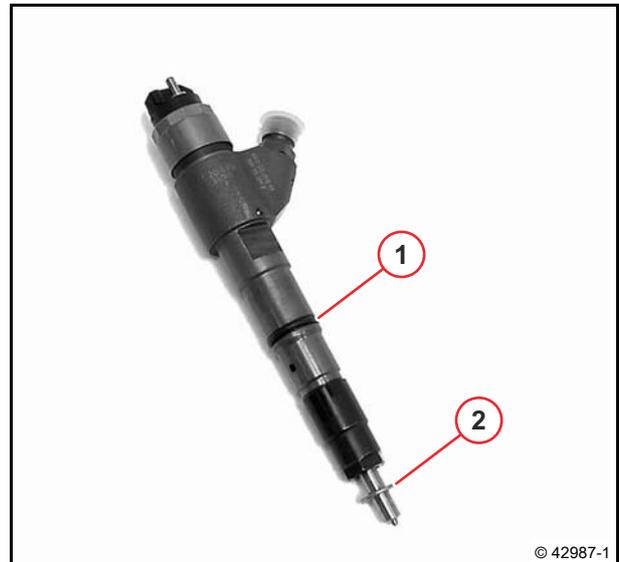
- Push assembly guide (1) onto injector.
- Push the new O-ring (2) onto the assembly guide.



- Push the O-ring (1) with assembly sleeve (2) up to the groove (3).



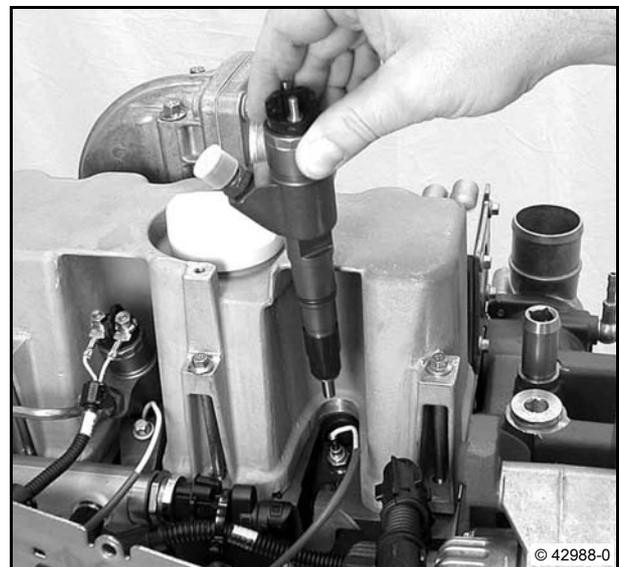
- Lightly oil round sealing ring (1).
- Mount new sealing ring (2) on injector.



Attention!

Before installing the injector, combustion residue must be cleaned carefully from the bore on the cylinder head.
Suck off dirt particles.
Install injector without tension.

- Insert injector carefully in the cylinder head.

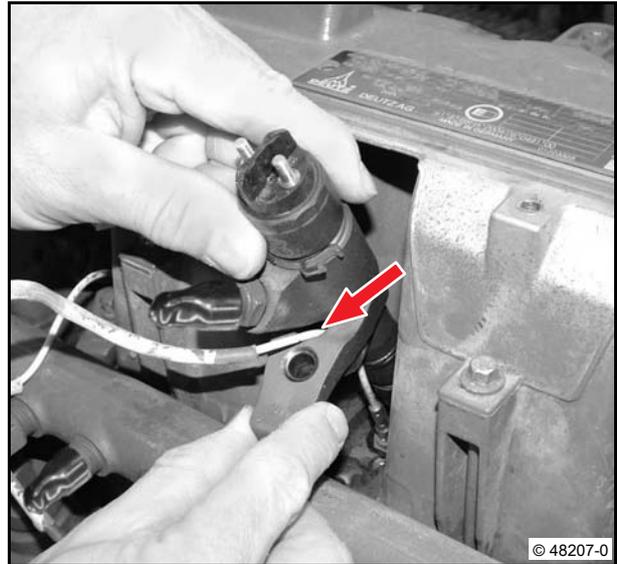




When installing the injectors on cylinders 1 to 5, the clamping shoe must be inserted together with the injector.

In version with heating plugs:

Pay attention to perfect cable laying (arrow).

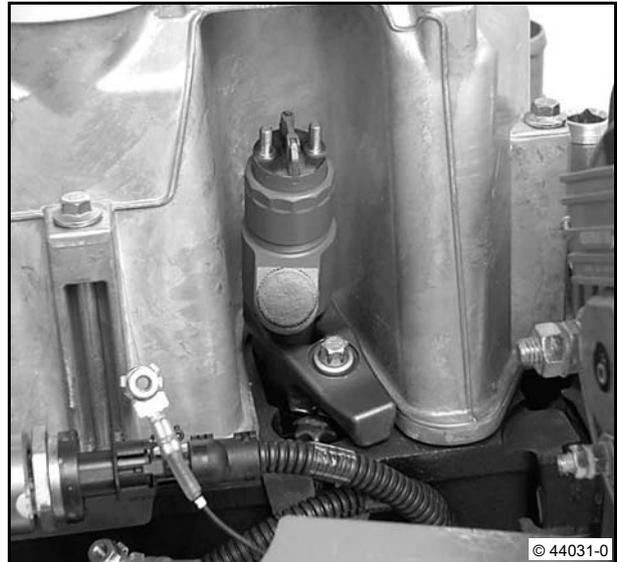


- Mount clamping shoe.
- Tighten screw.
- Stage 1:

 hand tight



Do not tighten the screw until after assembling the injection line.



Attention!

The injection lines must always be renewed after disassembly. Install injection line without tension.

- Mount new injection line (1) on rail and injector.



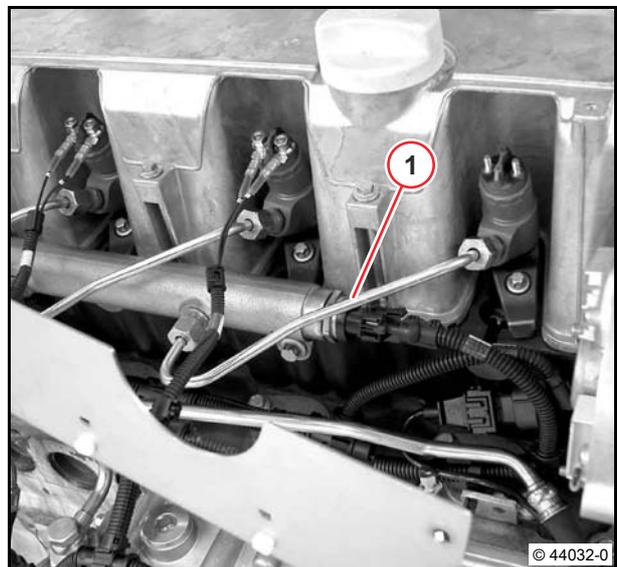
Note assignment and installation position of the injection lines.

- Screw on union nuts.



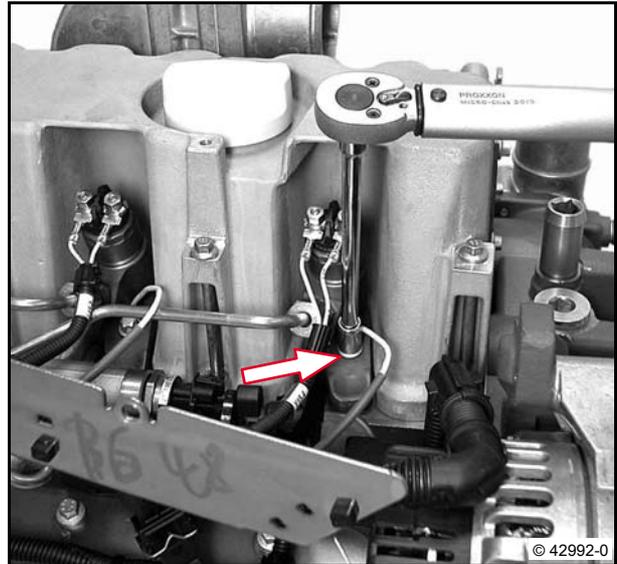
Do not tighten union nuts.

- Check the injection line for perfect installation position.



- Tighten screw (arrow).
- Stage 2:

 27 Nm

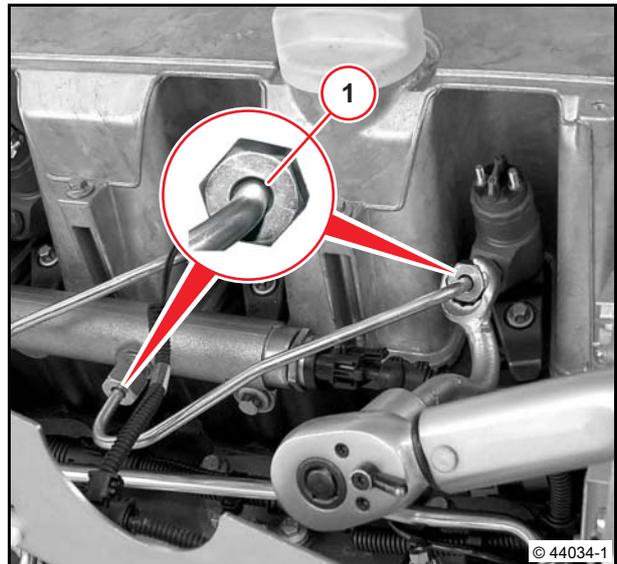


6

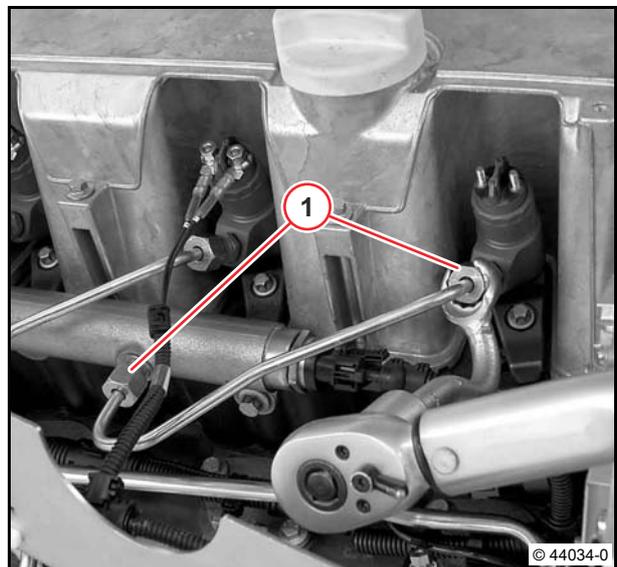


Attention!

Install injection pipes without tension!
Pay attention to alignment of the injection pipes.
Pipes which touch the bore (1) of the union nut must be renewed.

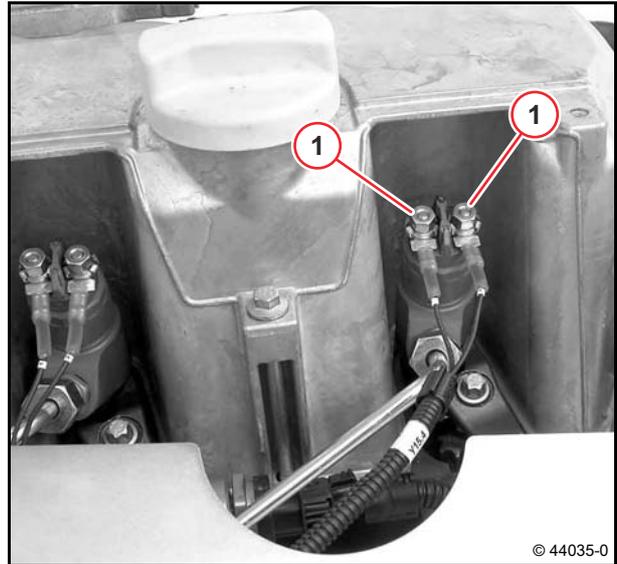


- Tighten union nuts (1) with special wrench.
- Stage 1:
 10 Nm
- Stage 2:
 60° +15°
- Check the injection pipes for perfect installation position.



- Mount cable on injector.
- Tighten nuts (1).

 1.5 Nm



- Mount cover (1).
- Tighten screws (arrows).

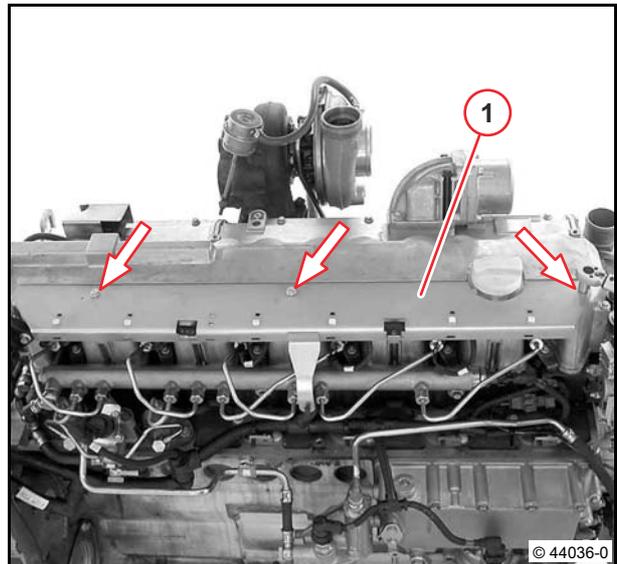
 8.5 Nm

With oil dipstick guide pulled up on the side of the rail:

- Insert oil dipstick.



Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A07 001	Injector on cylinder head, clamping claw		Stage 1: Observe order of assembly. Install injector without tension.	hand tight
A07 001	Injector on cylinder head, clamping claw		Stage 2:	27 Nm
A07 003	Injection pipe on rail and injector, High pressure pipe on high pressure pump and rail	Union nut	Stage 1: Observe assembly specification. Use new pipe.	10 Nm
A07 003	Injection pipe on rail and injector, High pressure pipe on high pressure pump and rail	Union nut	Stage 2:	60° ^{+15°}
A13 041	Cover plate on cylinder head cover	M6x16	self-tapping	8.5 Nm
A13 051	Cable connection on injector			1.5 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

Removing and installing the fuel filter console



Standard tools

Special tools:

- Special wrench 170050
- Plugs/caps 170160



- [User notes](#)
- Operation manual



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.
Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating fluids in suitable vessels and dispose of according to regulations.
After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

Removing the fuel filter console



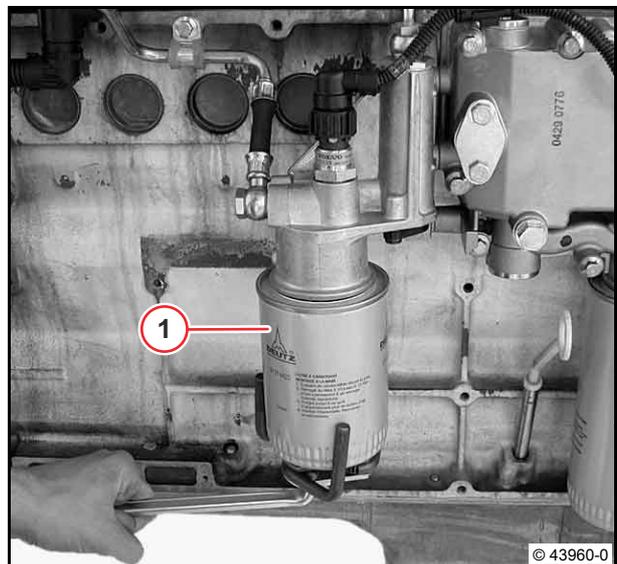
Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Unscrew fuel filter (1) with special wrench.



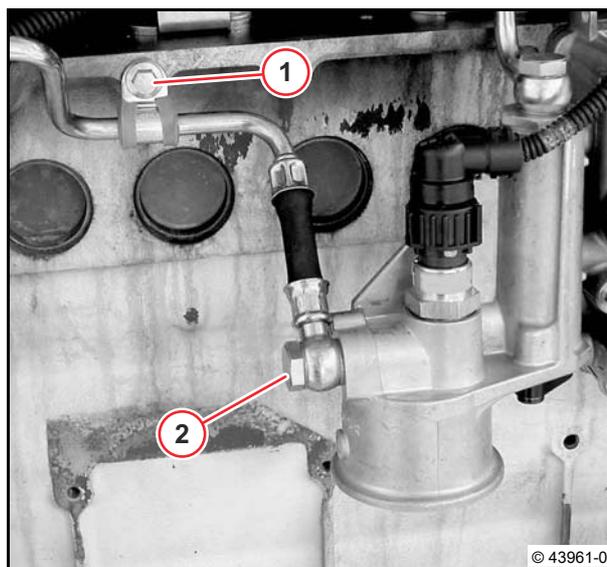
Collect draining fuel and dispose of according to regulations.



- Unscrew screw (1).
- Loosen pipe clip.
- Unscrew hollow screw (2).
- Remove sealing rings.

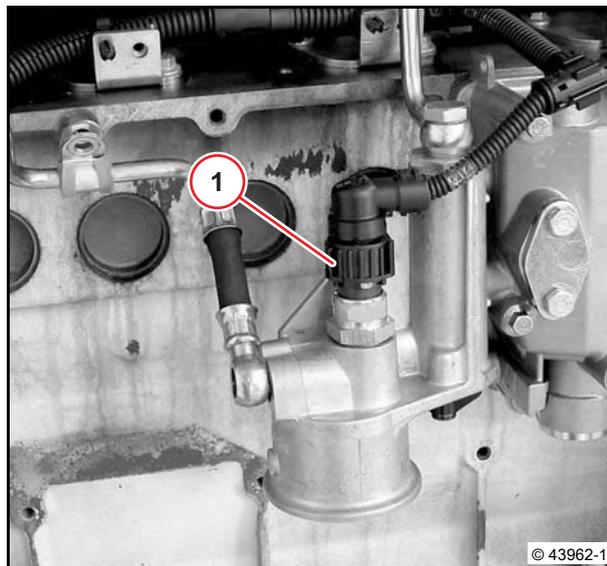


Collect draining fuel and dispose of according to regulations.



© 43961-0

- Loosen the locking ring (1).
- Pull out cable plug.

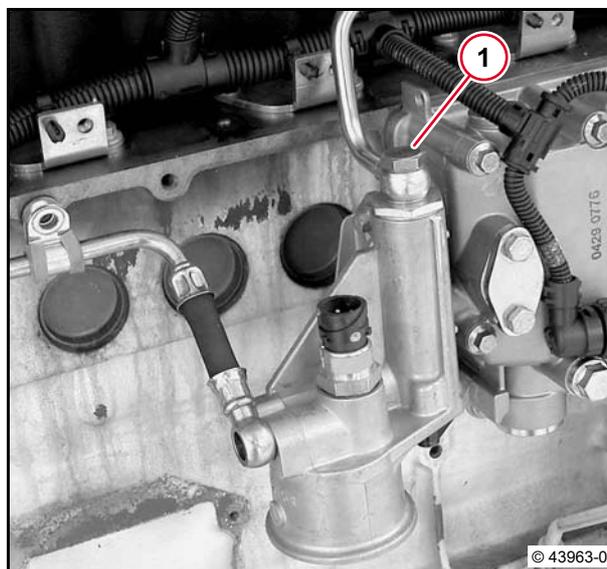


© 43962-1

- Unscrew hollow screw (1).
- Remove sealing rings.

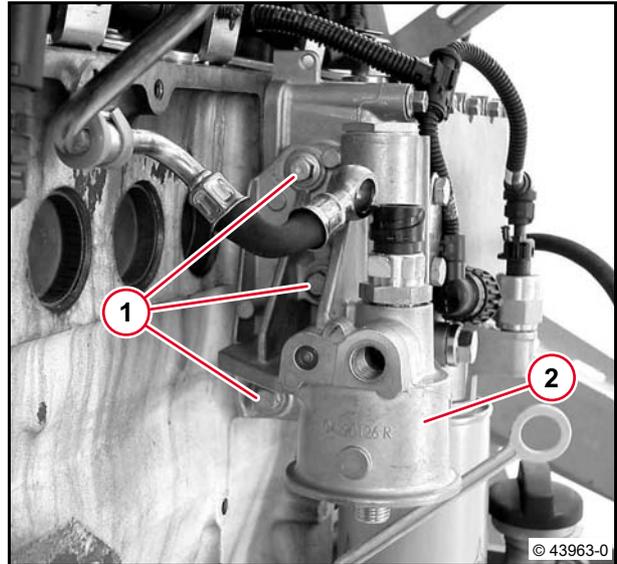


Collect draining fuel and dispose of according to regulations.



© 43963-0

- Unscrew screws (1).
- Remove fuel filter console (2).



- Visually inspect the components.

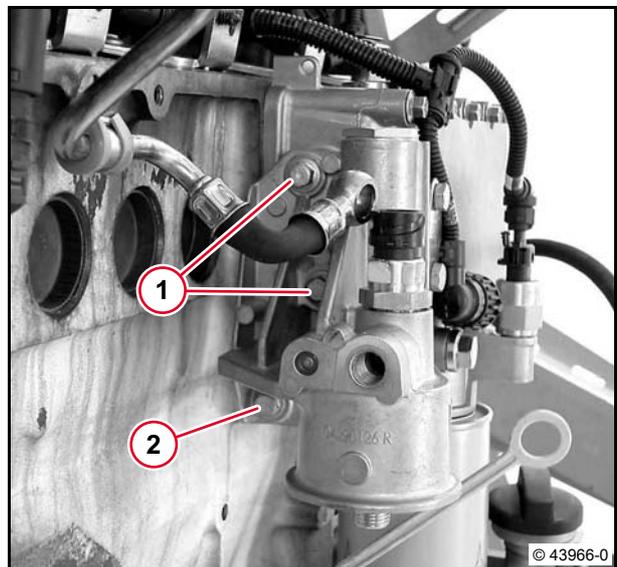


Installing the fuel filter console

- Install the fuel filter console.
-  Pay attention to different screw lengths.
M8 x 40 mm (1)
M8 x 55 mm (2)

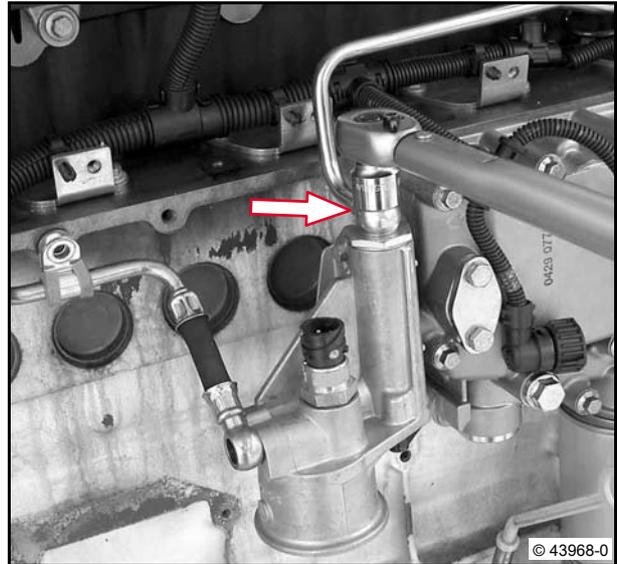
- Tighten screws (1) and (2).

 30 Nm



- Mount the fuel pipe with new sealing rings.
- Tighten hollow screw (arrow).

 39 Nm



6

- Mount fuel pipe.
- Tighten hollow screw (arrow) with new sealing rings.

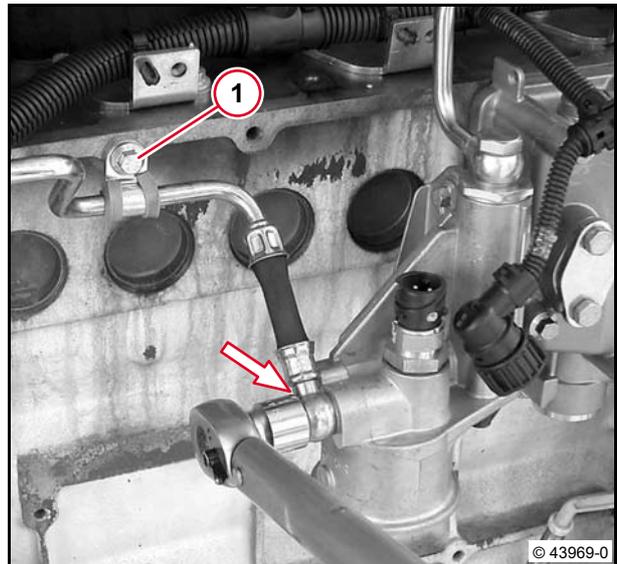
 Check hose pipes and renew if necessary.

- Position pipe clip.
- Tighten screw (1).
- M8

 30 Nm

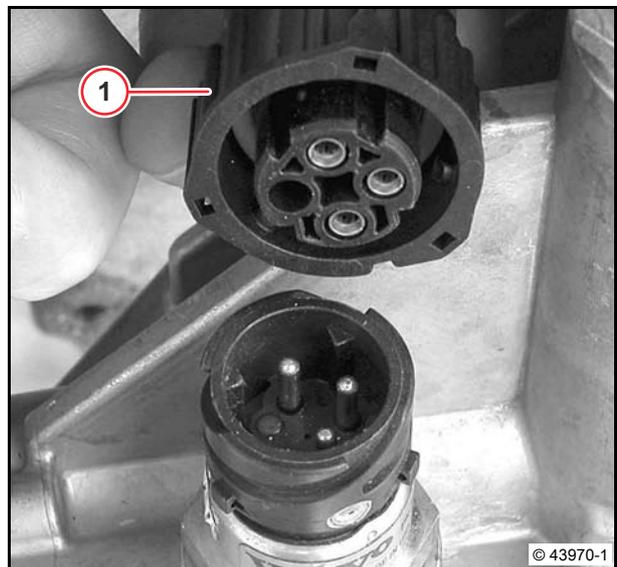
- Tighten hollow screw (arrow).

 39 Nm



- Press the cable plug onto the fuel pressure sensor.
- Turn in the locking ring (1) until it snaps in.

 Make sure that the contacts match up.



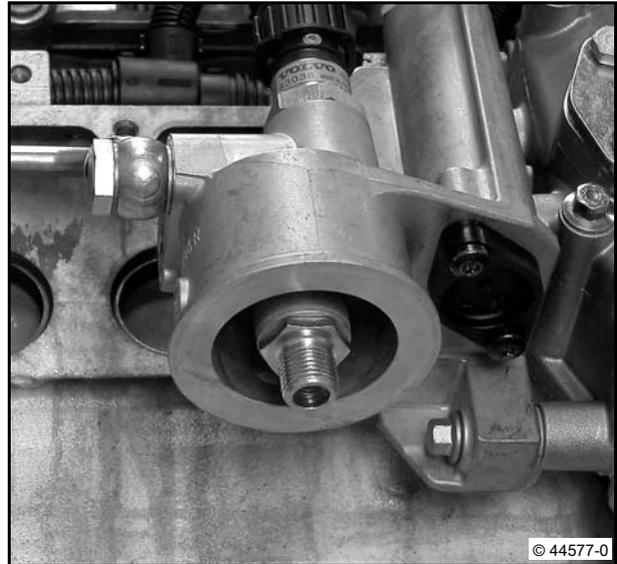
- Clean sealing surfaces.
- Lightly oil sealing ring on new fuel filter cartridge.
- Screw on fuel filter cartridge by hand.



The seal must fit evenly.



Operation manual



© 44577-0



Removing and installing the fuel supply pump (V-belt drive)



Standard tools:

- Hose clip pliers 8011
- V-belt tension measuring device 8115

Special tools:

- Plugs/caps 170160



- [User notes](#)
- Operation manual



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

Only test / tighten / renew V-belts with the engine at a standstill.



The V-belt tension of new V-belts must be checked after they have been running for 15 minutes.

Removing the fuel supply pump



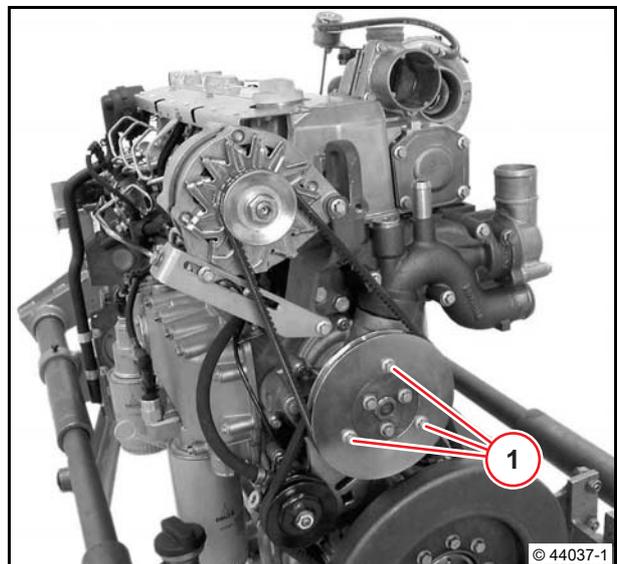
Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

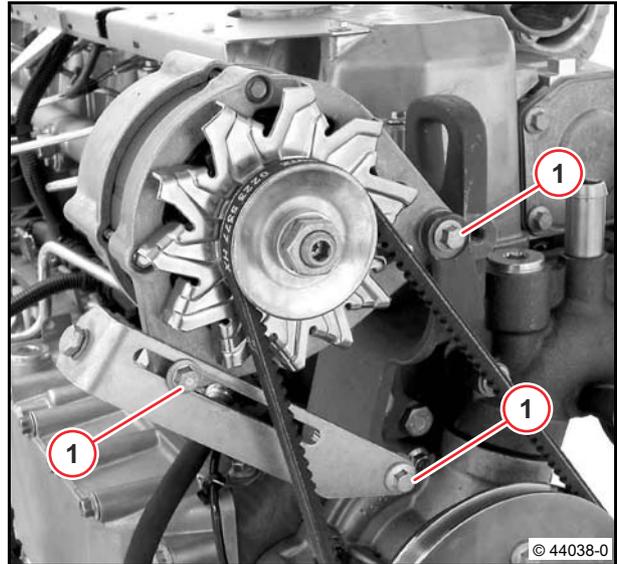
- Loosen screws (1).



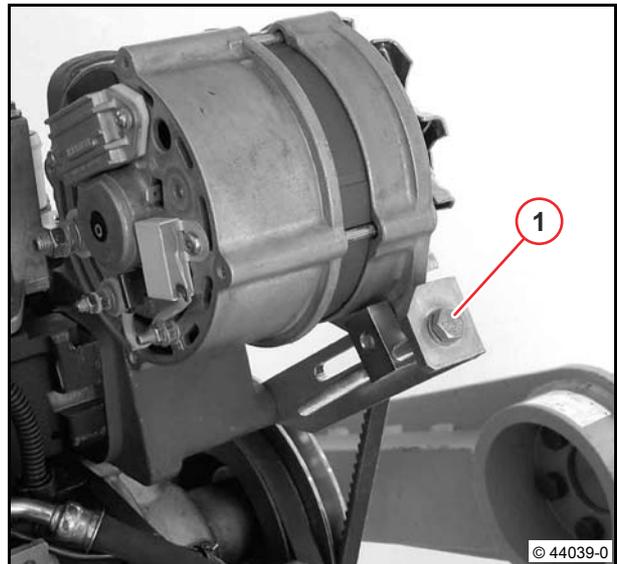
Do not unscrew screws.



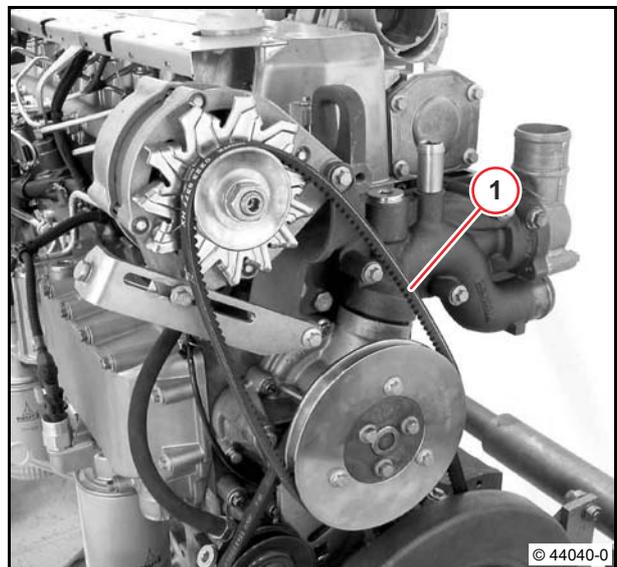
- Loosen screws (1).



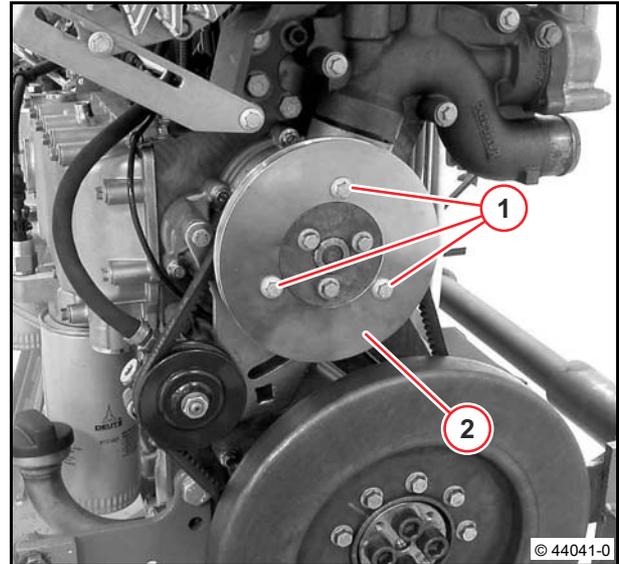
- Loosen V-belt by unscrewing the clamping screw (1).



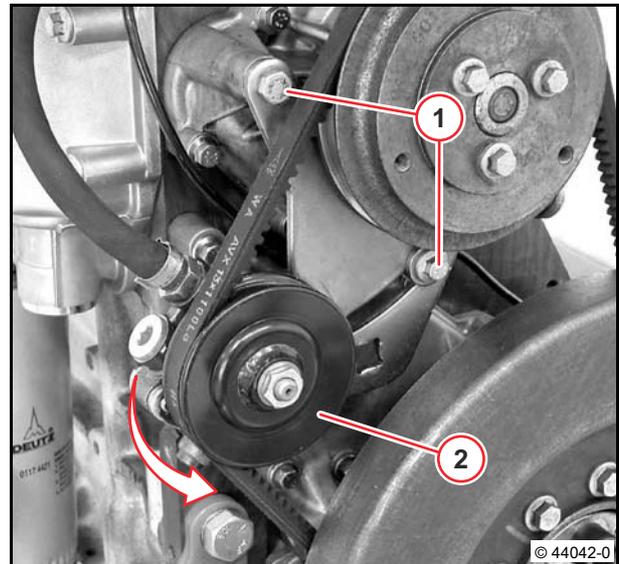
- Remove V-belt (1).



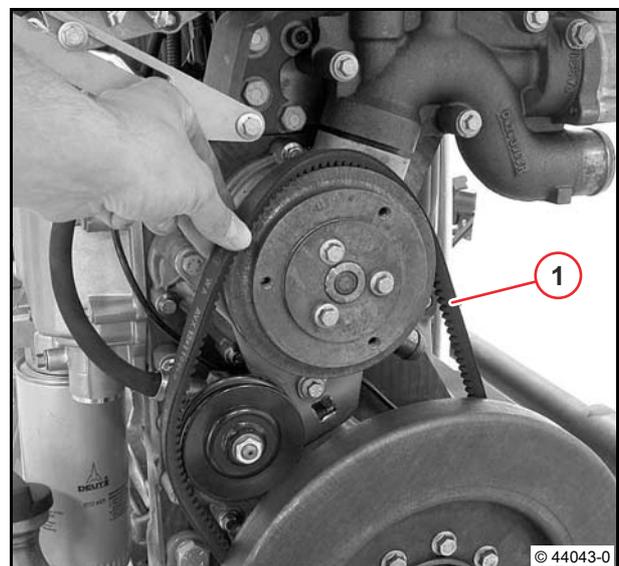
- Unscrew screws (1).
- Remove V-belt pulley (2).



- Loosen screws (1).
- Swing the fuel supply pump (2) to the side (arrow).



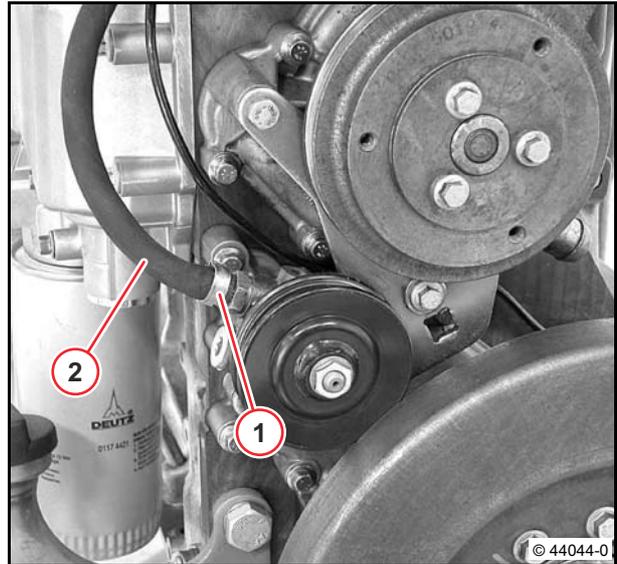
- Remove V-belt (1).



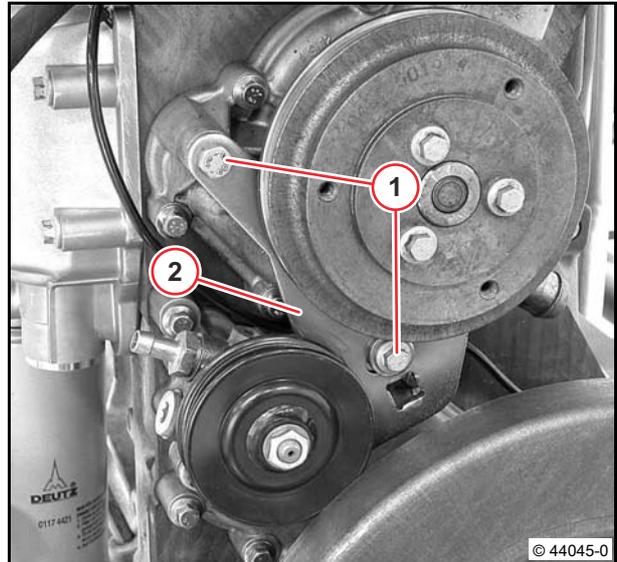
- Loosen hose clip (1).
- Pull off fuel pipe (2).



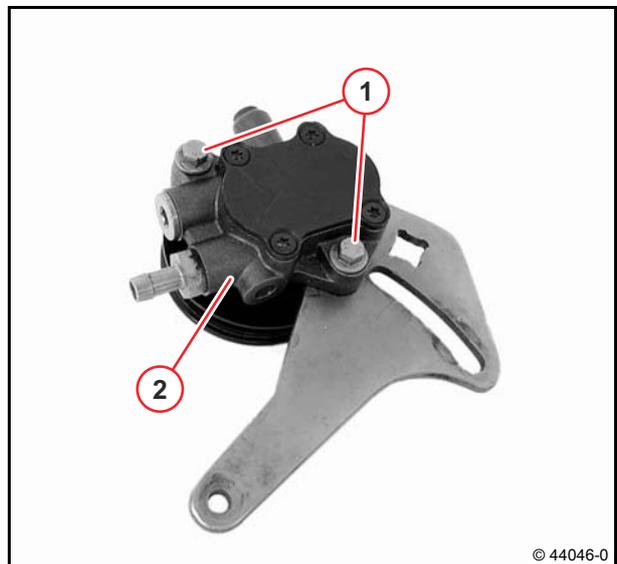
Check hose pipes and renew if necessary.



- Unscrew screws (1).
- Remove clamping strap (2) and fuel supply pump.



- Unscrew screws (1).
- Remove fuel supply pump (2).



- Visually inspect the components.



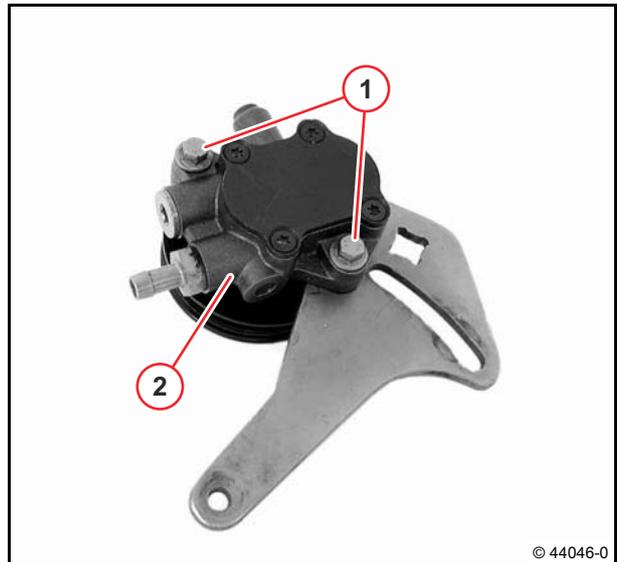
Installing the fuel supply pump

- Mount fuel supply pump (2).
- Tighten screws (1).

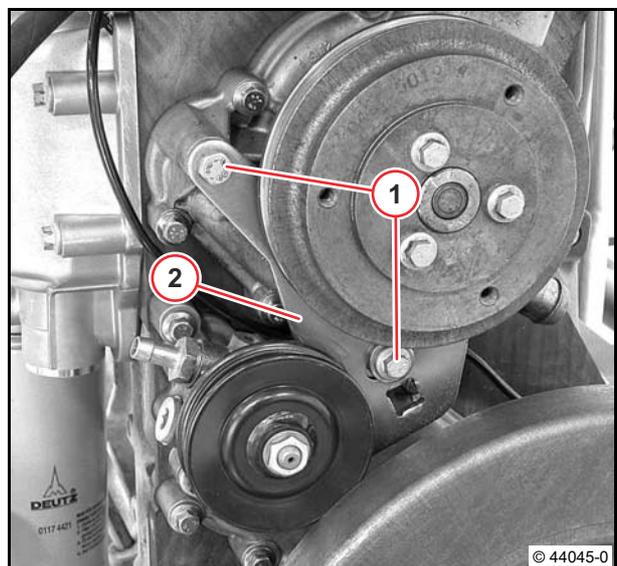
 20 Nm



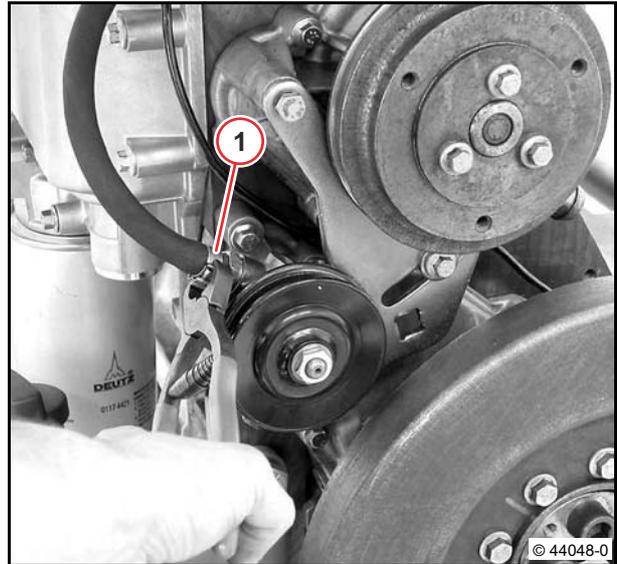
Note installation position of the clamping strap.



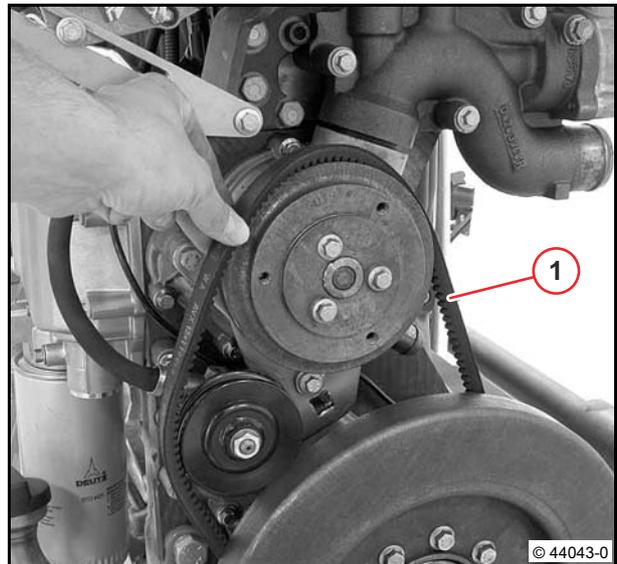
- Mount clamping strap (2) with fuel supply pump.
- Tighten screws (1).



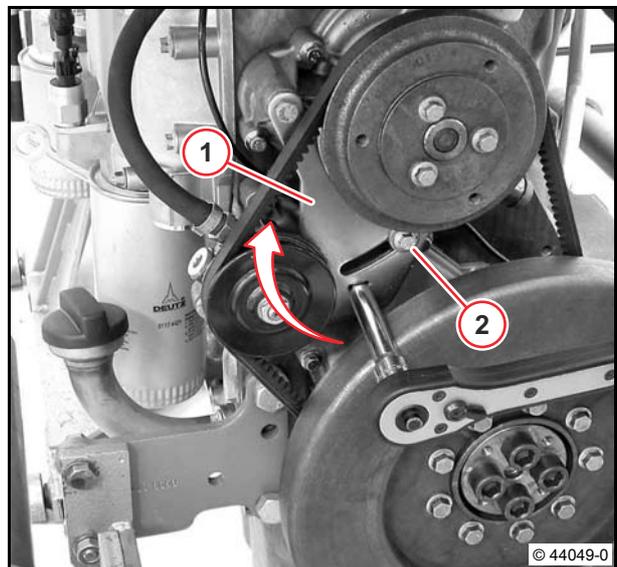
- Attach fuel pipe.
- Fix the hose clip (1) with the hose clip pliers.



- Mount V-belt (1) for coolant pump.



- Press clamping strap (1) in direction of arrow with a suitable tool.
- Tighten screw (2).
-  30 Nm
- Check V-belt tension.
-  Operation manual



Removing and installing the rail



Standard tools:
– Rotation angle disc 8190

Special tools:
– Special wrench 110500
– Plugs/caps 170160



– [User notes](#)
– [W 21-02-03](#)
– [W 21-02-05](#)



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

Removing the rail



Danger!

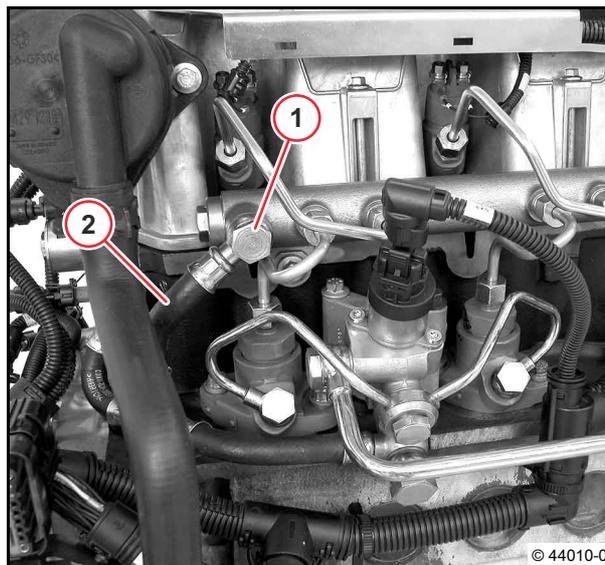
Wait 30 seconds after switching off the engine before working on the fuel system.



- Unscrew hollow screw (1).
- Remove fuel return pipe (2) and sealing rings from rail.



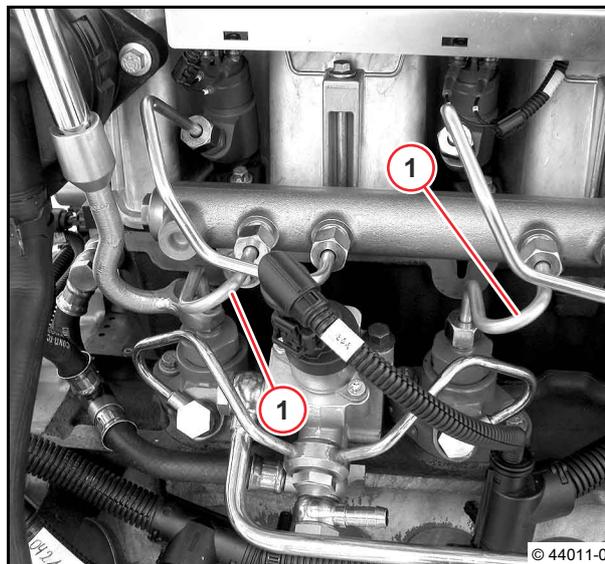
Collect draining fuel and dispose of according to regulations.



Collect draining fuel and dispose of according to regulations.

Support the pipe connection of the high pressure pump.

- Remove high pressure pipes (1) with special wrench.



- Unscrew the union nuts (1) of the injection lines from the injectors and rail.

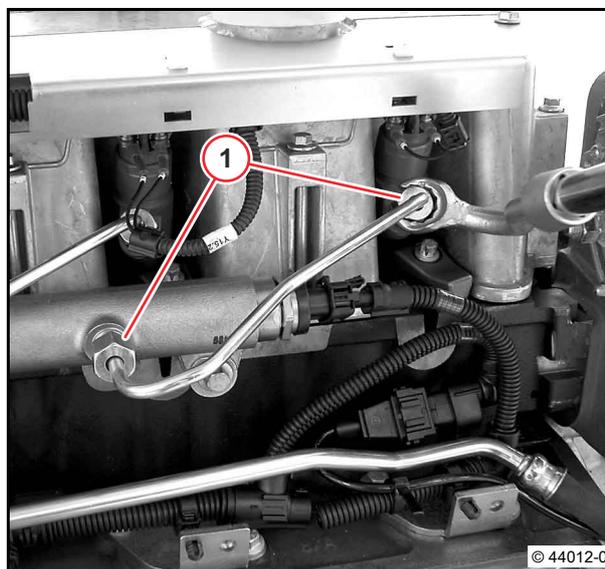


Support the pipe connection of the injector.

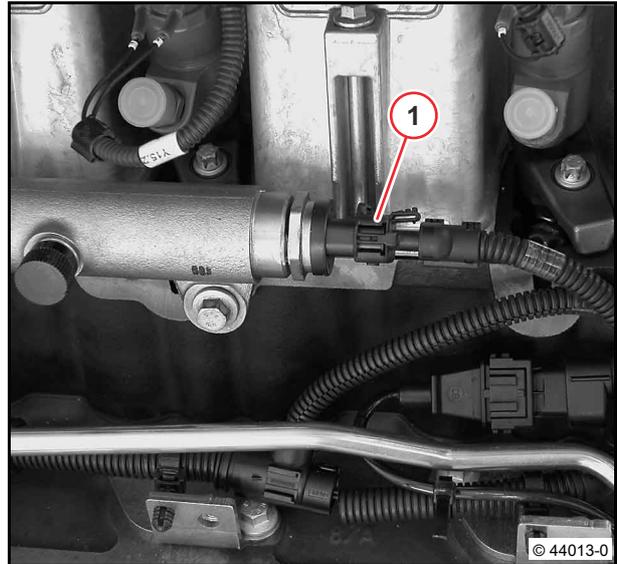
- Remove all injection pipes.



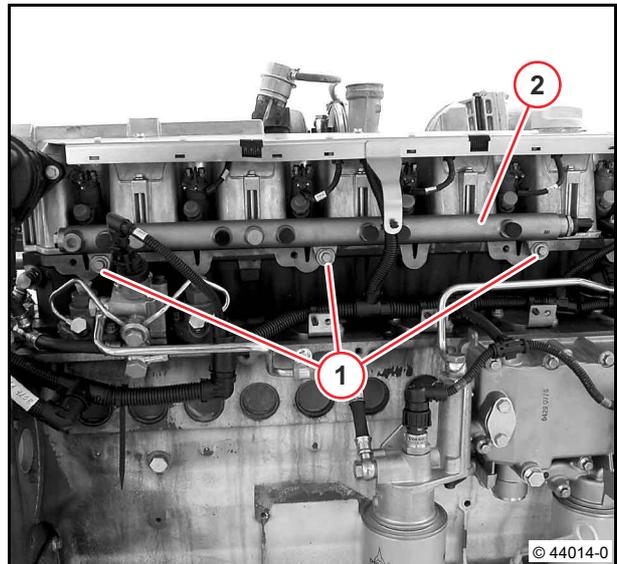
Collect draining fuel and dispose of according to regulations.



- Unlock cable plug (1) and remove.



- Unscrew screws (1).
- Remove the rail (2).



- Visually inspect the component.
- Remove pressure limiting valve.

 [W 21-02-03](#)

- Remove rail pressure sensor.

 [W 21-02-05](#)



Mounting rail

- Install rail pressure sensor.

W 21-02-05

- Install pressure limiting valve.

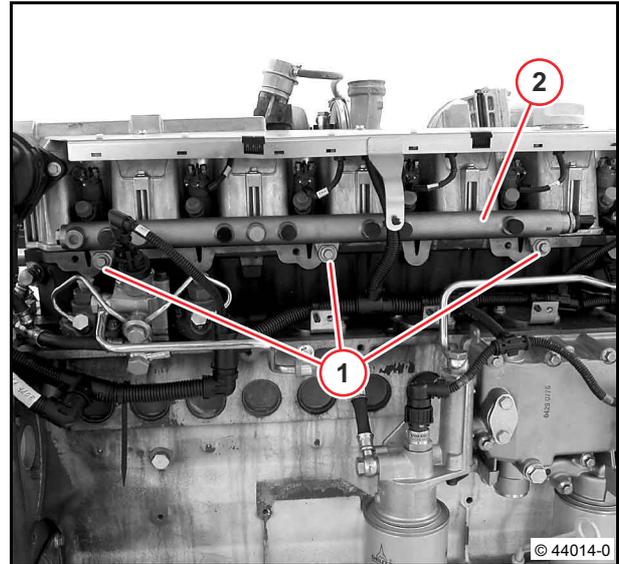
W 21-02-03

- Pre-assemble the rail (2) loosely with screws (1).

hand tight



Do not tighten screws.



Attention!

The injection lines must always be renewed after disassembly.
Install injection pipes without tension!

- Pre-assemble new injection pipes (arrow) on rail and injectors.



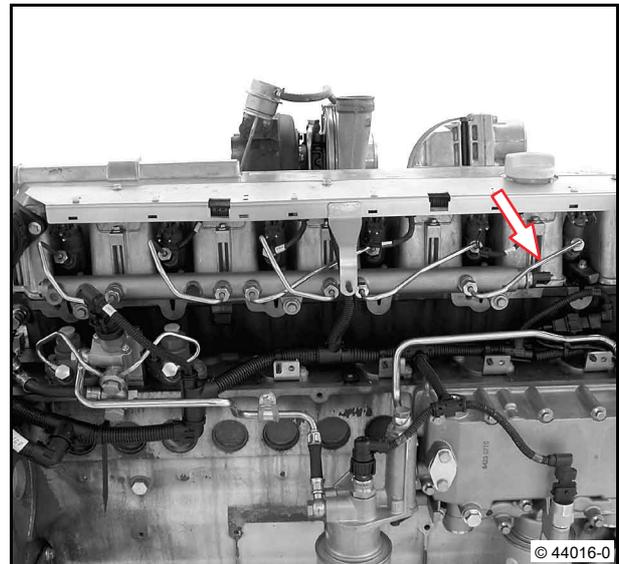
Note assignment and installation position of the injection lines.

- Screw on union nuts.



Do not tighten union nuts.

- Check the injection pipes for perfect installation position.



Attention!

The high-pressure lines must always be renewed after disassembly.
Install high pressure line without tension.

- Pre-assemble new high pressure pipes (1) on the rail and on the high pressure pumps.



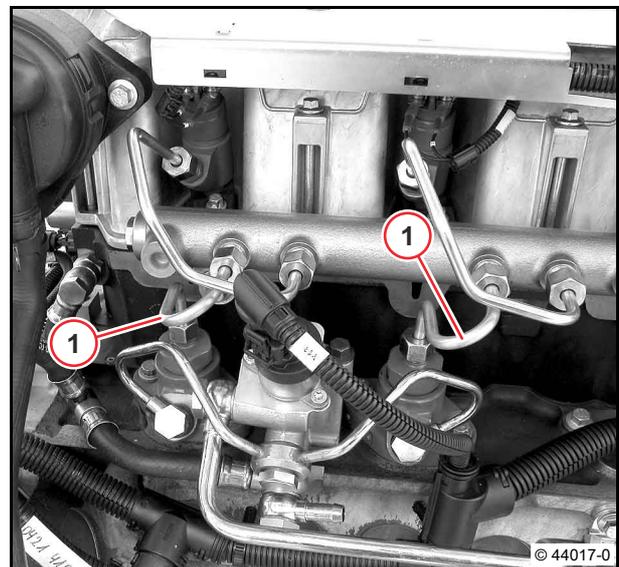
Note assignment and installation position of the high-pressure lines.

- Screw on union nuts.



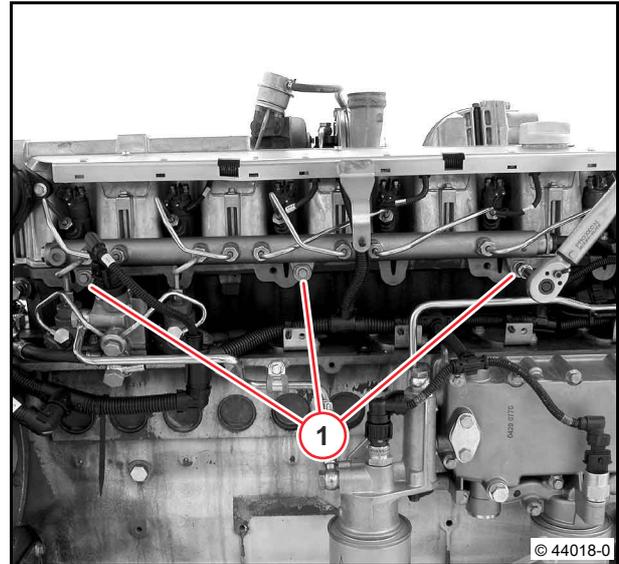
Do not tighten union nuts.

- Check the high pressure pipes for perfect installation position.



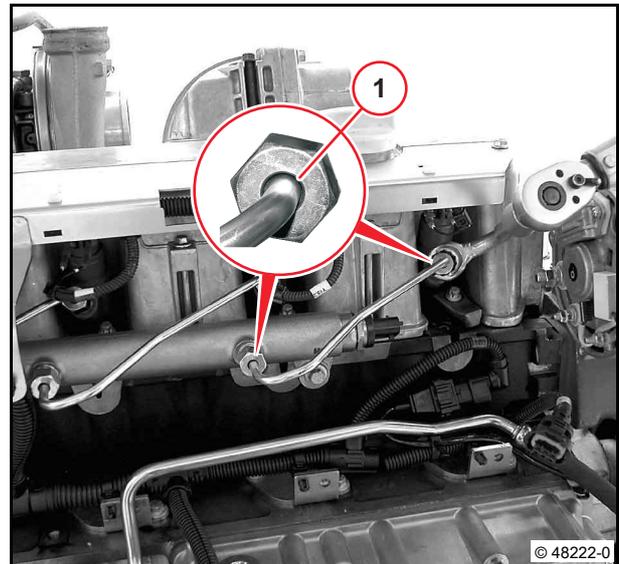
- Tighten screws (1).

 30 Nm



Attention!

Install injection pipes without tension!
Pay attention to alignment of the injection pipes.
Pipes which touch the bore (1) of the union nut must be renewed.



- Tighten all union nuts (1) on the rail and on the injectors with a special wrench.

– Stage 1:

 10 Nm

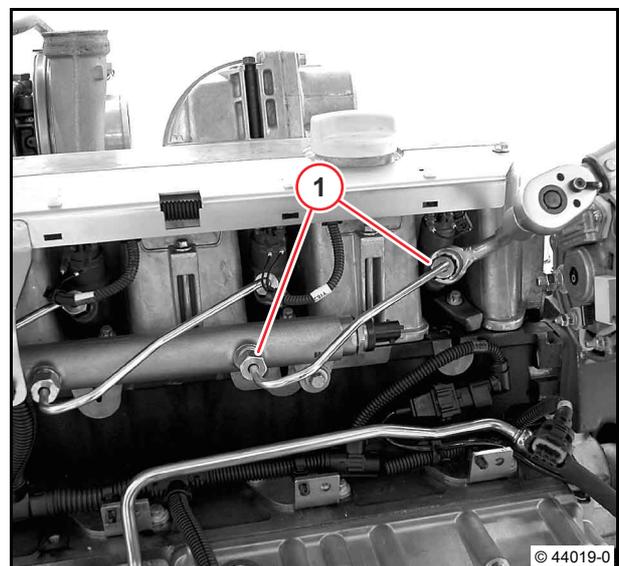


Use rotation angle disc.

– Stage 2:

 60° + 15°

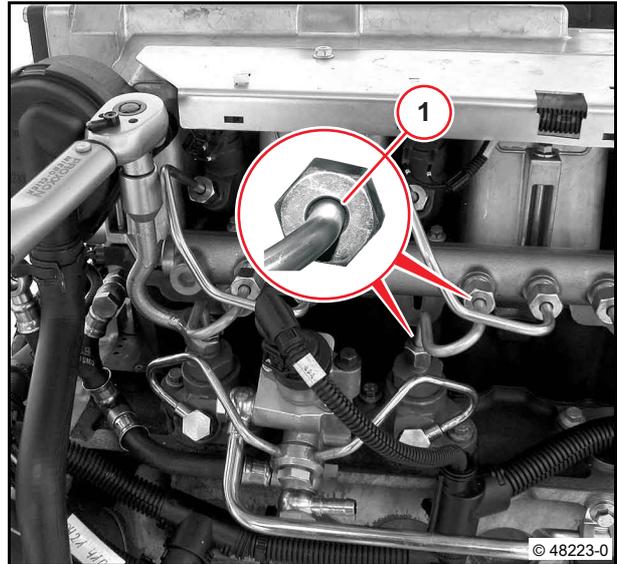
- Check the injection pipes for perfect installation position.





Attention!

Install high pressure line without tension.
Pay attention to alignment of the high pressure pipes.
Pipes which touch the bore (1) of the union nut must be renewed.



- Tighten union nuts (1) with special wrench.

– Stage 1:

 10 Nm

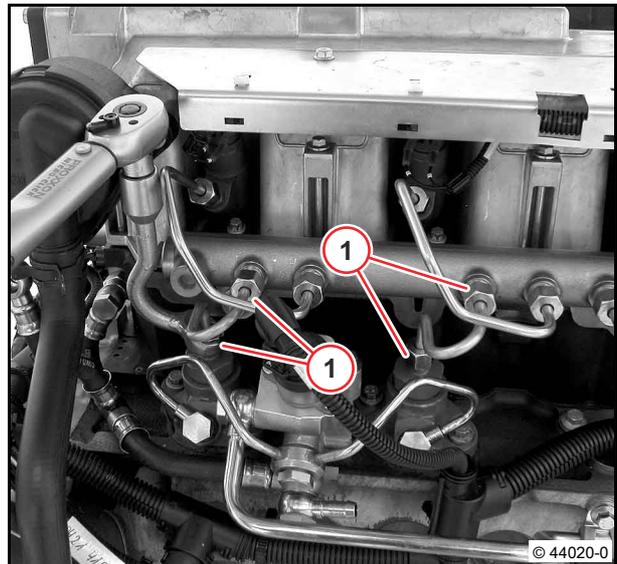


Use rotation angle disc.

– Stage 2:

 60° + 15°

- Check high pressure pipes for perfect installation position.

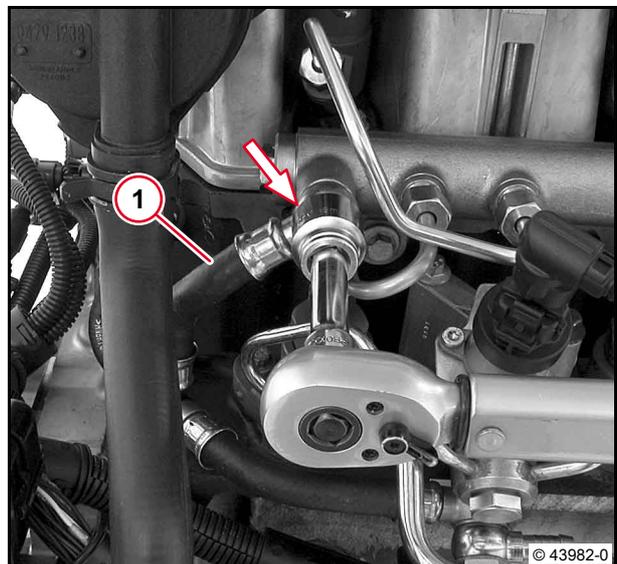


- Mount fuel return pipe (1).
- Tighten hollow screw (arrow) with new sealing rings.

 39 Nm



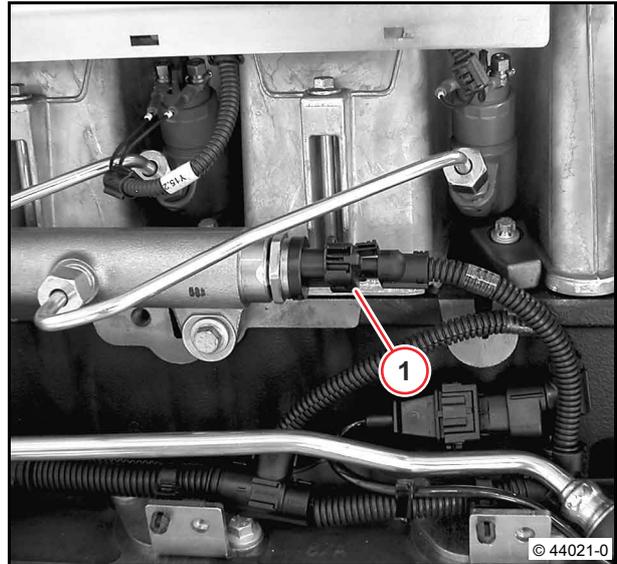
Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.



- Plug in the cable plug (1).



Ensure that the connection is perfect.



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A07 003	Injection pipe on rail and injector, High pressure pipe on high pressure pump and rail	Union nut	Stage 1: Observe assembly specification. Use new pipe.	10 Nm
A07 003	Injection pipe on rail and injector, High pressure pipe on high pressure pump and rail	Union nut	Stage 2:	60° + 15°
A07 038	Rail to cylinder head		Stage 1: Observe assembly specification	hand tight
A07 038	Rail to cylinder head		Stage 2:	30 Nm
A12 093	Pipe union, pipe diameter 10 mm, ring piece	Hollow screw M14x1.5		39 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

Removing and installing the pressure limiting valve



Standard tools

Special tools:

- Disassembly tool 110901
- Plugs/caps 170160



- Assembly grease 01016496



- [User notes](#)



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

No foreign bodies may get into the rail. Ensure utmost cleanliness. Especially on the thread and the sealing surface of the rail.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

Removing the pressure limiting valve



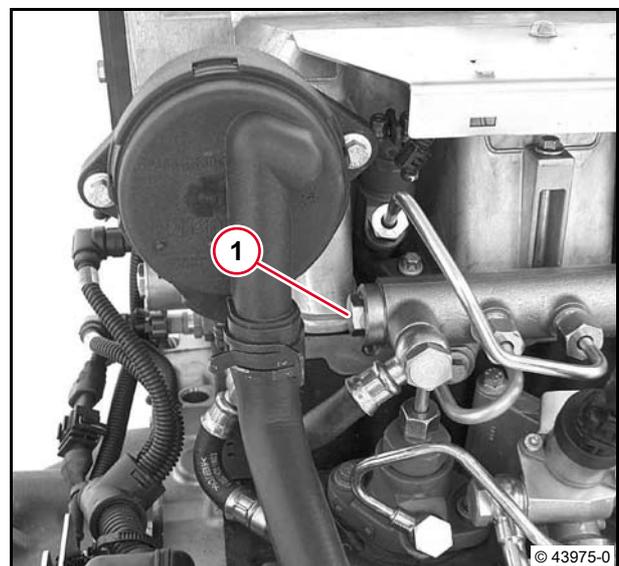
Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

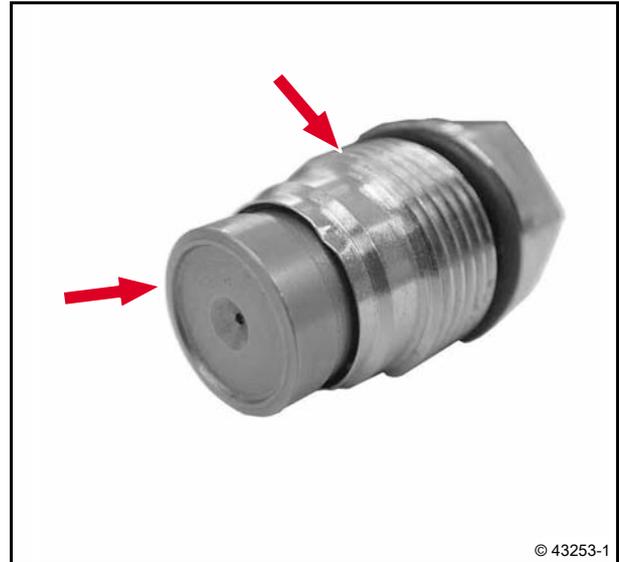
- Unscrew pressure limiting valve (1).



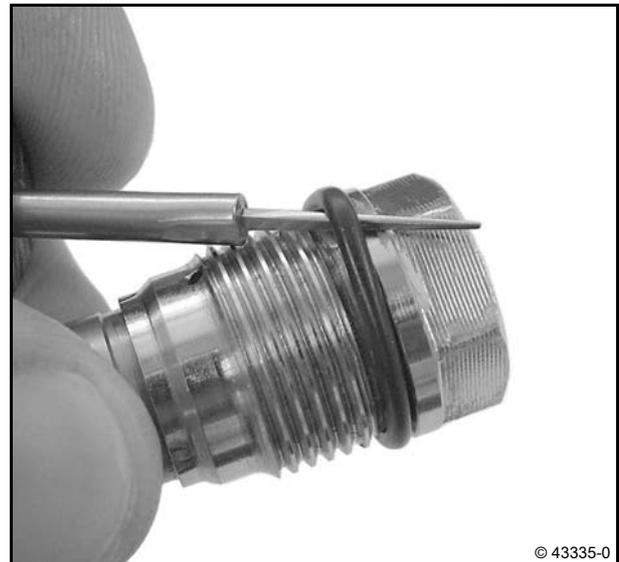
Collect draining fuel and dispose of according to regulations.



- Visually check the thread and the sealing edge of the pressure limiting valve.



- Remove the O-ring with the disassembly tool.



Installing the pressure limiting valve



Attention!

No foreign bodies may get into the rail. Ensure utmost cleanliness. Especially on the thread and the sealing surface of the rail.

- Mount new O-ring (1).
- Lightly coat the thread and sealing edge of the pressure limiting valve with assembly grease.

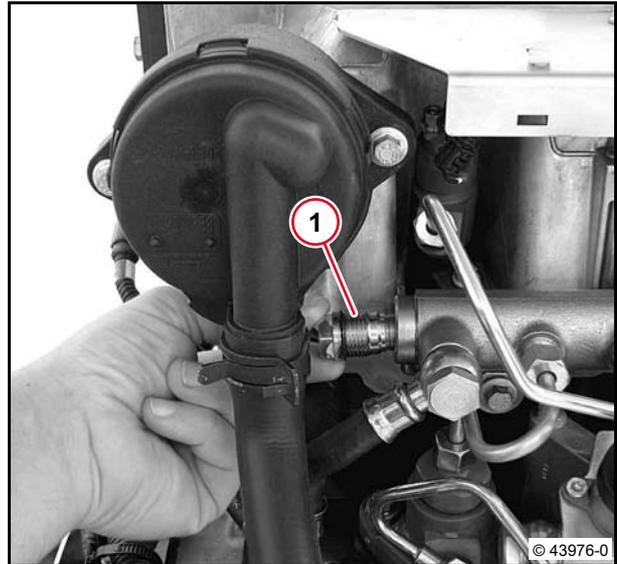


- Screw in pressure limiting valve (1).
- Tighten pressure limiting valve.

 100 Nm



Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.





Removing and installing the rail pressure sensor



Standard tools

Special tools:

- Long socket wrench insert 110700
- Plugs/caps 170160



- Assembly grease 01016496



- [User notes](#)



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

No foreign bodies may get into the rail. Ensure utmost cleanliness. Especially on the thread and the sealing surface of the rail.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

Removing the rail pressure sensor



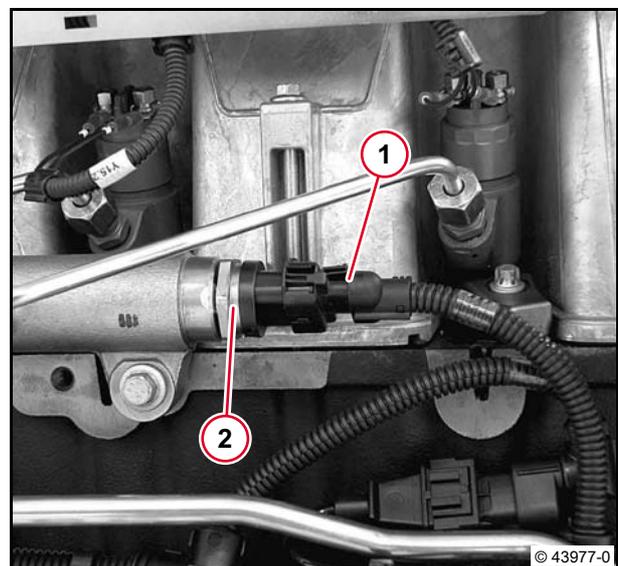
Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Unlock cable plug (1) and remove.
- Unscrew the rail pressure sensor (2) with the socket wrench.



Collect draining fuel and dispose of according to regulations.





Attention!

Do not touch the pin contacts of the rail pressure sensor with your hands to avoid electrostatic discharging. Ensure absolute cleanliness of the connector.

- Visually check the thread and the sealing edge (arrows) of the rail pressure sensor.



© 43017-0

6

Installing the rail pressure sensor



Attention!

No foreign bodies may get into the rail. Ensure utmost cleanliness. Especially on the thread and the sealing surface of the rail.

- Coat the thread and sealing edge of the rail pressure sensor lightly with assembly grease.
- Screw in rail pressure sensor (2).
- Tighten rail pressure sensor.

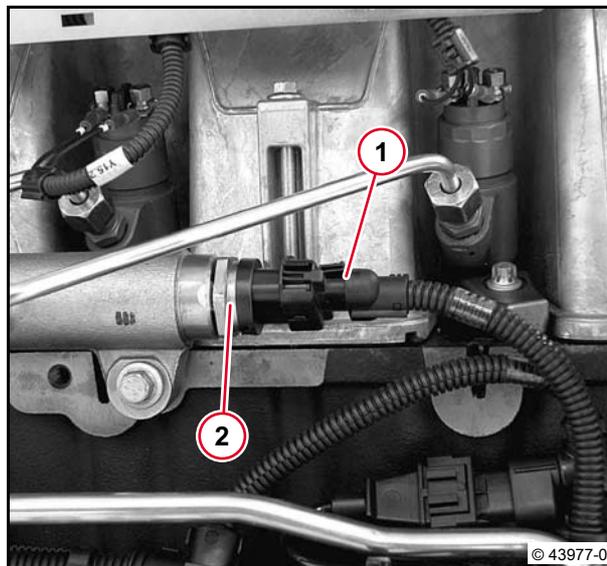
M18x1.5

 70 Nm

- Plug in the cable plug (1).



Ensure that the connection is perfect.



© 43977-0

Removing and install the charge air line



Standard tools



- W 08-01-01
- W 48-03-01

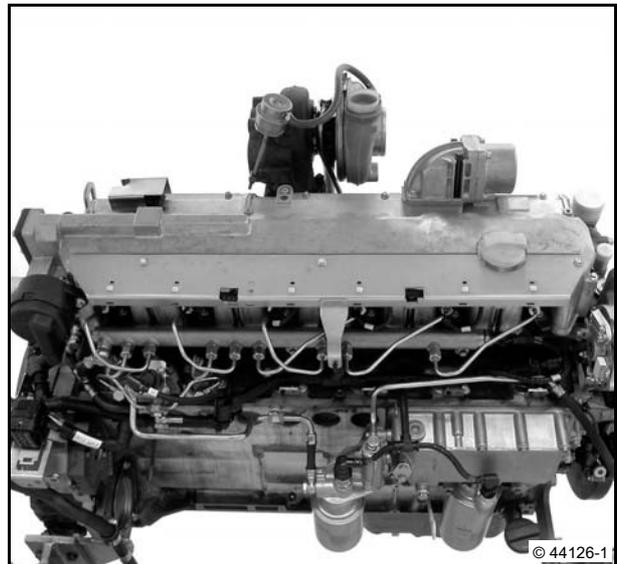
Remove charge air line

- Remove pressure/temperature sensor.

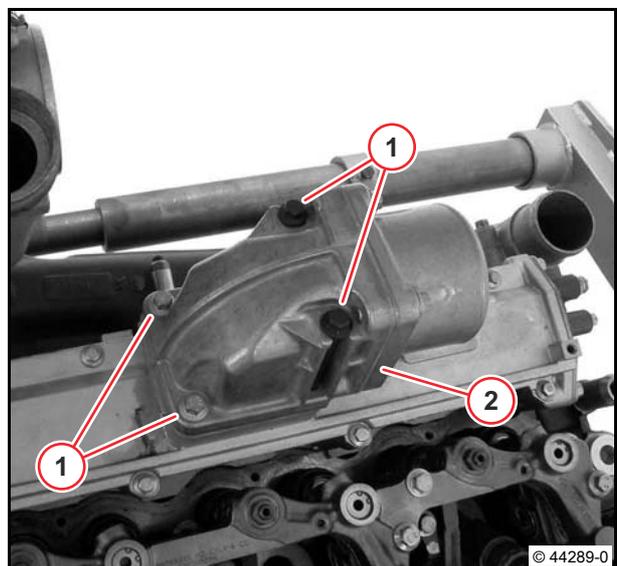
 W 48-03-01

- Remove the cylinder head hood.

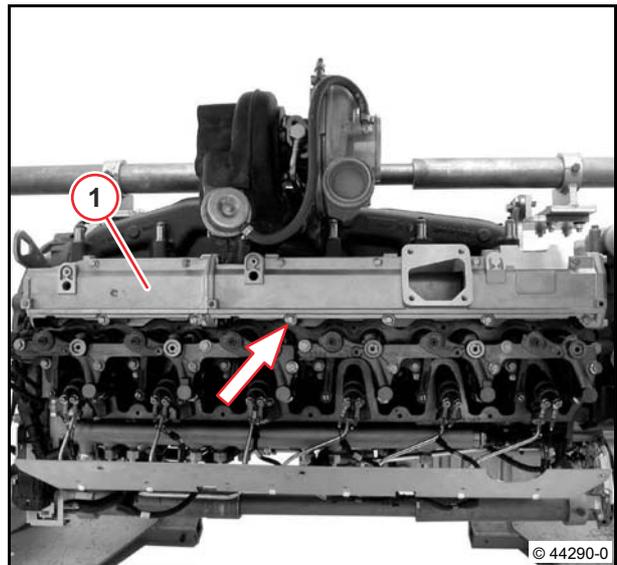
 W 08-01-01



- Unscrew screws (1).
- Remove charge air manifold (2).
- Remove gasket.

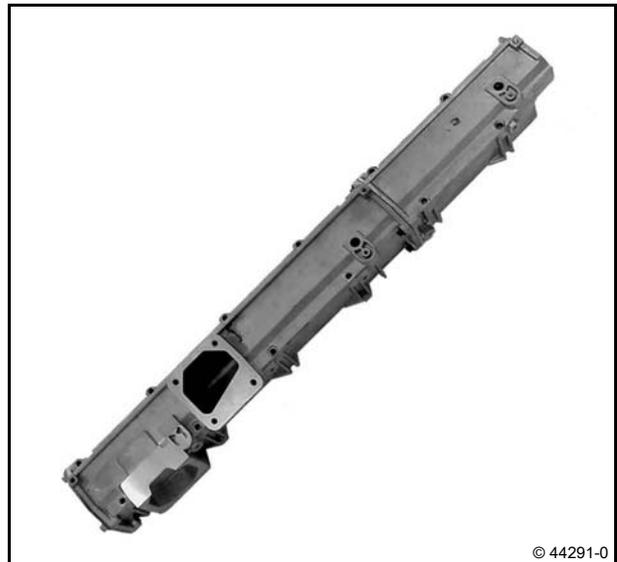


- Unscrew all screws (arrow).
- Remove charge air line (1).
- Remove gasket.



6

- Visually inspect the components.

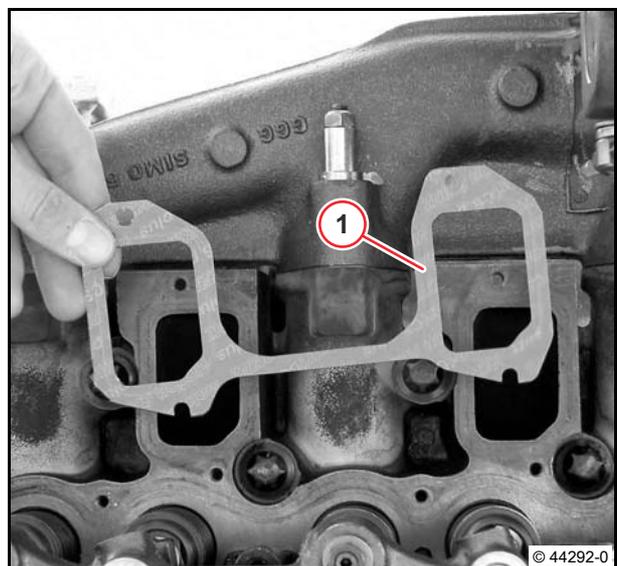


Install charge air line

- Clean sealing surfaces.
- Mount new gaskets (1).



Ensure that the installation location is free from faults.



- Mount charge air line.
- Fasten screws.

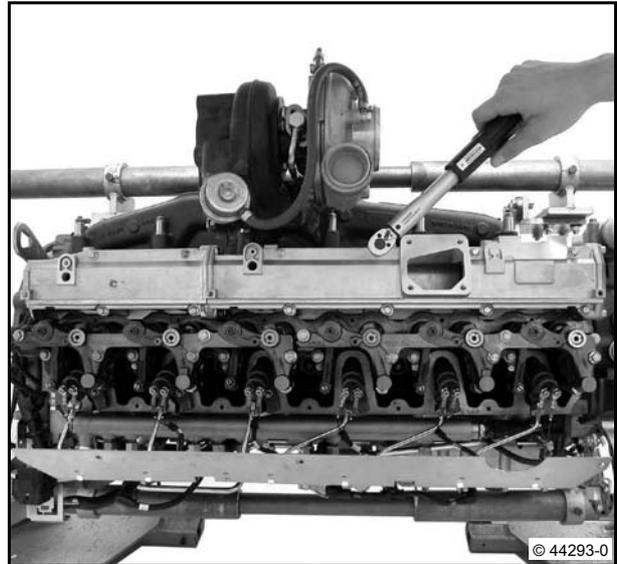


Do not move gaskets.

- Tighten screws alternately working from the centre to the outside.



11 Nm



6

- Clean sealing surfaces.
- Mount new gasket.
- Mount charge air manifold.
- Fasten screws.



Note different screw lengths:

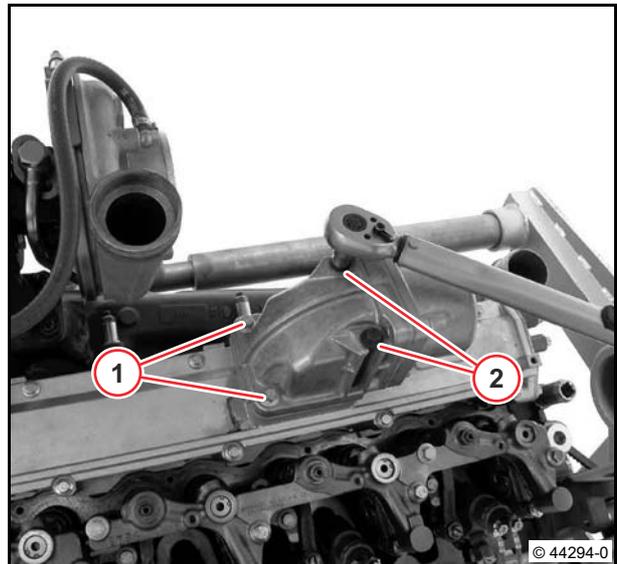
Screws M8 x 30 mm (1)

Screws M8 x 90 mm (2)

- Tighten screws .



30 Nm



- Install pressure/temperature sensor.

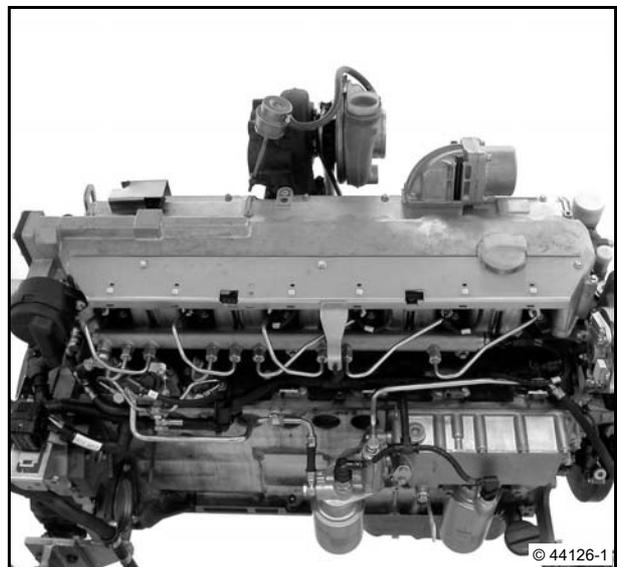


W 48-03-01

- Mount cylinder head cover.



W 08-01-01





Removing and installing the coolant pump (V-belt drive)



Standard tools:
– V-belt tension measuring device 8115



– Packing compound DEUTZ DW 76



– Operation manual
– [W 38-02-01](#)



Attention!

Only test / tighten / renew V-belts with the engine at a standstill.



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Emptying and filling the engine with operating media must be carried out according to the operating manual and the appropriate documentation of the vehicle/equipment manufacturer.

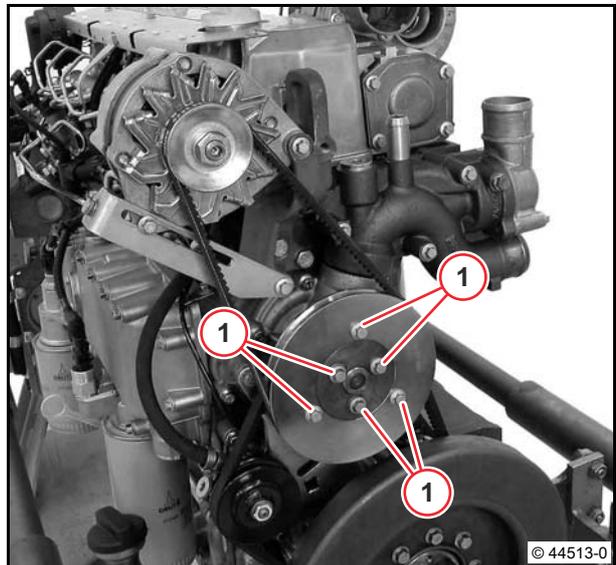
The V-belt tension of new V-belts must be checked after they have been running for 15 minutes.

Removing coolant pump

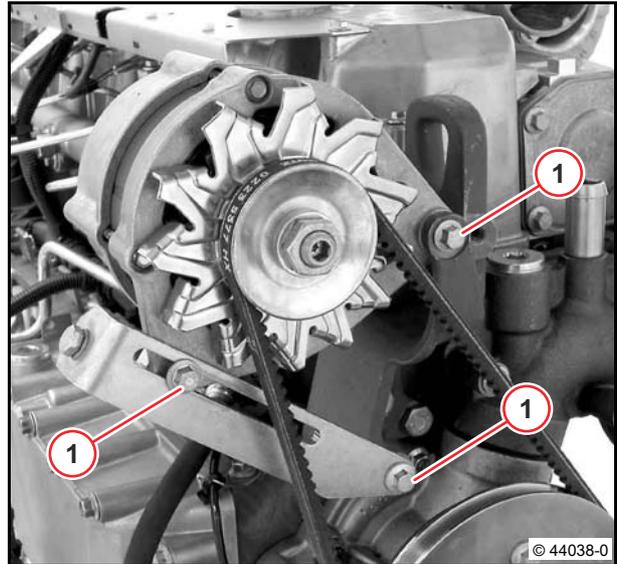
- Loosen screws (1).



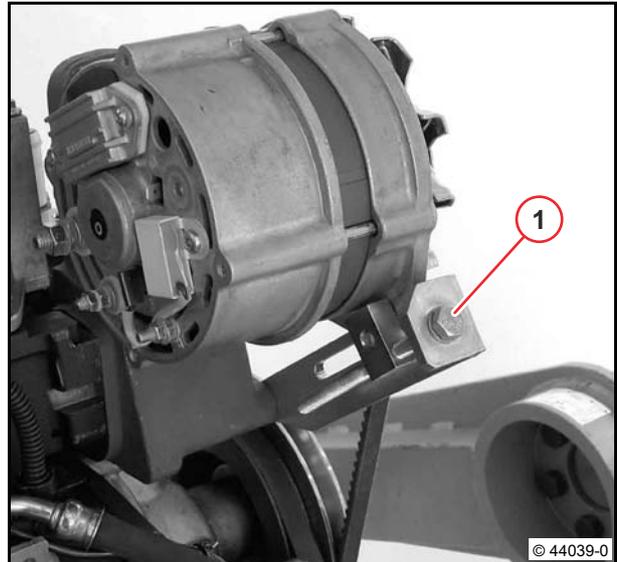
Do not unscrew screws.



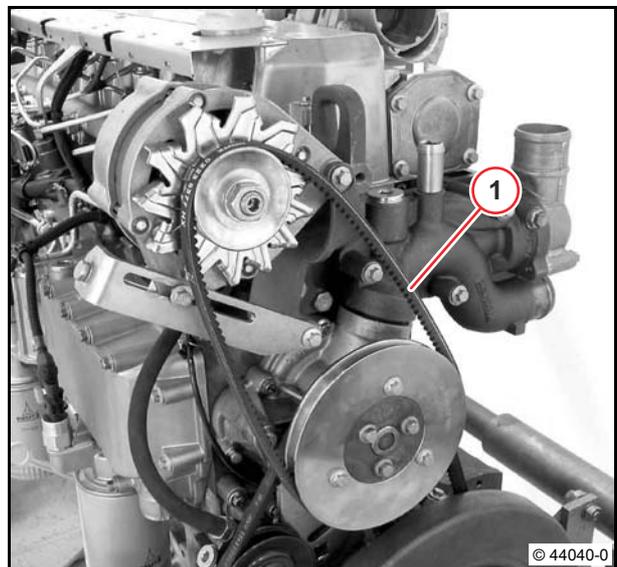
- Loosen screws (1).



- Loosen V-belt by unscrewing the clamping screw (1).

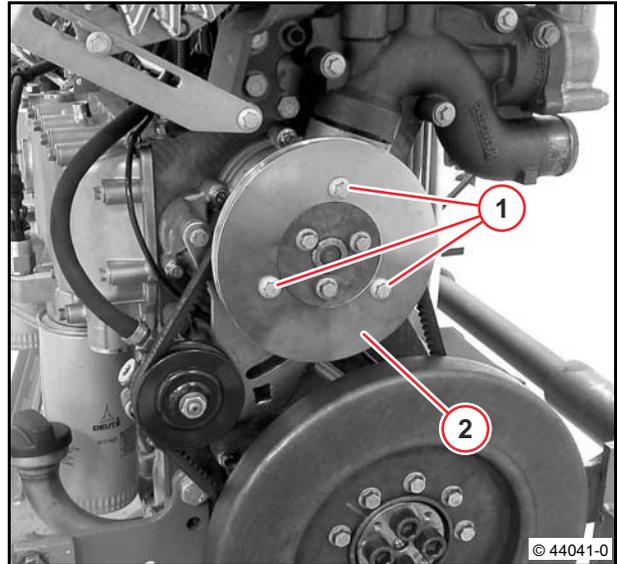


- Remove V-belt (1).

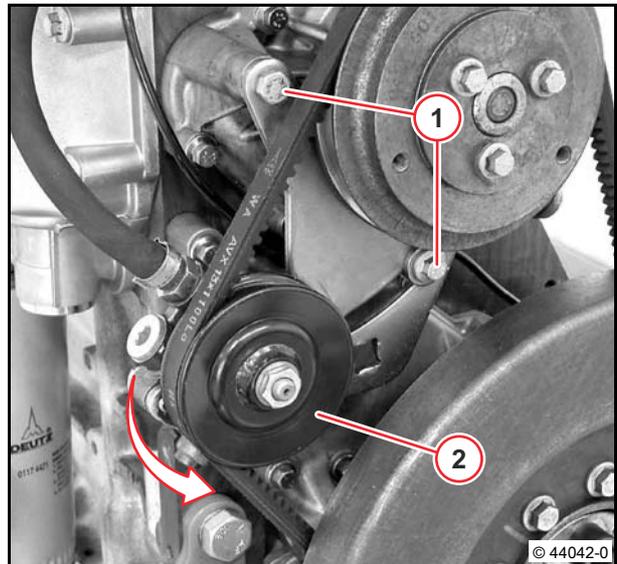


6

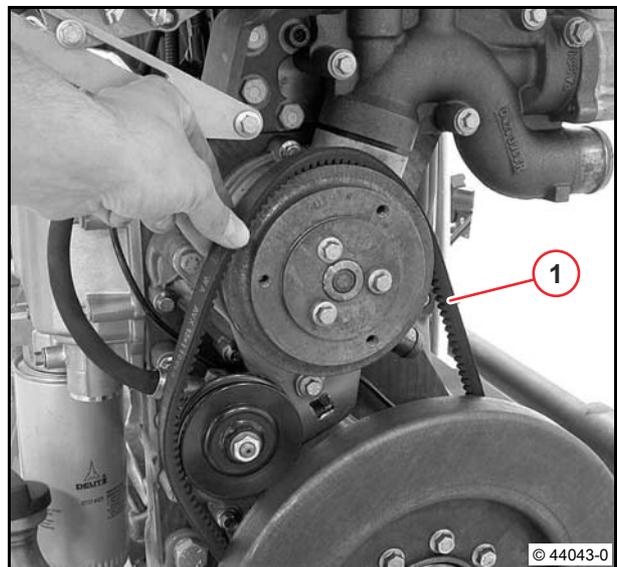
- Unscrew screws (1).
- Remove V-belt pulley (2).



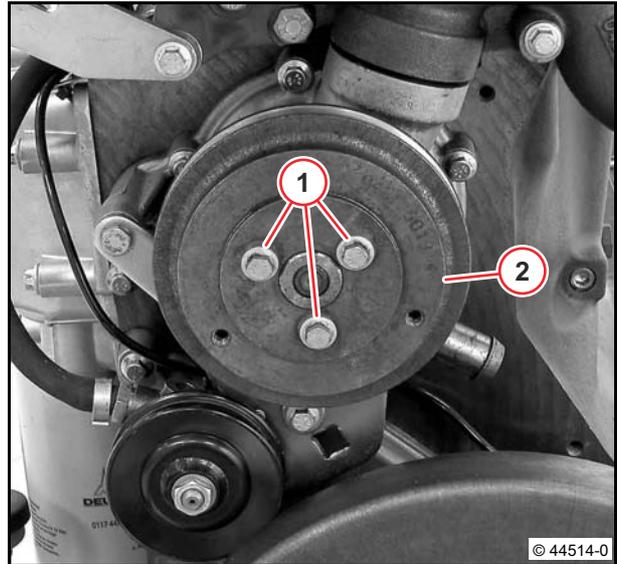
- Loosen screws (1).
- Swing the fuel supply pump (2) to the side (arrow).



- Mount V-belt (1) for coolant pump.



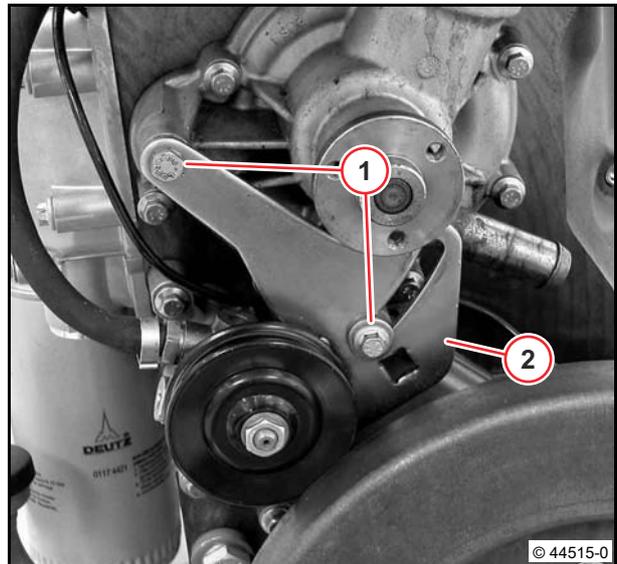
- Unscrew screws (1).
- Remove V-belt pulley (2).



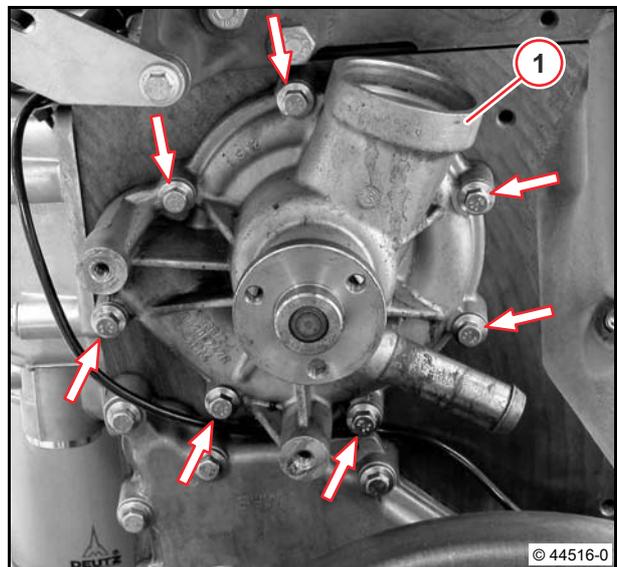
6

- Unscrew screws (1).
- Remove clamping strap (2) and fuel supply pump.
- Unhook the fuel supply pump at the side.
- Remove thermostat housing.

[W 38-02-01](#)



- Unscrew screws (arrows).
- Remove coolant pump (1).
- Remove gasket.

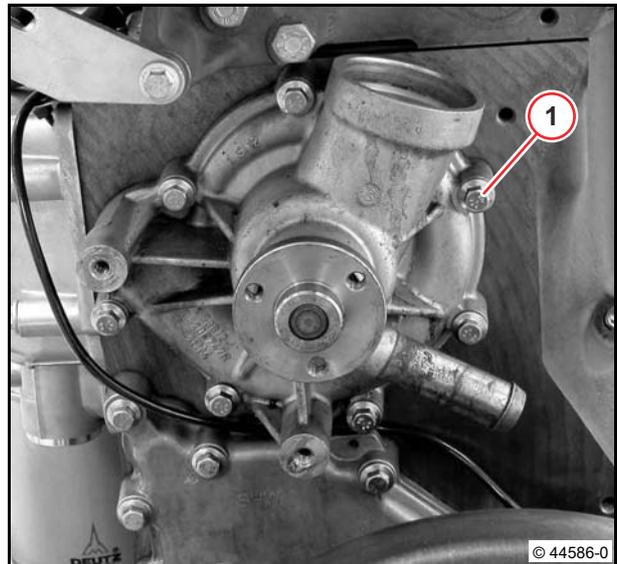


- Visually inspect the components.

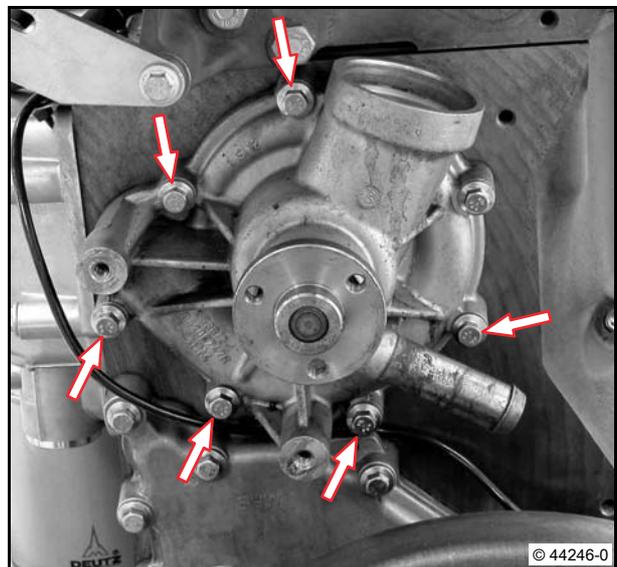


Installing coolant pump

- Clean sealing surfaces.
- Mount new gasket.
- Insert screw (1) with packing compound.
- Fasten screw (1).



- Tighten screws (arrows).



- Tighten the screws according to the tightening sequence.

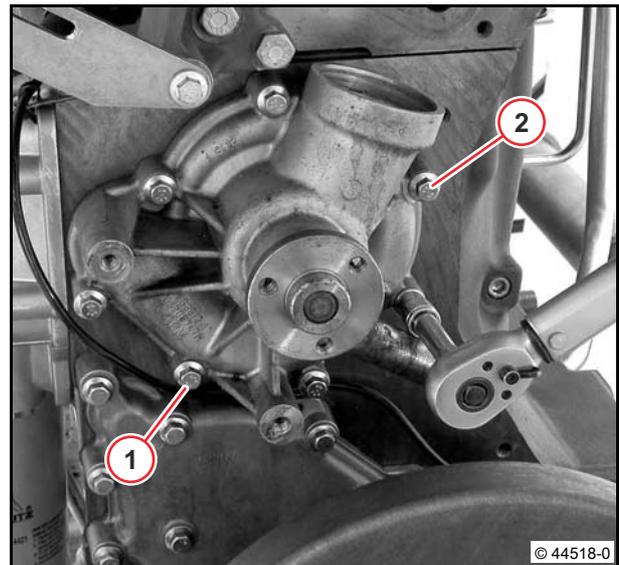
 30 Nm



Tightening order:
screw (1), then screw (2), then the other
screws in any order.

- Install thermostat housing.

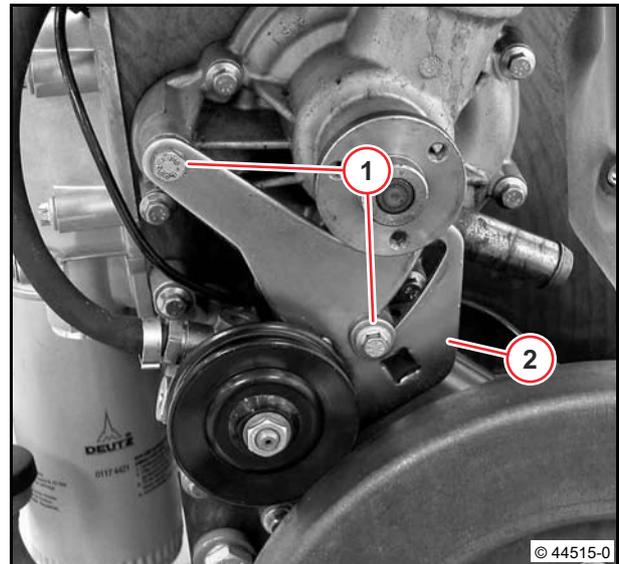
 [W 38-02-01](#)



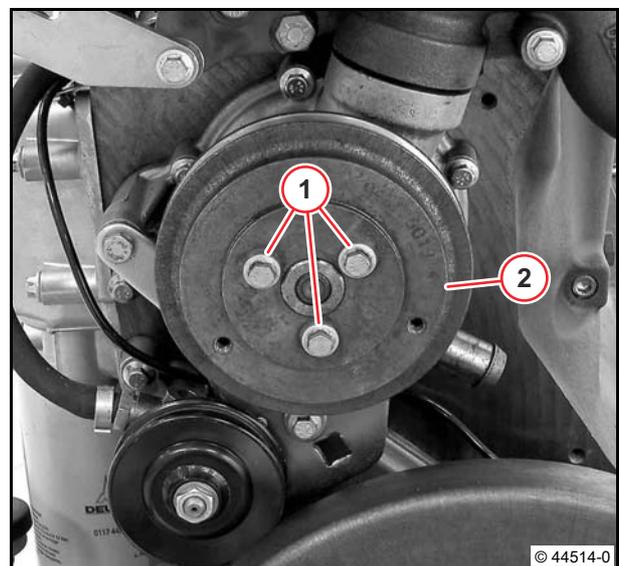
- Mount clamping strap (2) with fuel supply pump.
- Tighten screws (1).



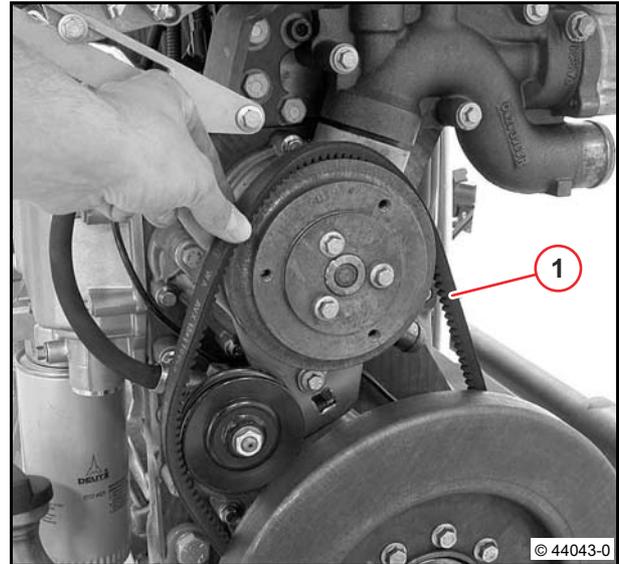
Do not tighten screws.



- Mount V-belt pulley (2).
- Fasten screws.



- Mount V-belt (1) for coolant pump.

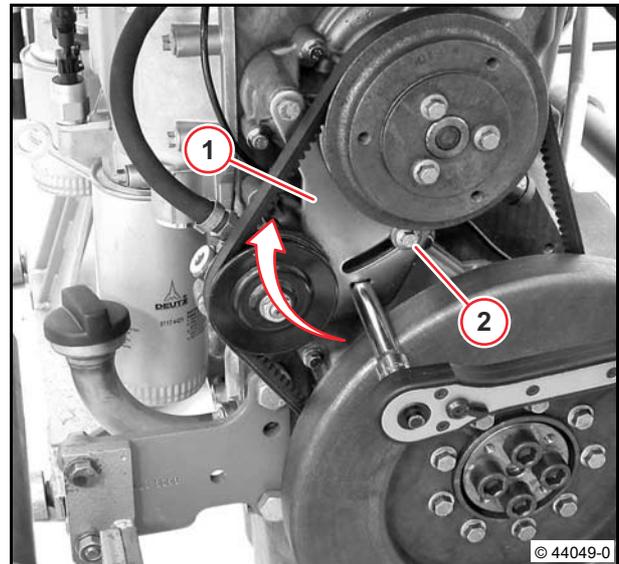


- Press clamping strap (1) in direction of arrow with a suitable tool.
- Tighten screw (2).

 30 Nm

- Check V-belt tension.

 Operation manual





Removing and installing the thermostat



Standard tools



– Fitting compound
DEUTZ AP1908

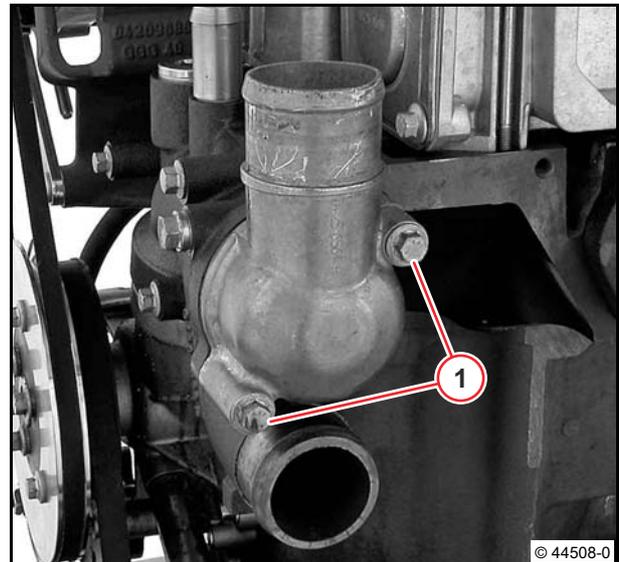


Collect leaking operating substances in suitable vessels and dispose of according to regulations.

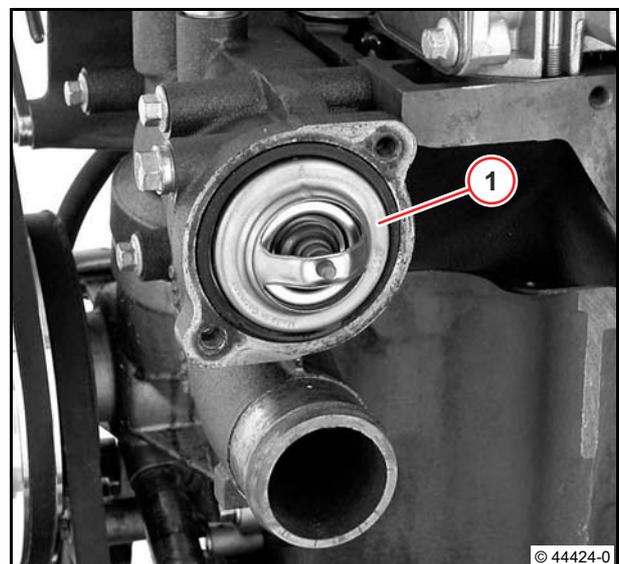
The appropriate documentation of the vehicle/equipment manufacturer should be observed for emptying and filling the cooling system.

Removing the thermostat

- Unscrew screws (1).
- Remove outlet nozzle (2).



- Remove thermostat (1).
- Visually inspect the components.



Installing the thermostat

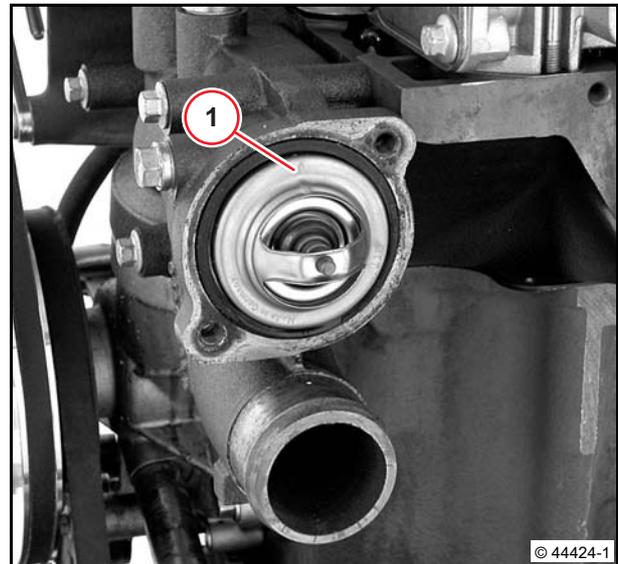
- Clean sealing surfaces.
- Insert new sealing ring (1).
- Coat the sealing ring with fitting compound.



- Insert thermostat.

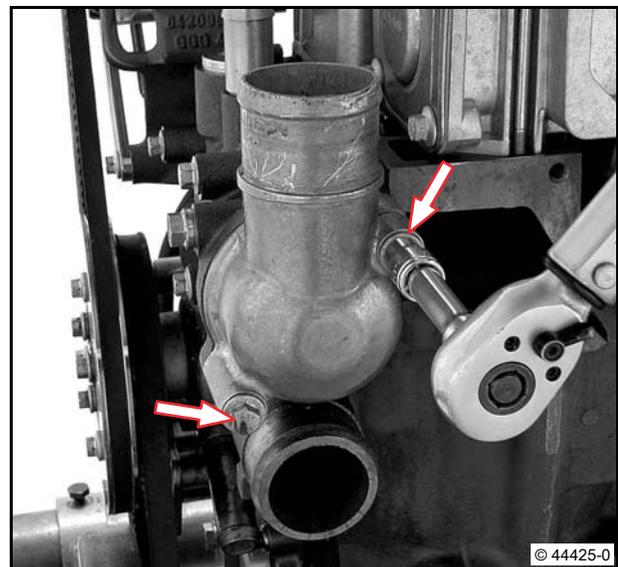


Arrow (1) points up.



- Mount outlet nozzle.
- Tighten screws (arrows).

 30 Nm



Checking the thermostat (in the removed state)



Standard tools:
– Thermometer



– W 38-01-01



Danger!

Risk of injury!
Hot water and hot thermostat.

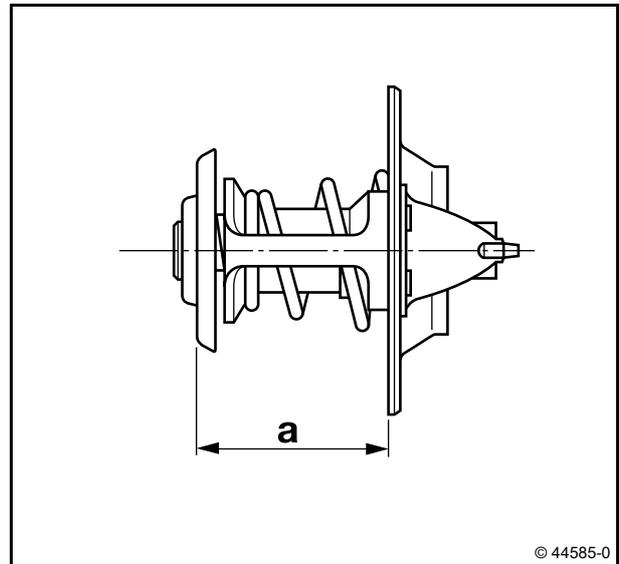
Checking thermostat

- Remove thermostat.



W 38-01-01

- Measure beginning of stroke, dimension (a).
- Note measured value, dimension (a).



- Heat up the thermostat in the water bath.
- Determine beginning of opening.



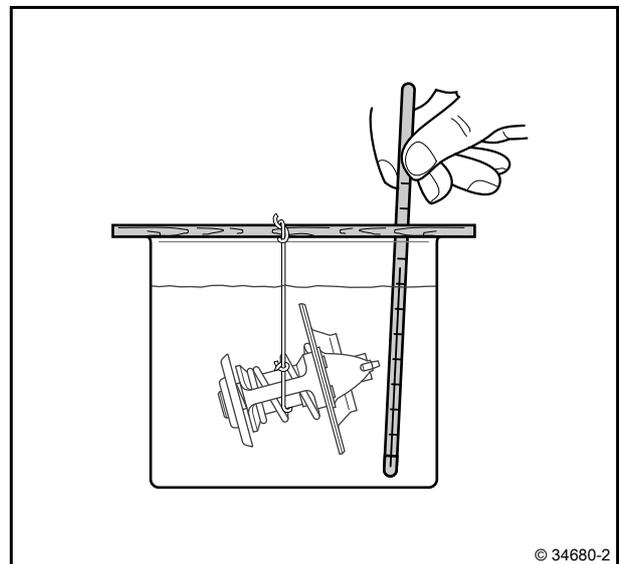
In order to determine the exact beginning of opening, the temperature should be measured as close as possible to the thermostat.

Do not touch the thermostat.

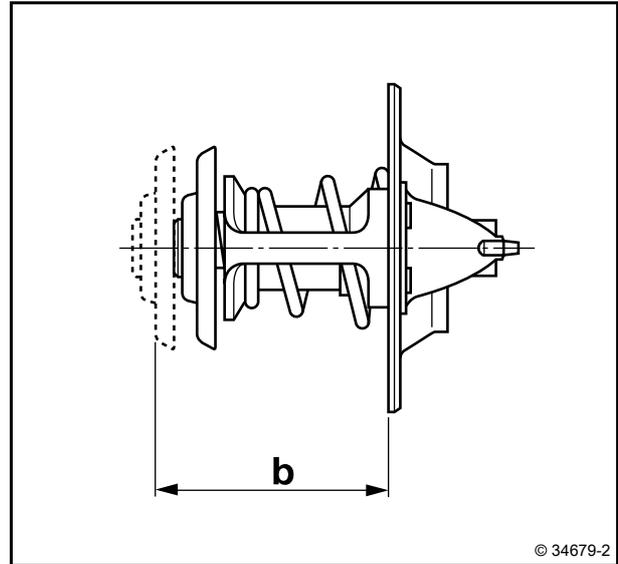
The water should be continuously stirred for an even temperature distribution. The temperature rise should not take place faster than 1°C/min. Otherwise the beginning of opening will be delayed accordingly.



83 °C



- Measure end of stroke, dimension (b).
- Note measured value, dimension (b).



- Determine stroke.

Calculation example

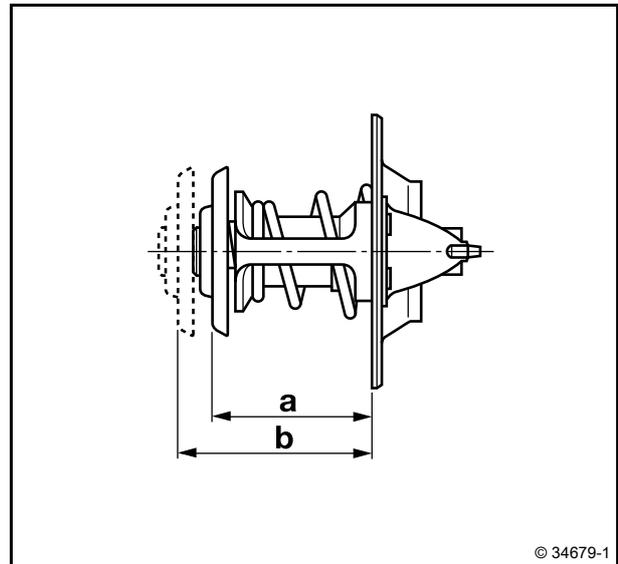
Desired:	Stroke
Given:	-
Measured:	Beginning of stroke, dimension (a) End of stroke, dimension (b)
Calculation:	Dimension (b) - dimension (a)
Result:	= stroke

- Compare result with setpoint value.

 8 mm

- Install thermostat.

 [W 38-01-01](#)



Removing and installing the thermostat housing



Standard tools



– Fitting compound
DEUTZ AP1908



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

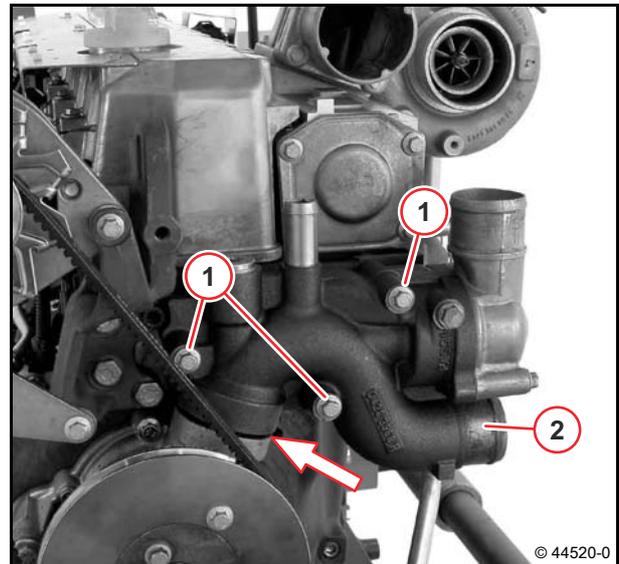
Emptying and filling the engine with operating media must be carried out according to the operating manual and the appropriate documentation of the vehicle/equipment manufacturer.

Removing the thermostat housing

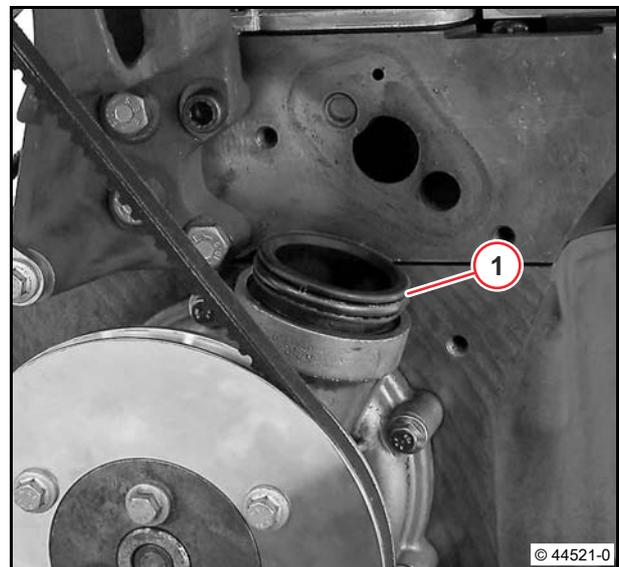
- Unscrew screws (1).
- Remove thermostat housing (2)



Note plug element (arrow).



- Pull out plug element (1).



- Visually inspect the components.



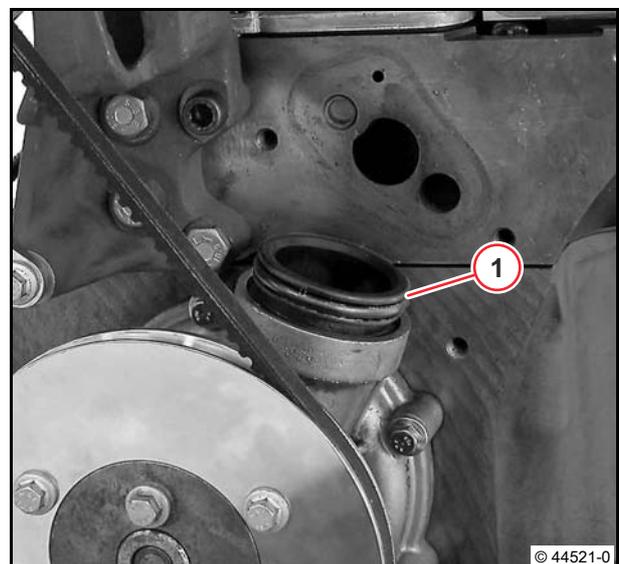
6

Installing the thermostat housing

- Insert new O-rings (arrows).
- Coat the O-rings with fitting compound.



- Insert plug element (1).

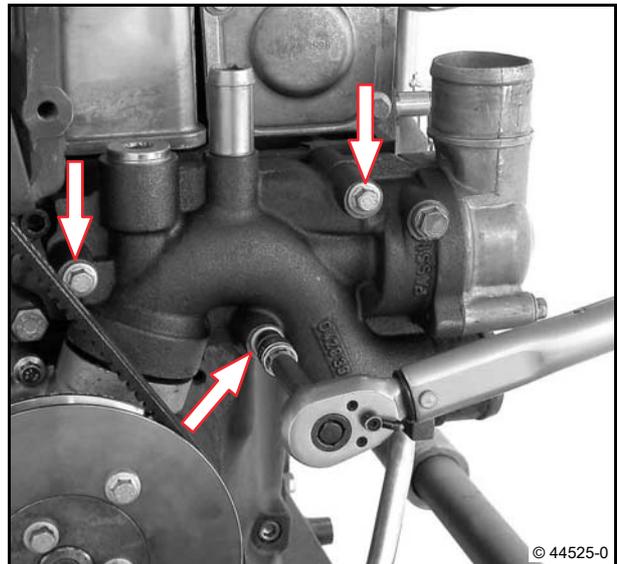


- Clean sealing surfaces.
- Insert new sealing ring (arrow).
- Coat the sealing ring with fitting compound.



- Push the coolant thermostat housing onto the adapter first.
- Mount the coolant thermostat housing.
- Tighten screws (arrows).

 30 Nm





Removing and installing the belt tensioner (V-rib belt)



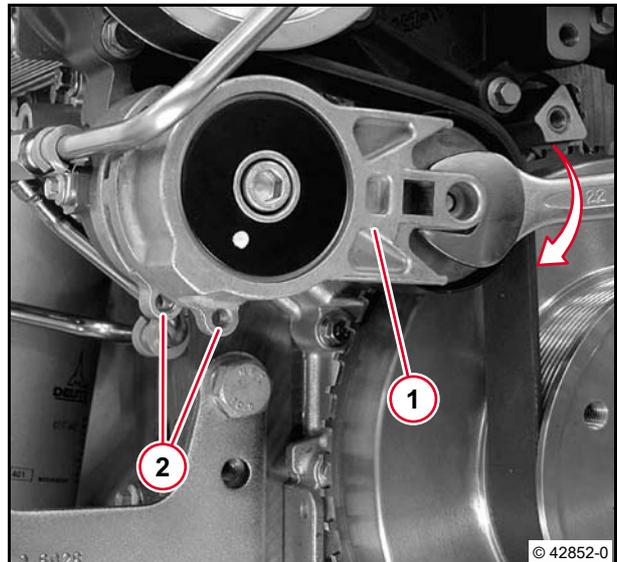
Standard tools:

- Retaining pin, diameter 6 mm

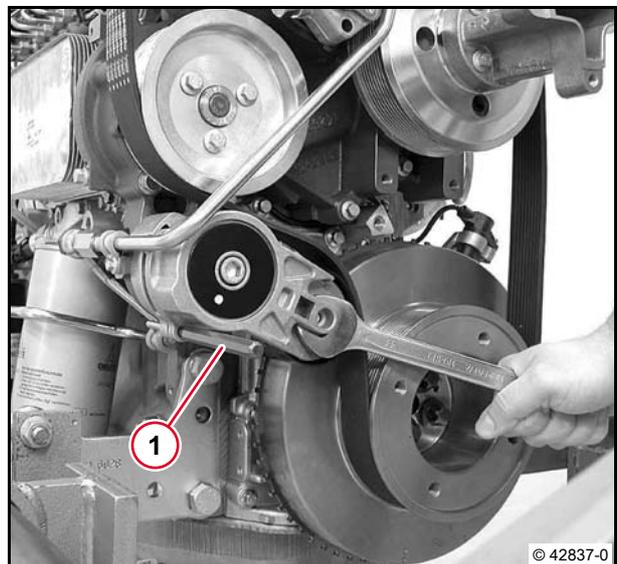
6

Removing the belt tensioner

- Tighten the belt tensioner (1) in the direction of the arrow until the bores (2) are in line.



- Insert holding pin (1).

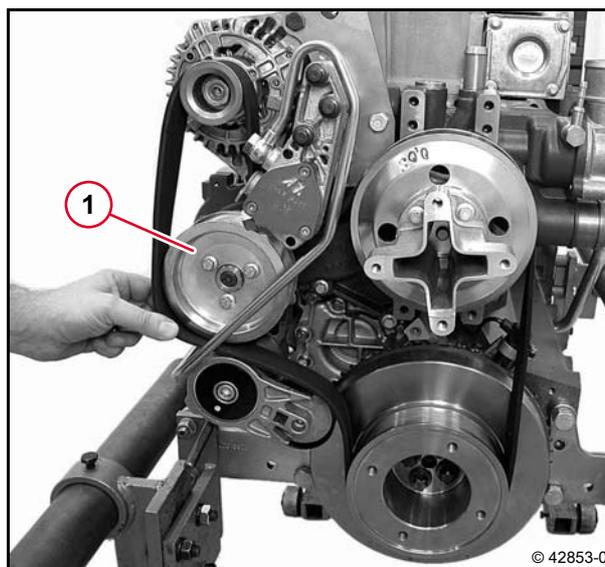


- Remove V-rib belt.

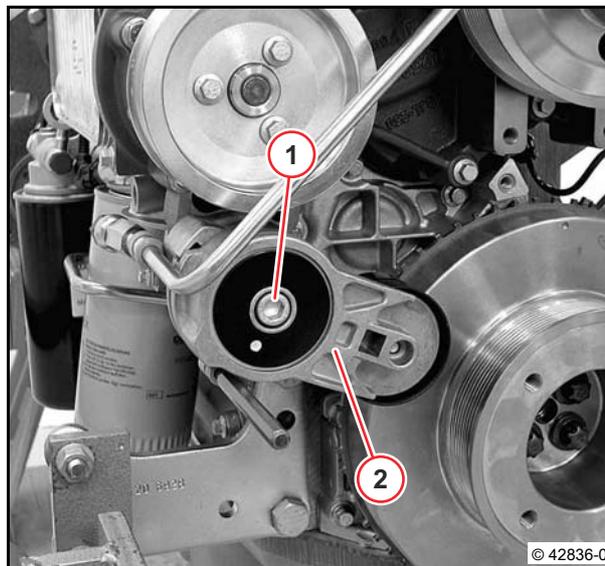


The running direction must be marked when the V-rib belt is to be re-used.

First remove the V-rib belt from the V-rib belt pulley (1)



- Unscrew screw (1).
- Remove belt tightener (2).
- Visually inspect the components.

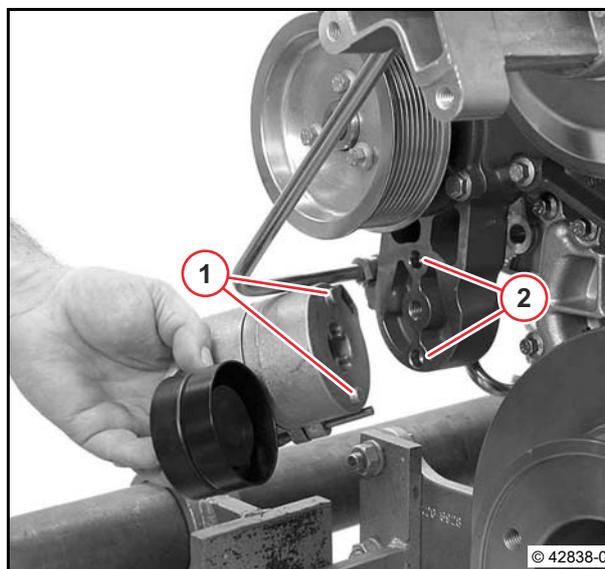


Installing the belt tensioner

- Mount the belt tightener.

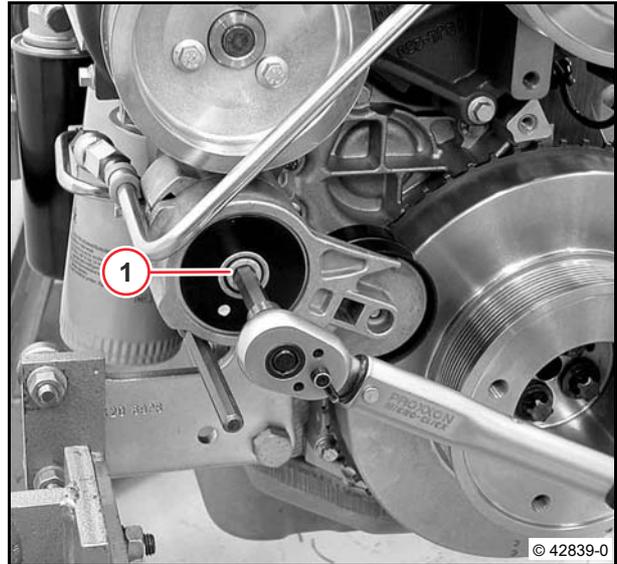


The fixing bolts (1) must fit into the bores (2).



- Tighten screw (1).

 80 Nm



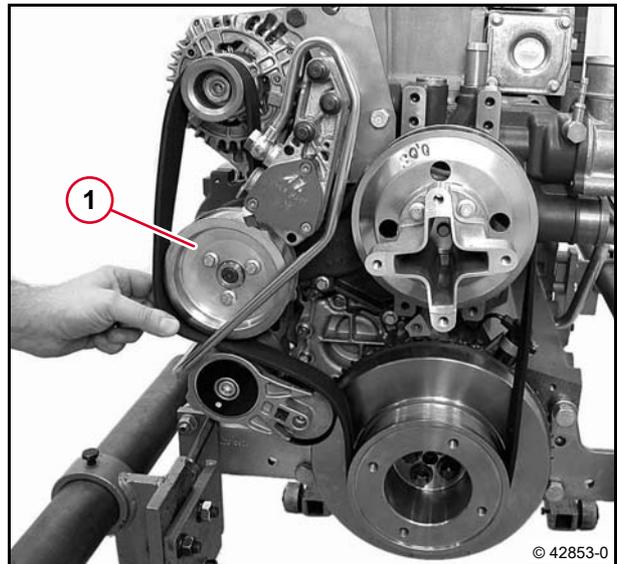
6

- Fit the V-rib belt according to the running direction.



Place the V-rib belt over the V-rib belt pulley (1) last.

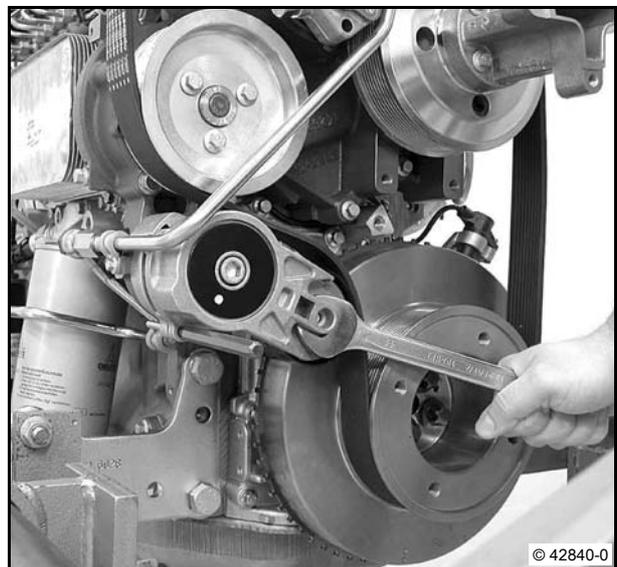
Ensure that the installation location is free from faults.



- Hold the belt tensioner.
- Remove the retaining pin.
- Relieve the belt tightener.



The belt tightener clamps the V-rib belt automatically.



Check the wear limit of the V-rib belt

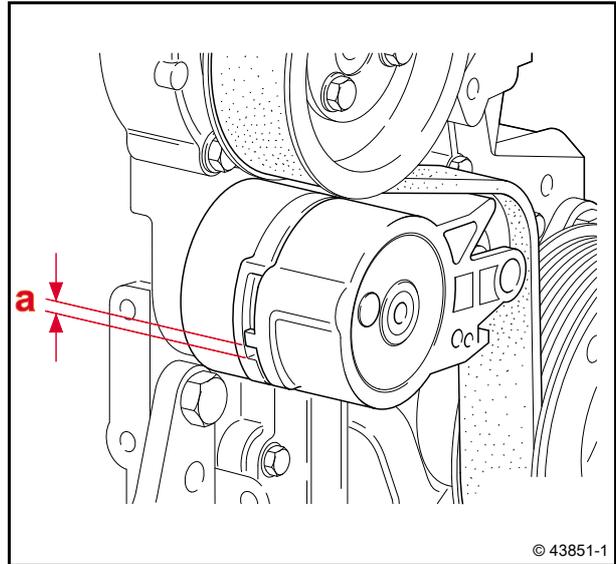


The fuel pipe is removed for better illustration.

- Measure distance (a).



If the distance (a) is less than 3 mm, the V-rib belt must be changed.



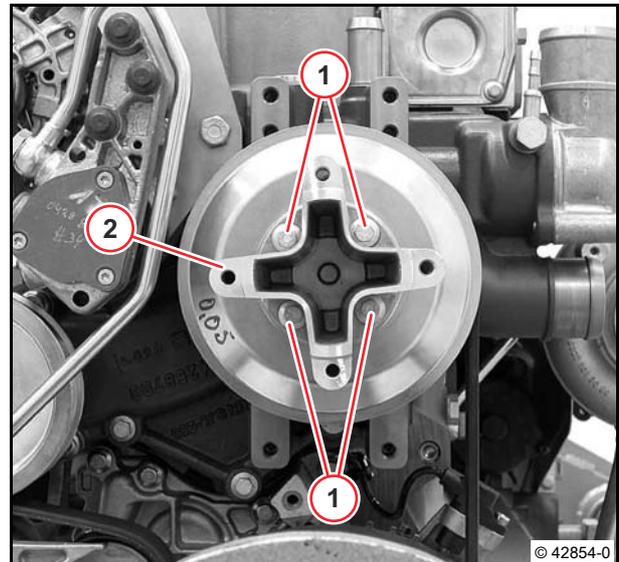
Removing and installing the fan drive



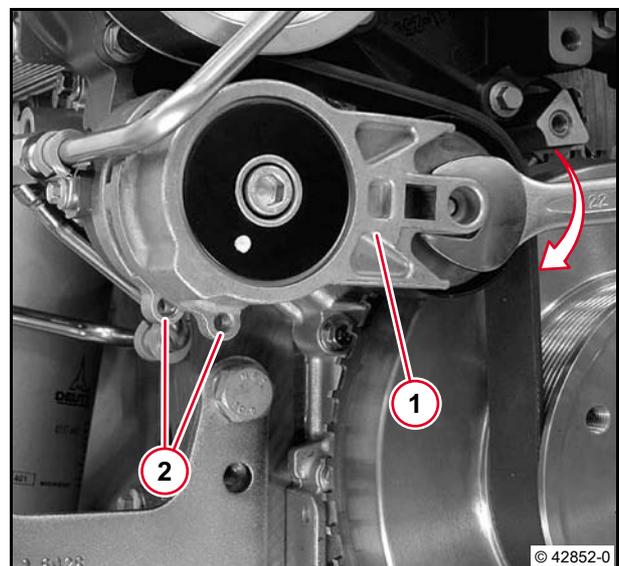
Standard tools:
– Retaining pin, diameter 6 mm

Removing the fan drive

- Unscrew screws (1).
- Remove adapter (2).



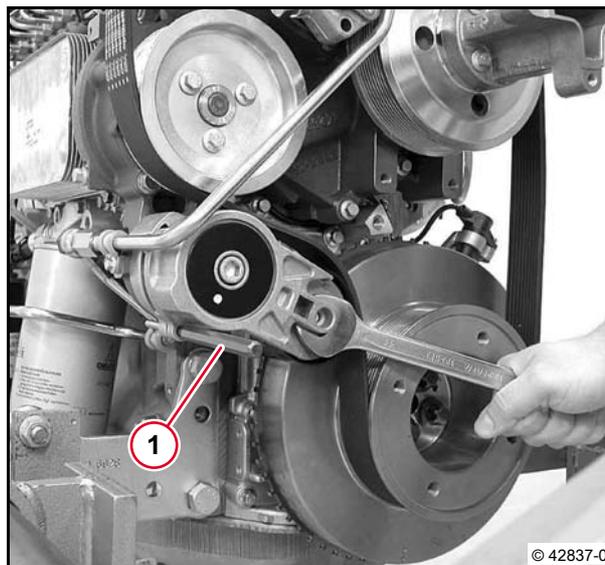
- Tighten the belt tensioner (1) in the direction of the arrow until the bores (2) are in line.



- Insert holding pin (1).



The running direction must be marked when the V-rib belt is to be re-used.

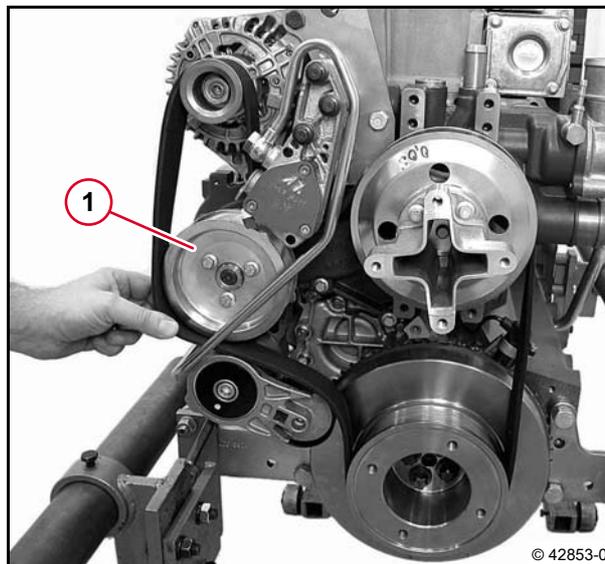


- Mark the running direction of the V-rib belt.
- Remove V-rib belt.



The running direction must be marked when the V-rib belt is to be re-used.

First remove the V-rib belt from the V-rib belt pulley (1)

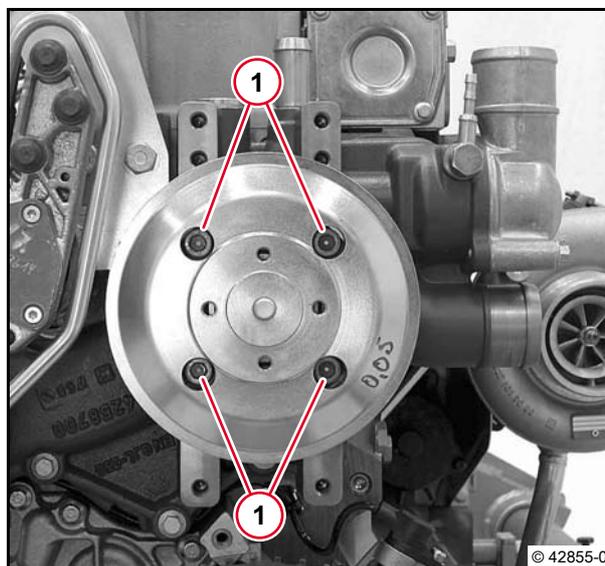


- Unscrew screws (1).
- Remove fan drive with V-rib belt pulley.



Note installation position of the fan drive.

- Visually inspect the components.



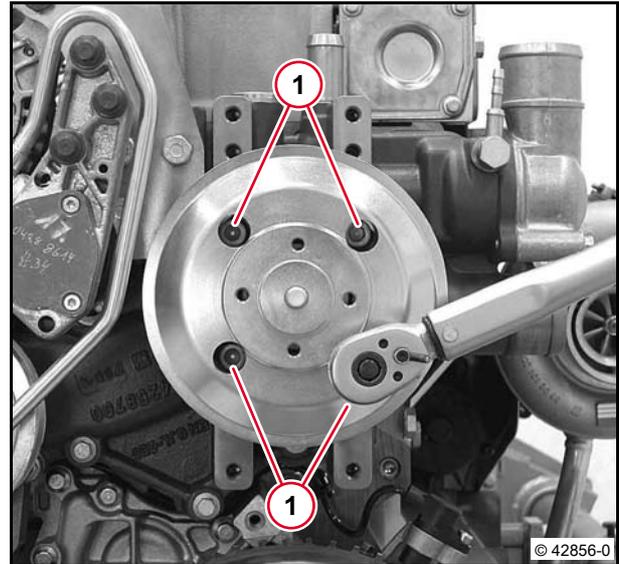
Installing the fan drive

- Install fan drive with V-rib belt pulley.
- Tighten screws (1).

 60 Nm



Note installation position of the fan drive.



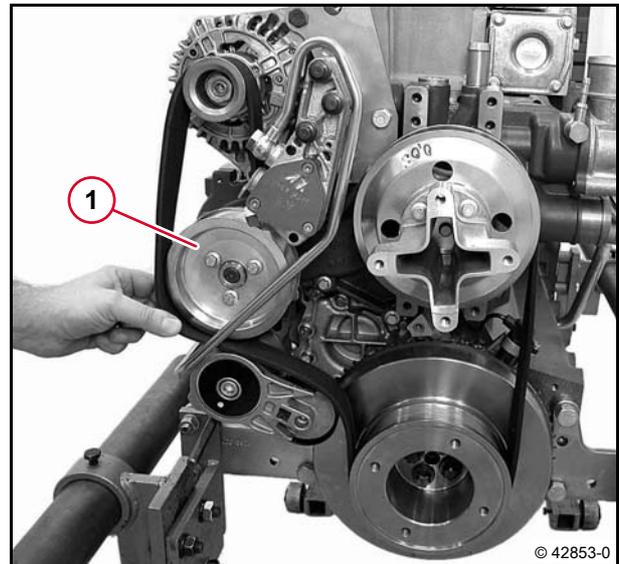
6

- Fit the V-rib belt according to the running direction.



Place the V-rib belt over the V-rib belt pulley (1) last.

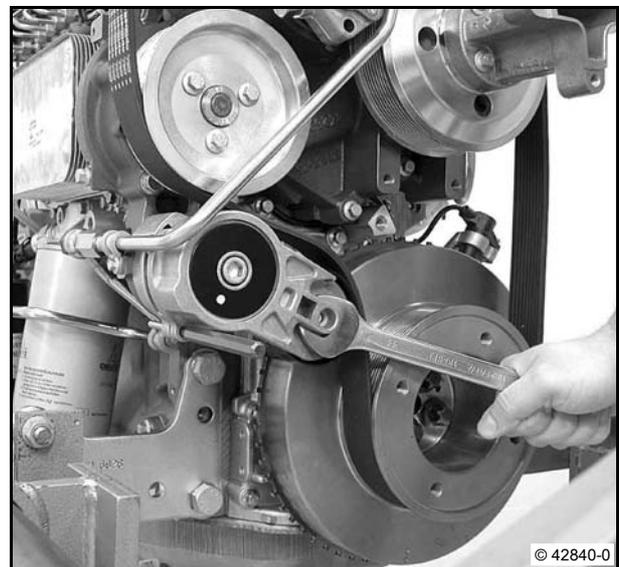
Ensure that the installation location is free from faults.



- Hold the belt tensioner.
- Remove the retaining pin.
- Relieve the belt tightener.



The belt tightener clamps the V-rib belt automatically.



Check the wear limit of the V-rib belt

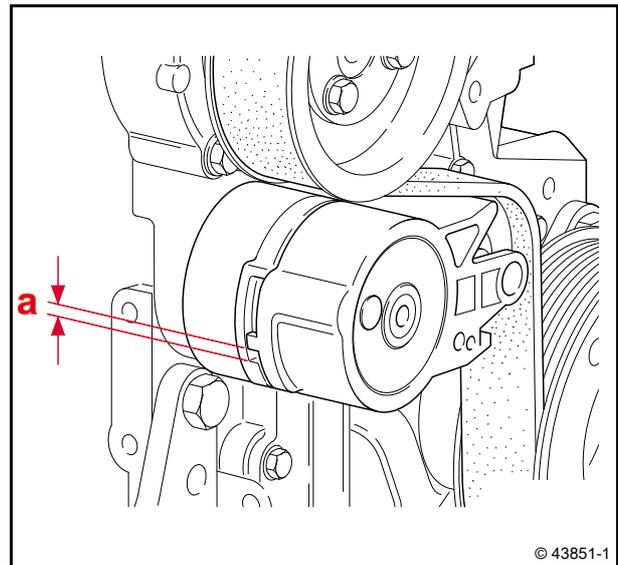


The fuel pipe is removed for better illustration.

- Measure distance (a).



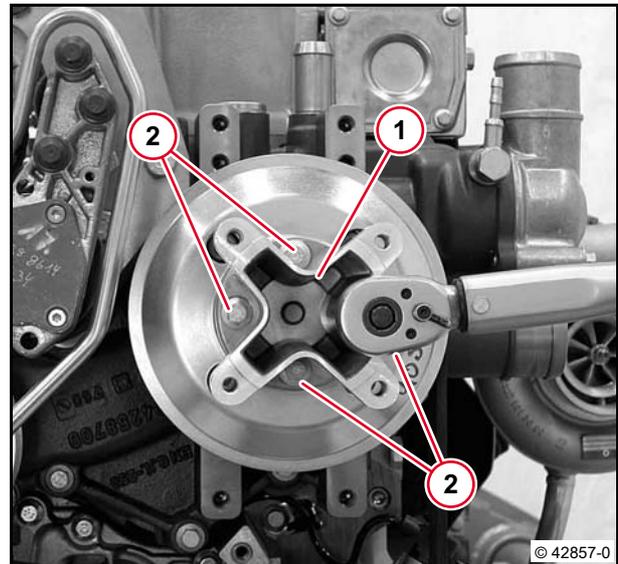
If the distance (a) is less than 3 mm, the V-rib belt must be changed.



6

- Mount adapter (1).
- Tighten screws (2).

 30 Nm



Dismantling and assembling the fan drive



Standard tools



– W 39-02-01

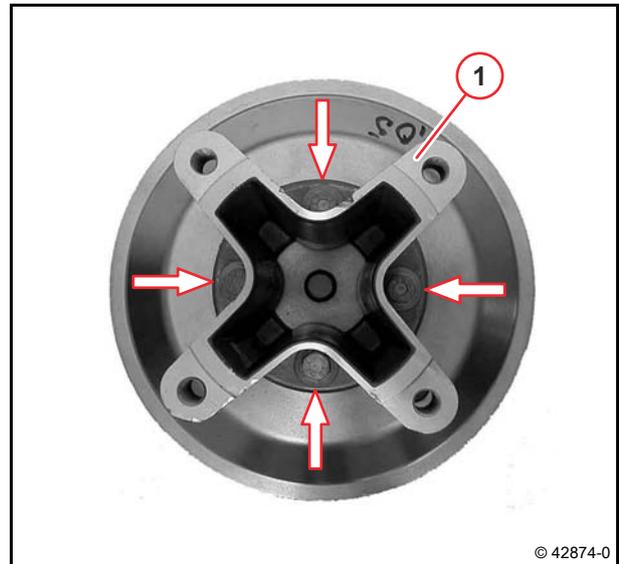
Dismantling the fan drive

- Remove the fan drive.

W 39-02-01

- Mount adapter (1).
- Tighten screws (arrows).

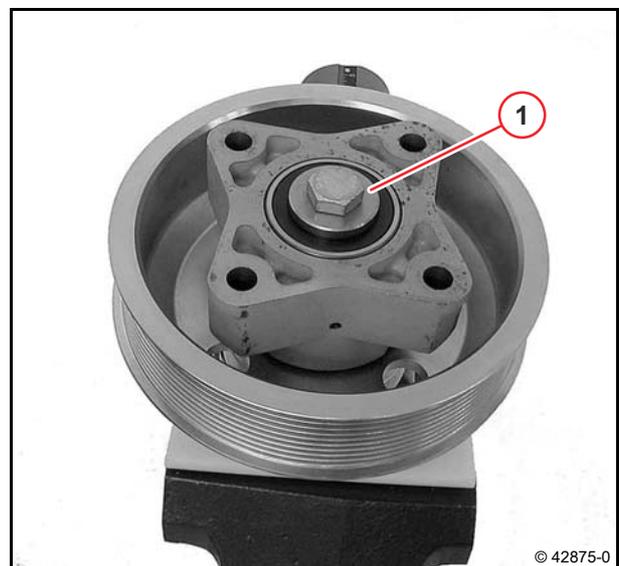
30 Nm



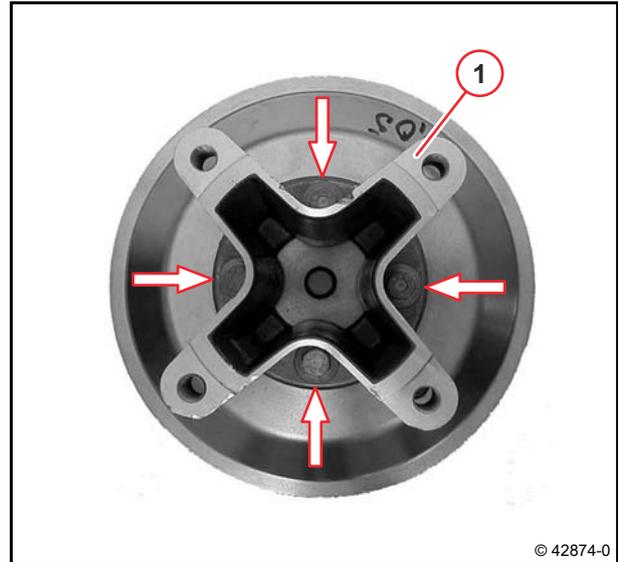
- Clamp the fan drive in the vice.
- Unscrew screw (1).



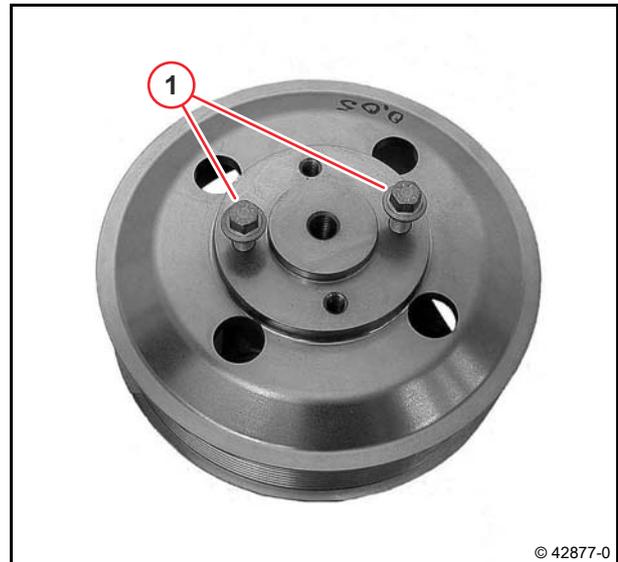
Attention!
Screw has left-hand thread.



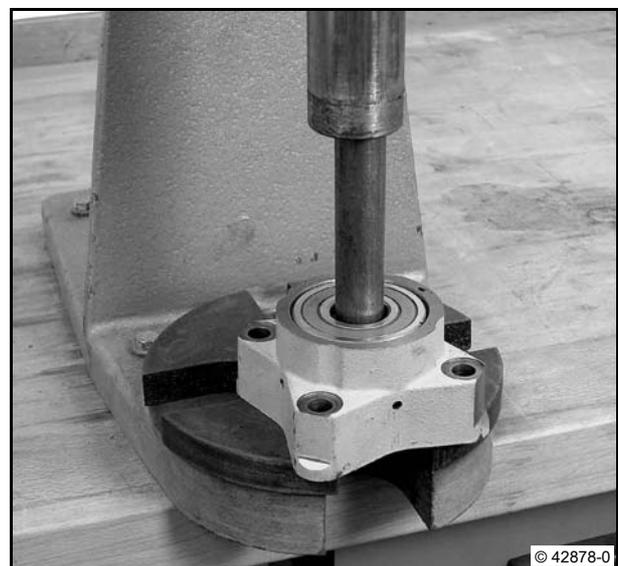
- Unclamp the fan drive.
- Unscrew screws (arrows).
- Remove adapter (1).



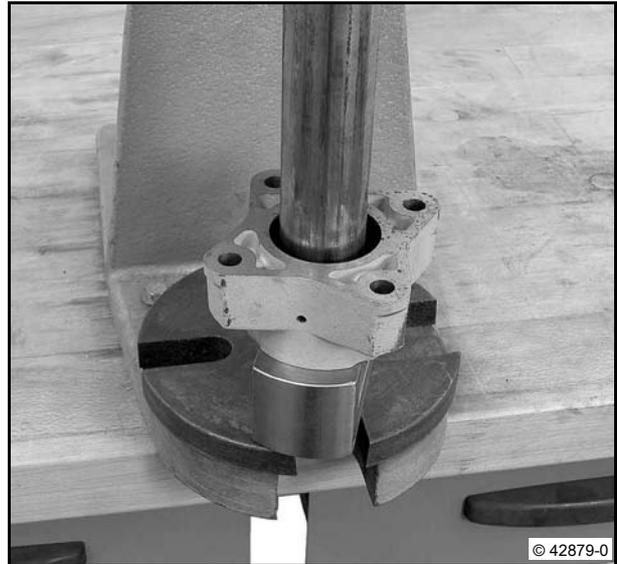
- Press off tight V-rib belt pulley from the fan drive with **two forcing screws (1)**.



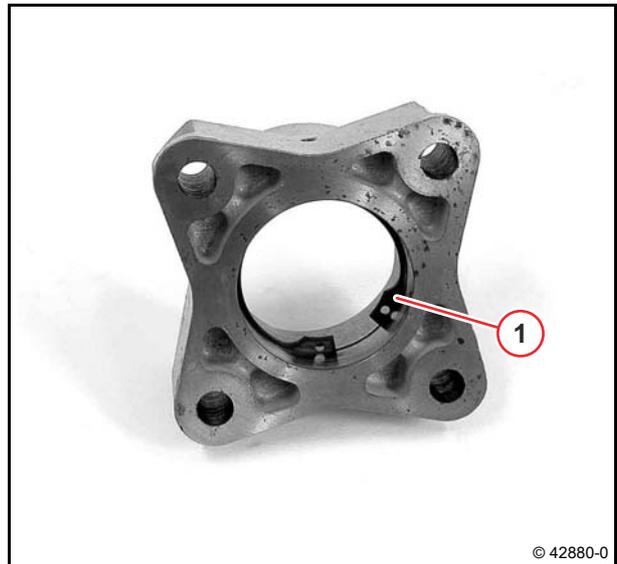
- Press out shaft and inside ball bearing.



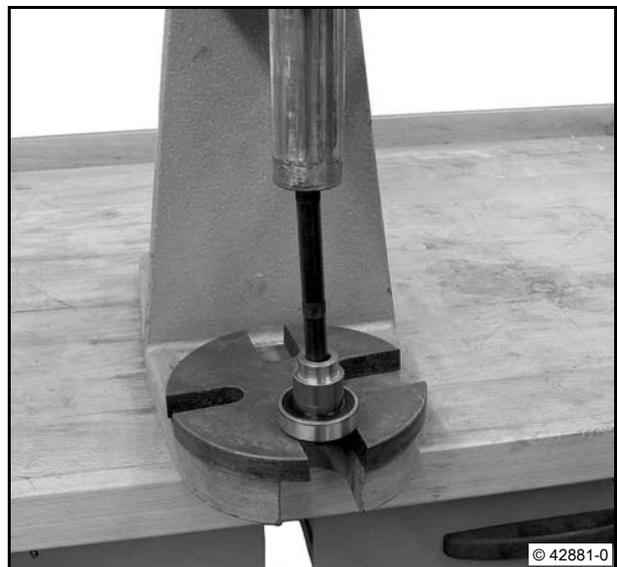
- Press out outside ball bearing.



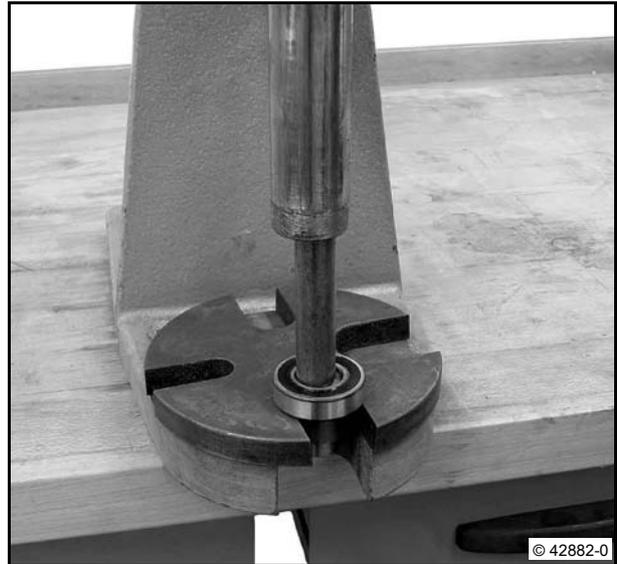
- Remove locking ring (1).



- Press pulley out of the inside ball bearing.



- Press shaft out of the inside ball bearing.
- Visually inspect the components.



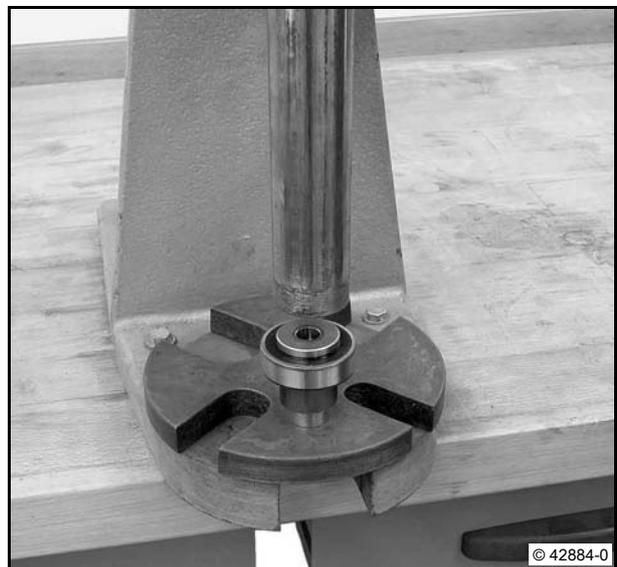
6

Assembling the fan drive

- Press shaft into the inside ball bearing to the stop.



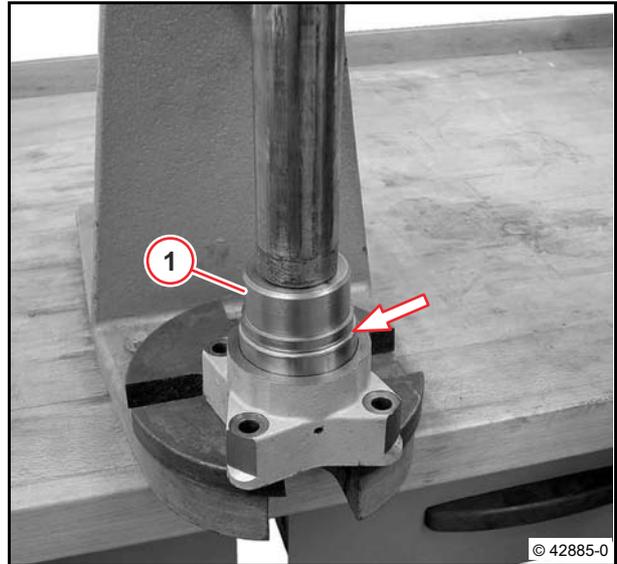
- Press pulley into the inside ball bearing to the stop.



- Press the outside ball bearing into the housing to the stop.



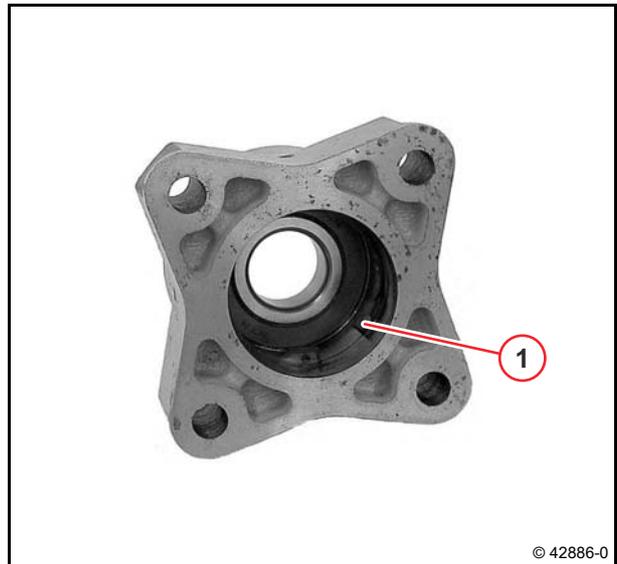
The press-in tool (1) must touch the outer ring of the ball bearing (arrow).



- Insert locking ring (1).



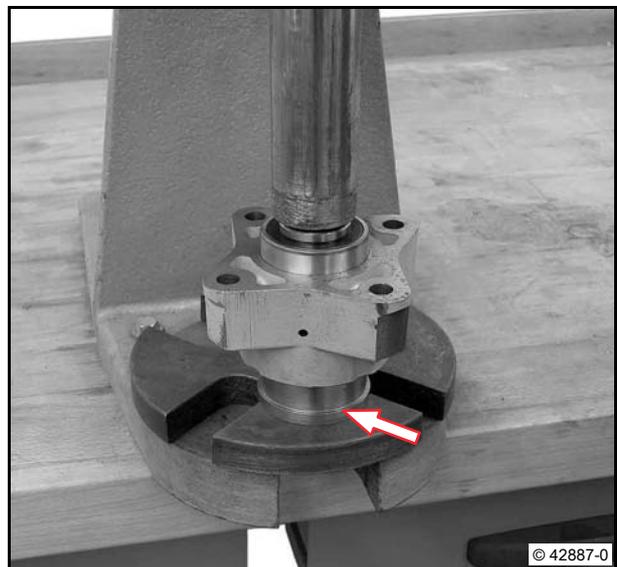
Make sure the locking ring fits correctly in the groove.



- Press in shaft and inside ball bearing to the stop.

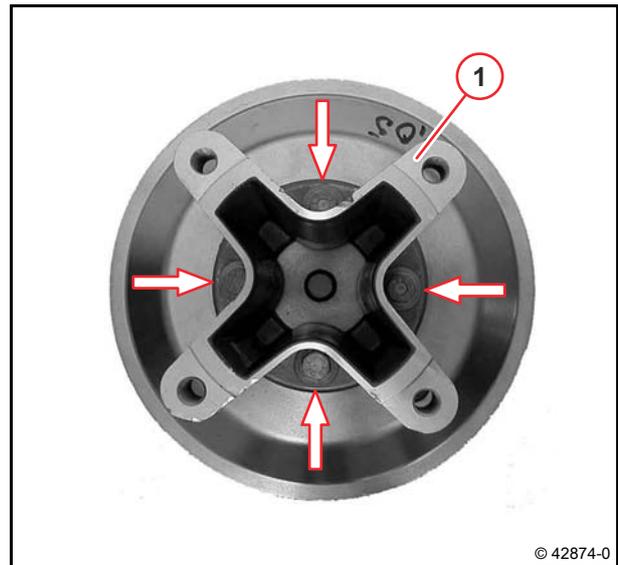


Support inside ring of the outside ball bearing with a suitable tool (arrow).



- Mount adapter (1).
- Tighten screws (arrows).

30 Nm



© 42874-0

- Clamp the fan drive in the vice.
- Install fan drive.
- Tighten screw (1).

– Stage 1:
 30 Nm

– Stage 2:
 90 °



Attention!

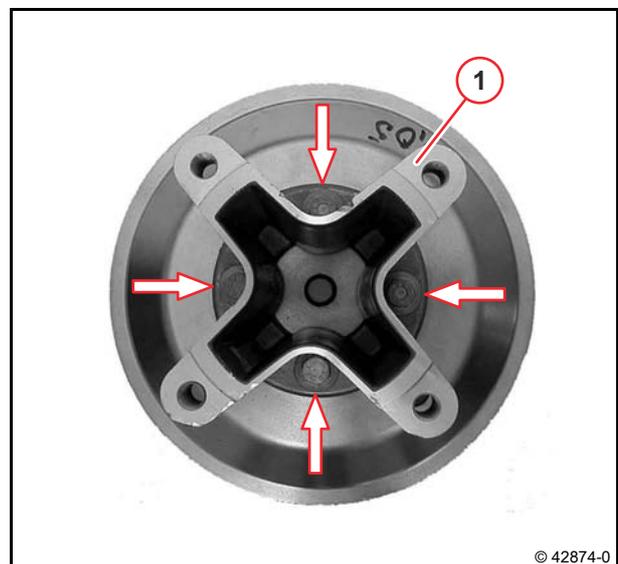
Screw has left-hand thread.



© 42875-0

- Unclamp the fan drive.
- Unscrew screws (arrows).
- Remove adapter (1).
- Install fan drive.

[W 39-02-01](#)



© 42874-0

Removing and installing the fan console (V-rib belt drive)



Standard tools



- Fitting compound
DEUTZ AP1908
- Packing compound
DEUTZ DW 74



- W 20-02-01
- W 39-01-01
- W 39-02-01
- W 44-02-01



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing the fan console

- Remove the fan drive.

W 39-02-01

- Remove the belt tensioner.

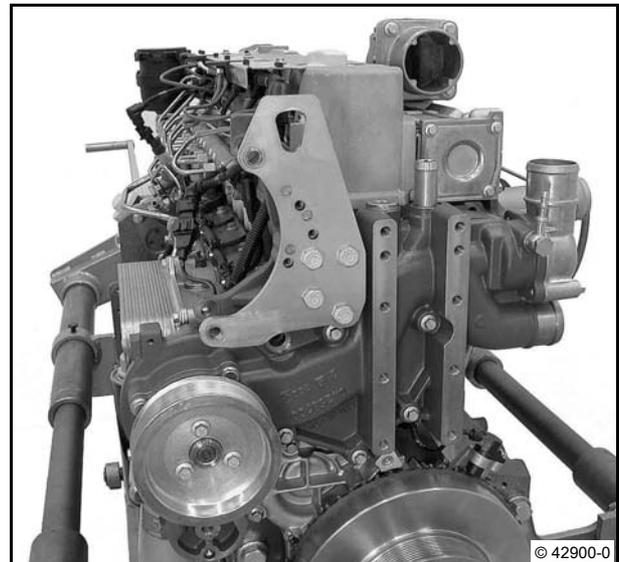
W 39-01-01

- Remove fuel supply pump.

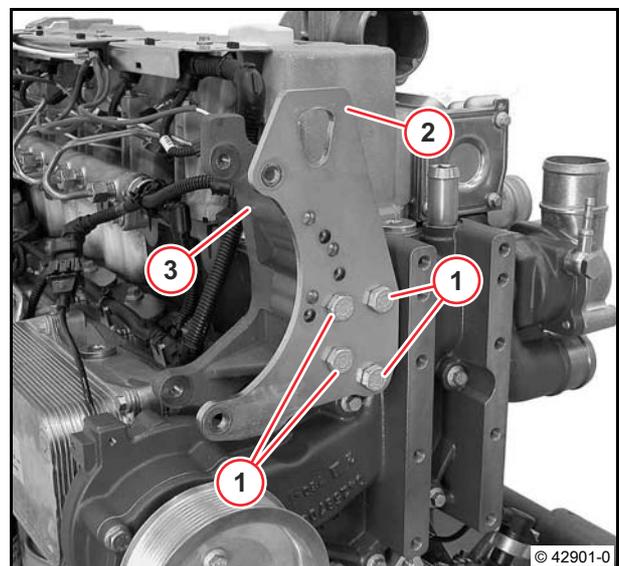
W 20-02-01

- Remove generator.

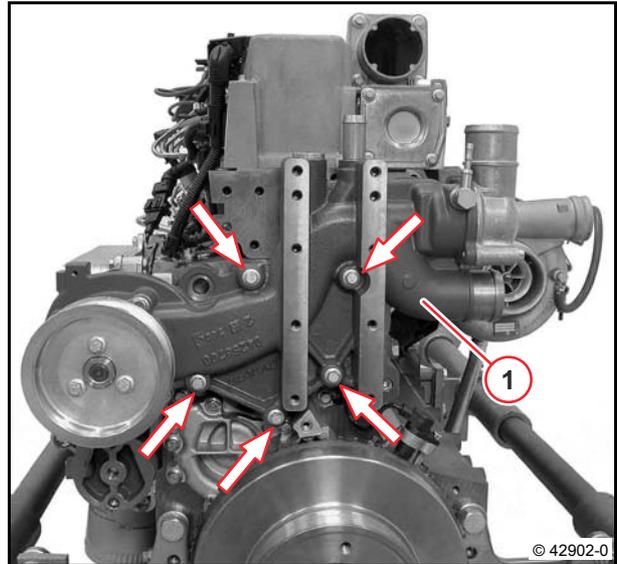
W 44-02-01



- Unscrew screws (1).
- Remove transport flange (2).
- Remove generator console (3).



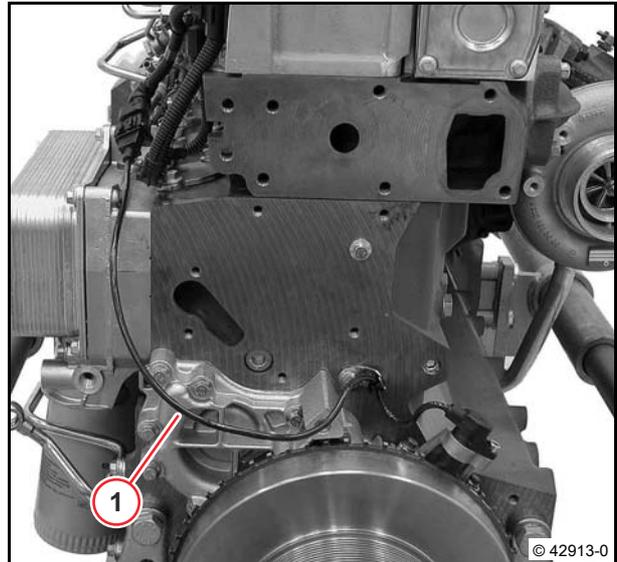
- Unscrew screws (arrows).
- Remove fan console (1).



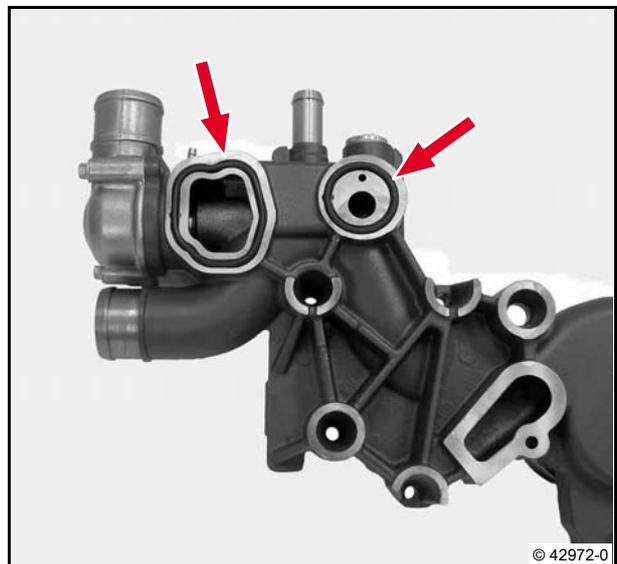
6

Installing the fan console

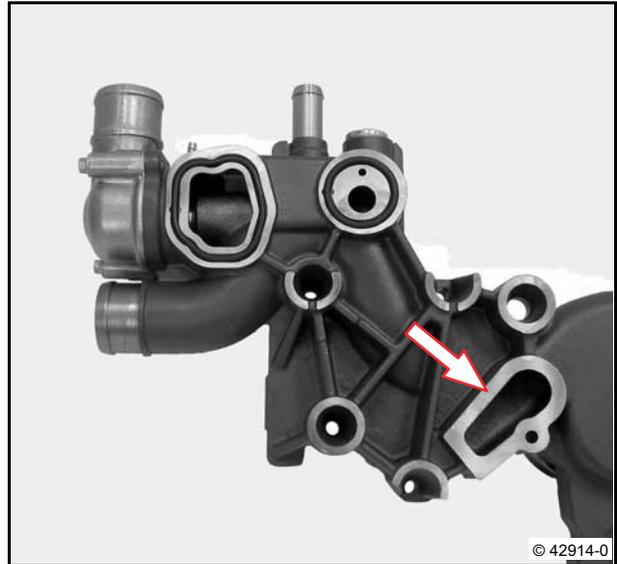
- Pull cable (1) forward slightly.



- Clean sealing surfaces.
- Coat new sealing rings with fitting compound .
- Insert new sealing rings (arrows).



- Apply packing compound (arrow).



- Install fan console.
- Tighten screws (arrows).

30 Nm

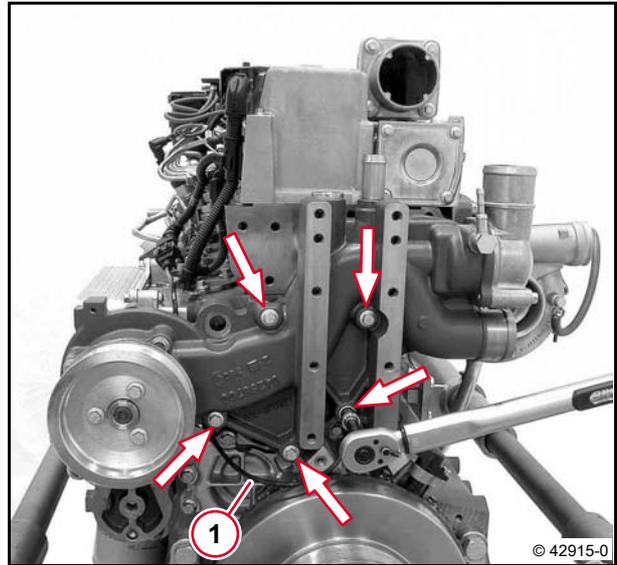


Attention!
Do not trap the cable (1).



Do not displace the packing compound.

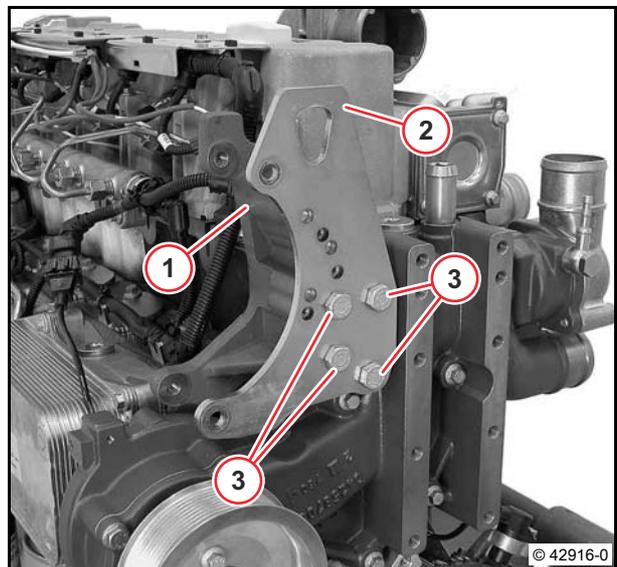
- Lay cable between front cover and fan console.



- Install generator console (1) with transport flange (2).
- Fasten screws (3).



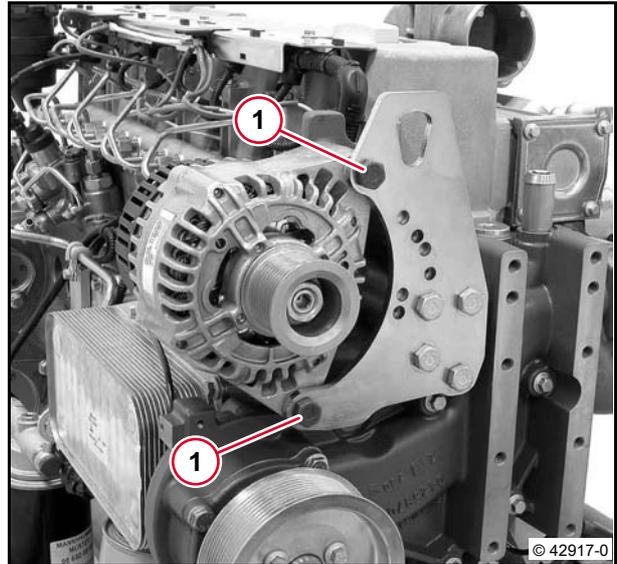
Do not tighten screws.



- Mount generator.
- Tighten screws (1).



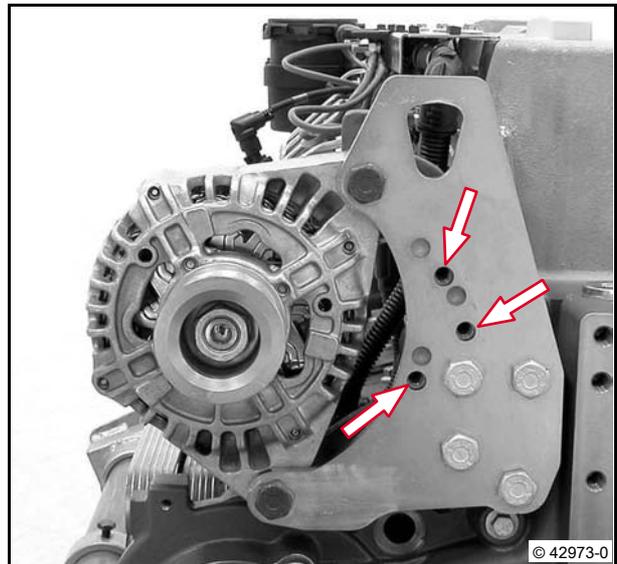
Do not tighten screws.



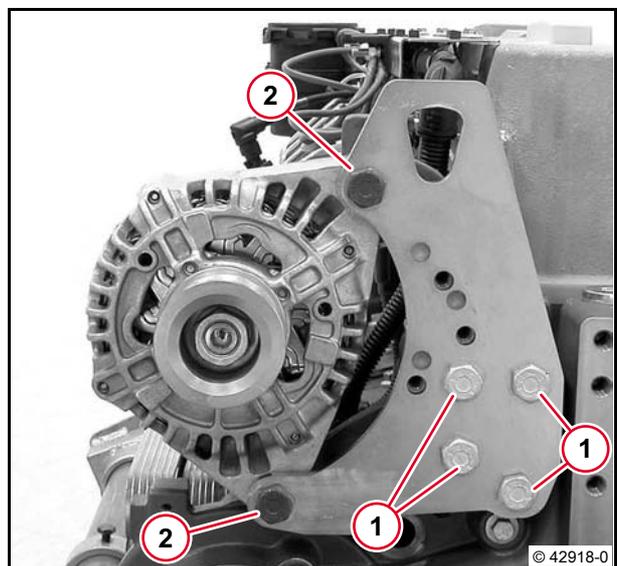
6



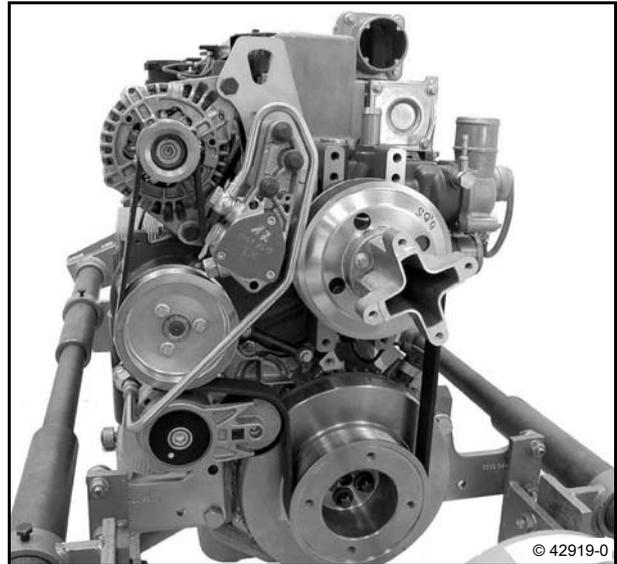
The holes in the transport flange (arrows) must match up with the threaded holes in the generator console.



- Tighten screws (1).
 70 Nm
- Tighten screws (2).
 60 Nm



- Install fuel pump.
 W 20-02-01
- Install the belt tensioner.
 W 39-01-01
- Install fan drive.
 W 39-02-01
- Install generator.
 W 44-02-01





Removing and installing the exhaust line



Standard tools



– W 43-01-01



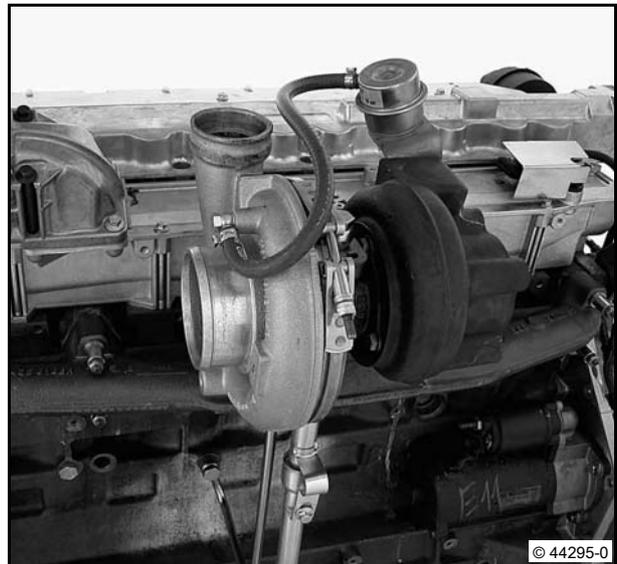
– Fitting compound
DEUTZ S1

Removing exhaust line

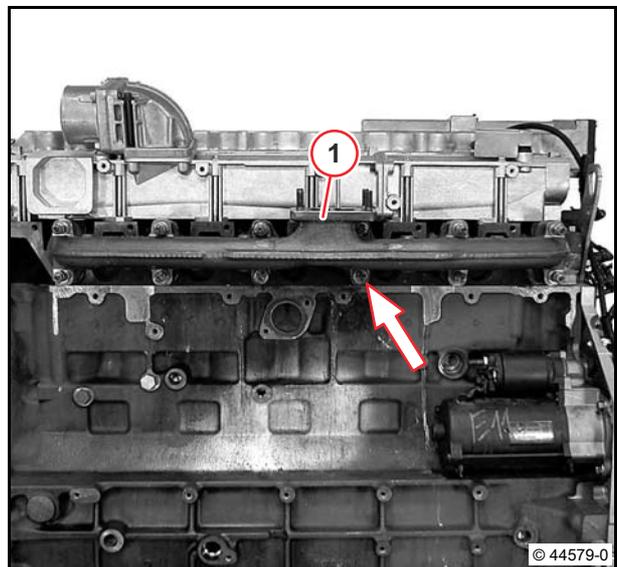
- Remove turbocharger.



W 43-01-01



- Unscrew all nuts (arrow).
- Remove exhaust manifold (1).
- Remove seals.
- Remove studs.



- Remove studs.
- Visually inspect the component.

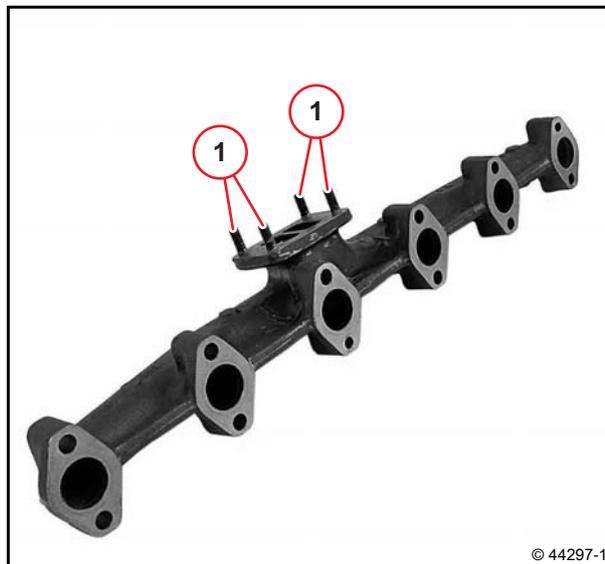


6

Installing exhaust line

- Coat new pin bolts with DEUTZ S1 mounting compound.
- Mount new pin bolts with locking nuts.
- Tighten pin bolts (1).

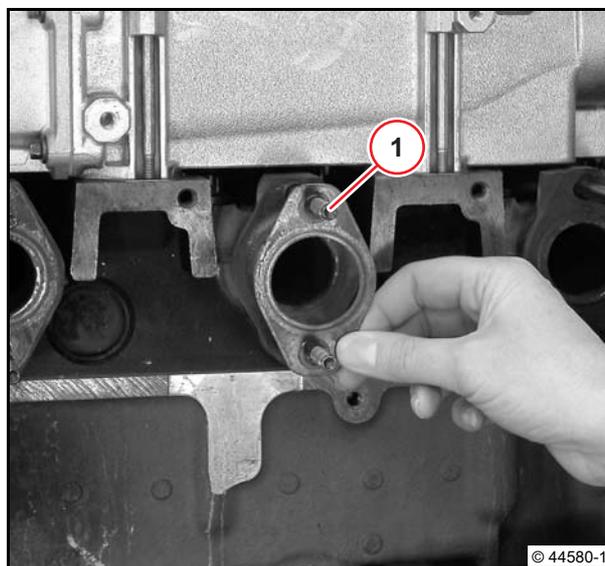
 10 Nm



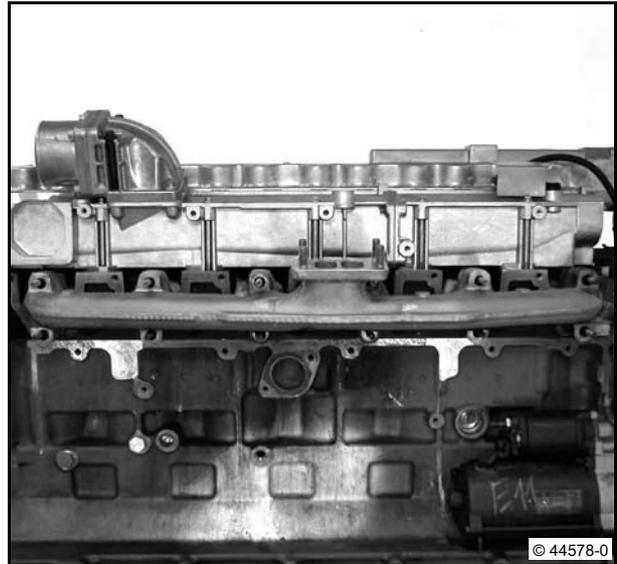
- Coat new pin bolts with DEUTZ S1 mounting compound.
- Mount new pin bolts with locking nuts.
- Tighten pin bolts (1).

 10 Nm

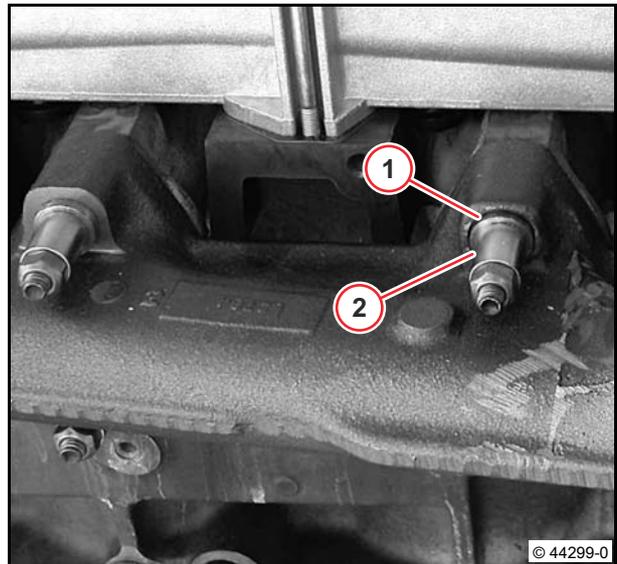
- Clean sealing surfaces.
- Mount new seals.



- Mount exhaust manifold.



- Mount washers (1).
- Mount spacer sleeves (2).
- Screw on new nuts.

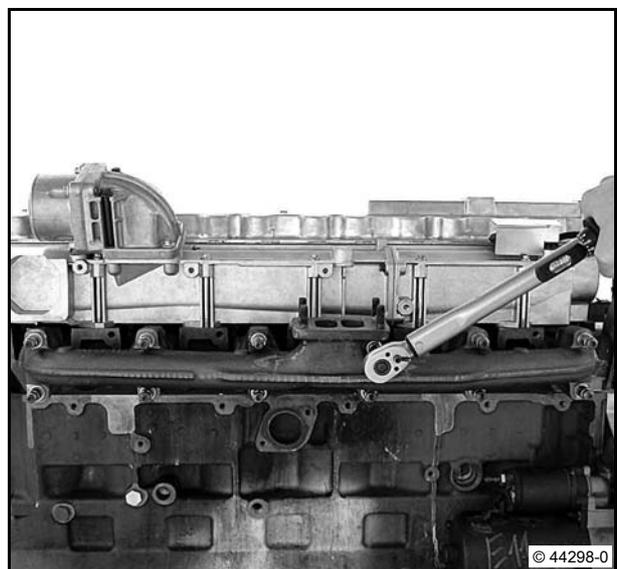


- Tighten nuts alternately.

 25 Nm

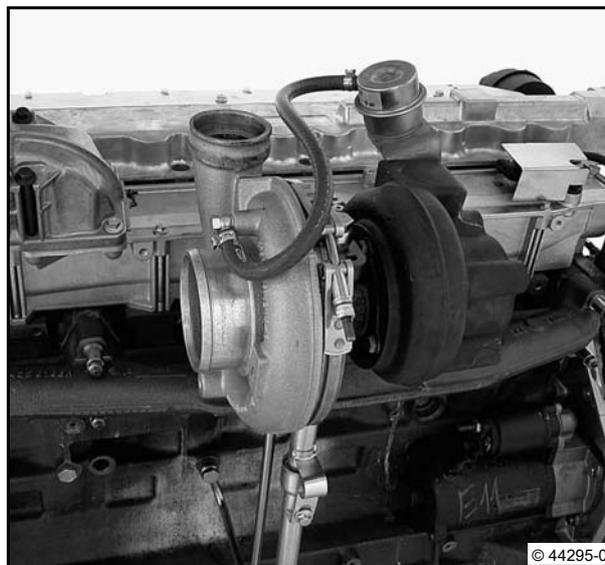


Tightening sequence: From the centre outwards.



- Install the turbocharger.

 [W 43-01-01](#)



Removing and installing the turbocharger



Standard tools



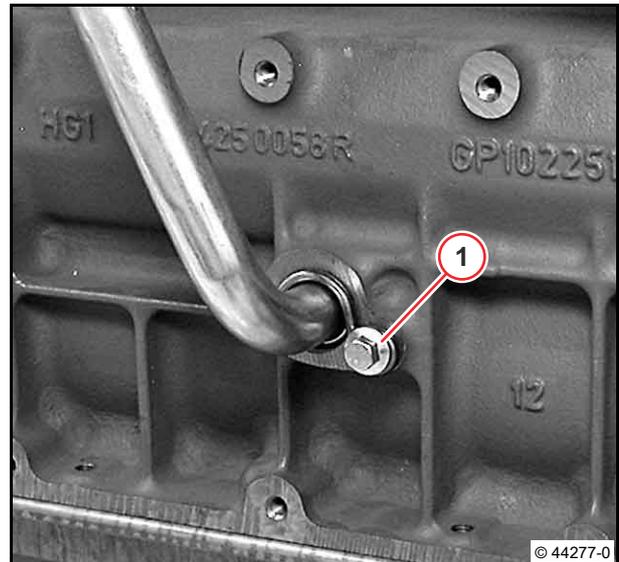
- Fitting compound
DEUTZ S1
- Fitting compound
DEUTZ AP1908



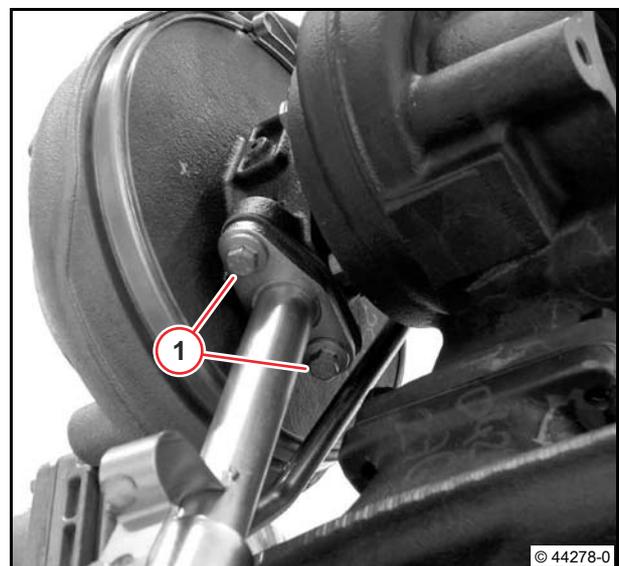
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing turbocharger

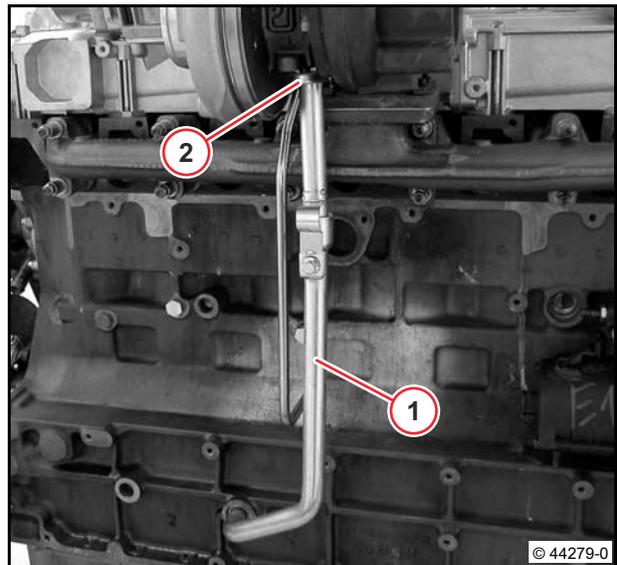
- Unscrew screw (1).
- Remove retainer.



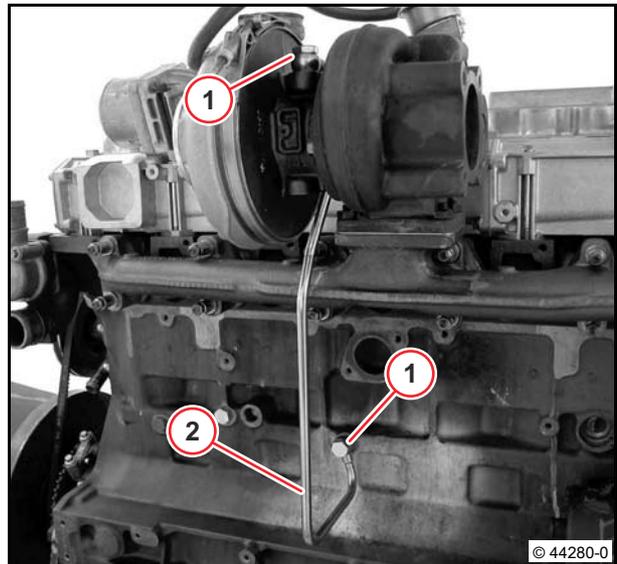
- Unscrew screws (1).



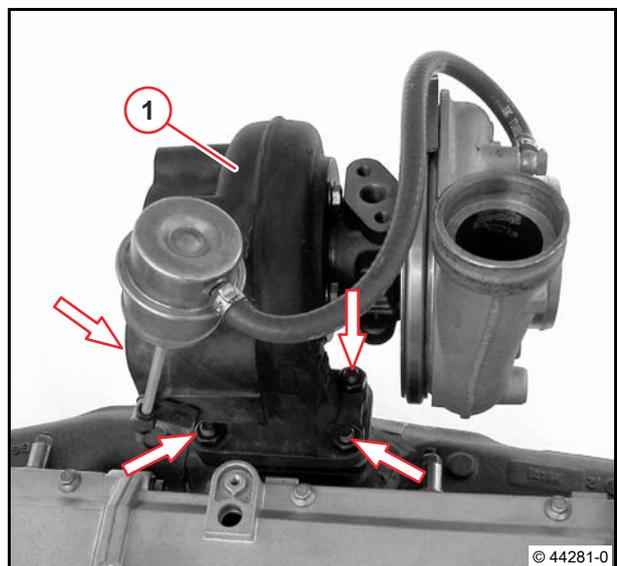
- Pull out oil return pipe (1).
- Remove pipe socket (2).



- Unscrew hollow screws (1).
- Remove lubricating oil pipe (2).
- Remove sealing rings.



- Unscrew nuts (arrows).
- Remove turbocharger (1).
- Remove sealing ring.



- Visually inspect the components.



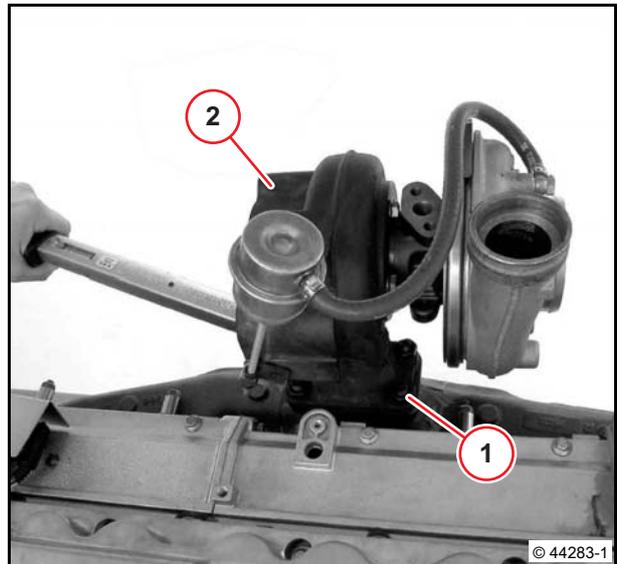
Installing the turbocharger

- Clean sealing surfaces.
- Coat new pin bolts with DEUTZ S1 mounting compound.
- Mount new pin bolts with locking nuts.
- Tighten pin bolts (1).

 10 Nm

- Mount new gasket.
- Mount turbocharger (2).
- Tighten all nuts.

 42 Nm



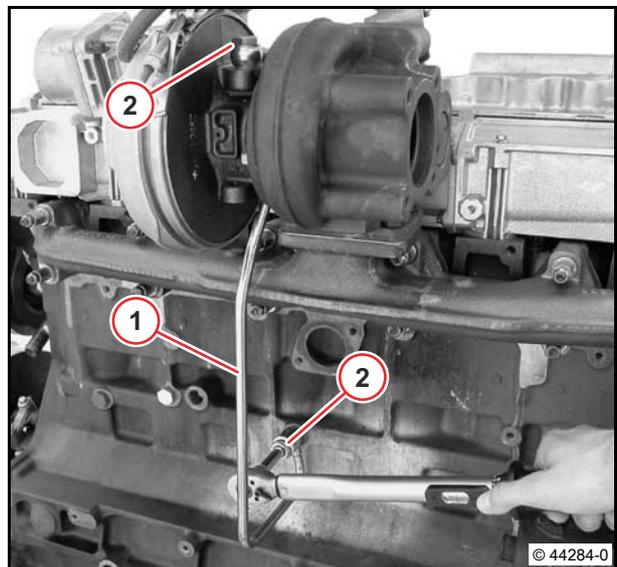
- Mount lubrication oil line (1).



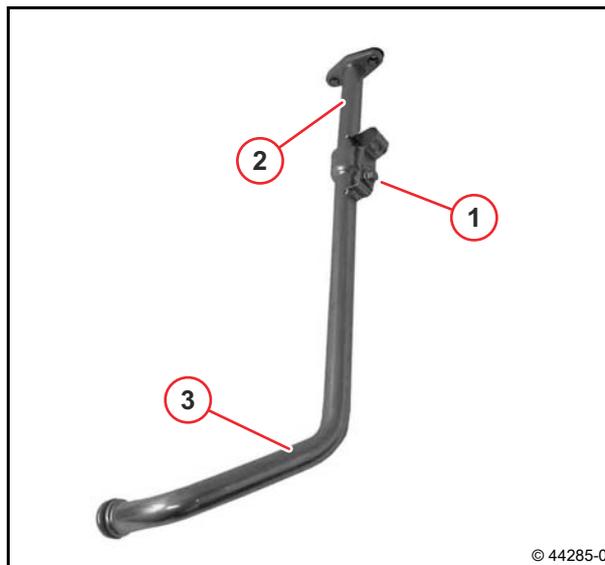
Use new sealing rings.

- Tighten hollow screws (2).

 39 Nm



- Unscrew screw (1).
- Pull pipe socket (2) out of oil return line (3).



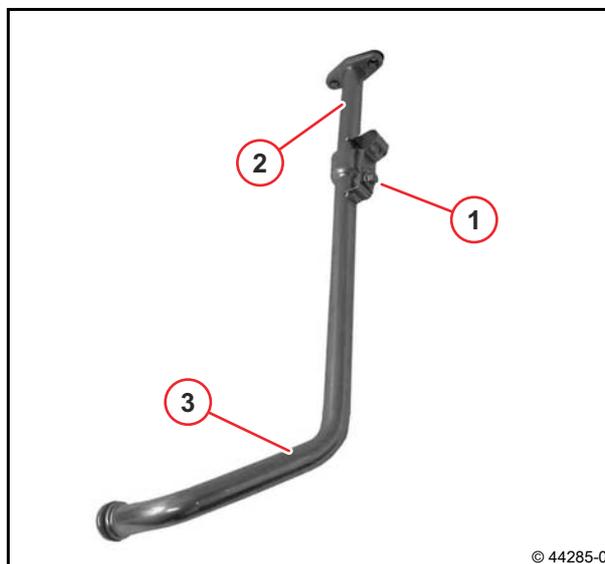
- Insert new O-rings (arrows).
- Coat the O-rings with fitting compound.



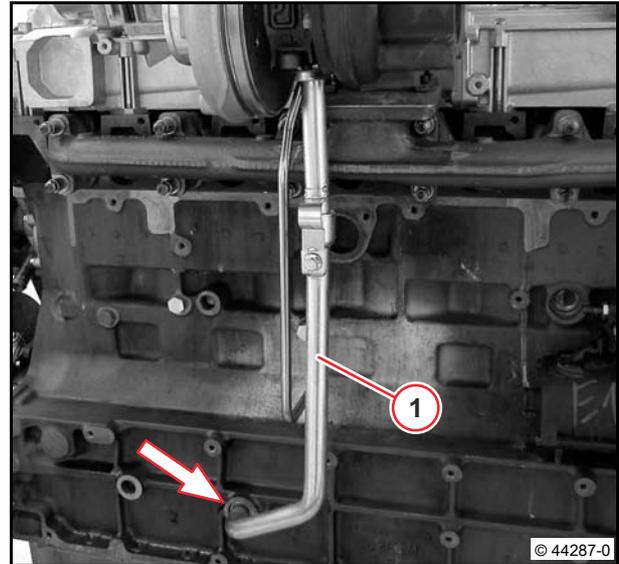
Use fitting compound AP 1908.



- Plug pipe socket (2) into oil return line (3).
- Fasten screw (1).



- Clean sealing surfaces.
- Push oil return line (1) into crankcase (arrow).

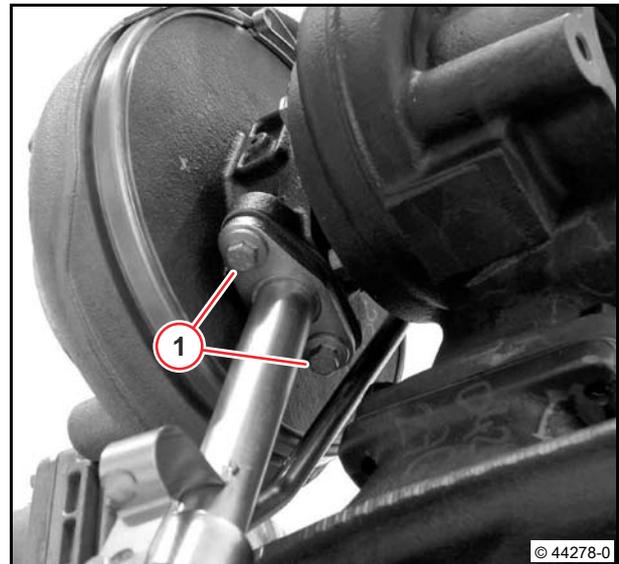


- Mount new gasket.
- Mount pipe nozzle.
- Tighten screws (1).

 20 Nm

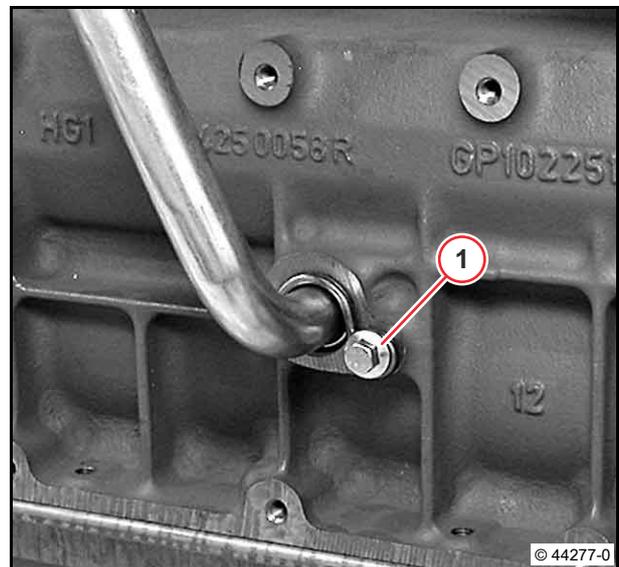


Attention!
Install tension-free!



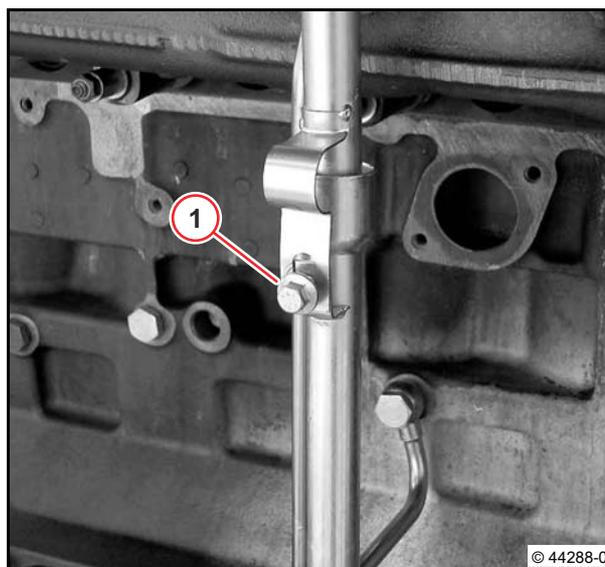
- Mount retainer.
- Tighten screw (1).

 20 Nm



- Tighten screw (1).

 20 Nm



Removing and installing the generator (V-belt drive)



Standard tools:

- V-belt tension measuring device

8115



- Operation manual



Attention!

Only test / tighten / renew V-belts when the engine is not running.



The V-belt tension of new V-belts must be checked after they have been running for 15 minutes.

6

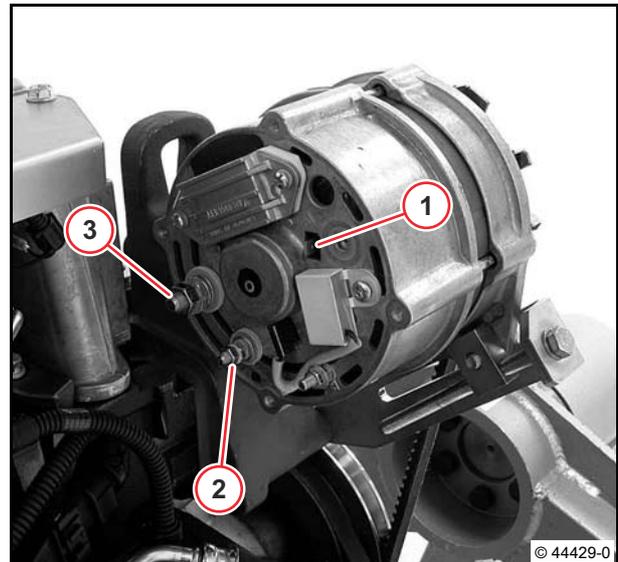
Removing the generator

- Disconnect the battery's negative terminal.
- Remove cable from generator.

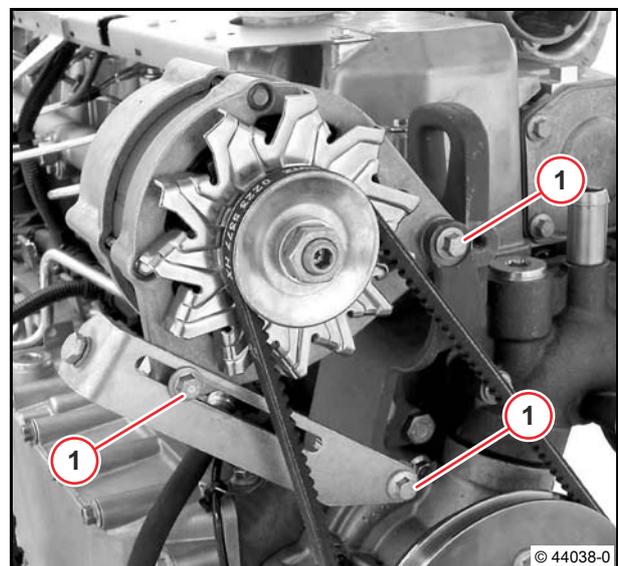


Note assignment!

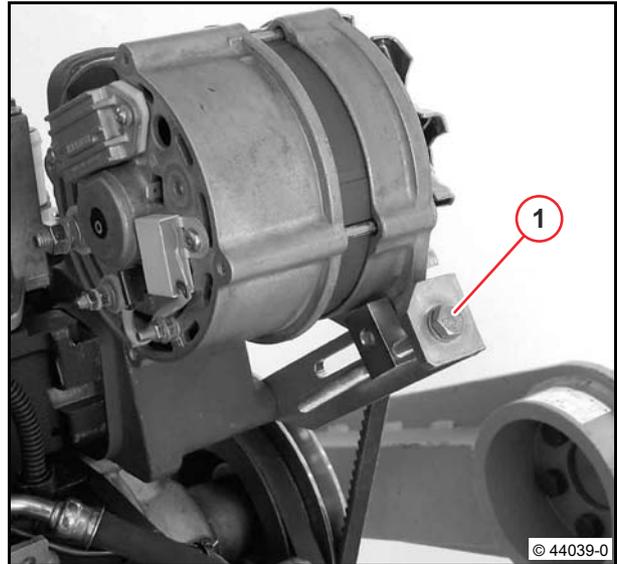
- (1) = terminal W
- (2) = terminal D+
- (3) = terminal B+



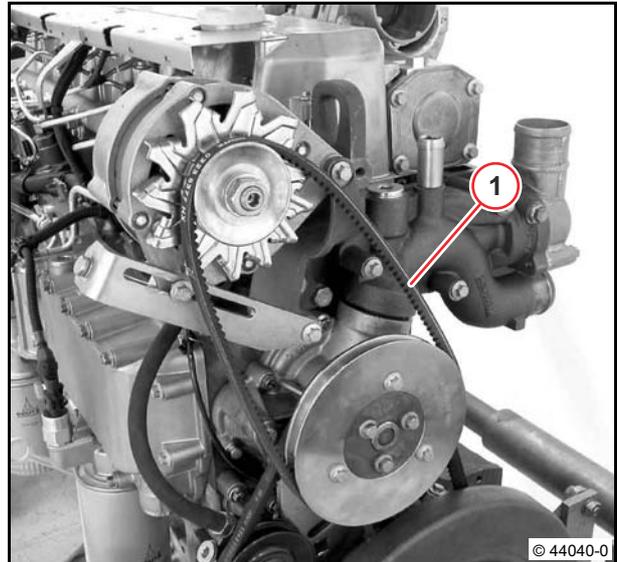
- Loosen screws (1).



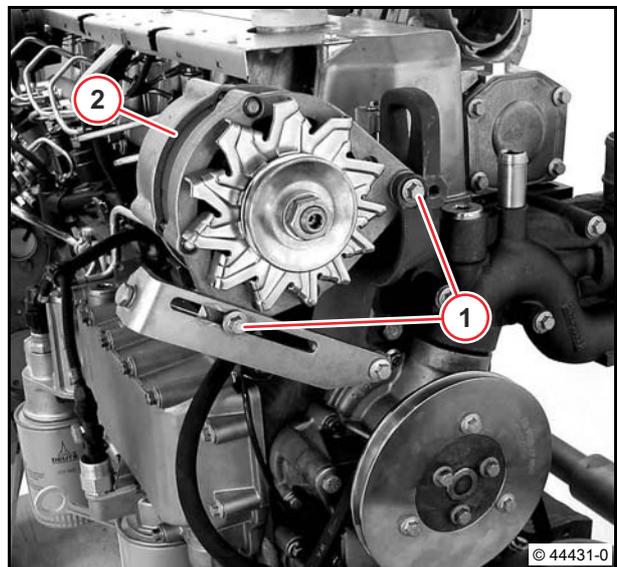
- Loosen V-belt by unscrewing the clamping screw (1).



- Remove V-belt (1).



- Unscrew screws (1).
- Remove generator (2).
- Visually inspect the components.

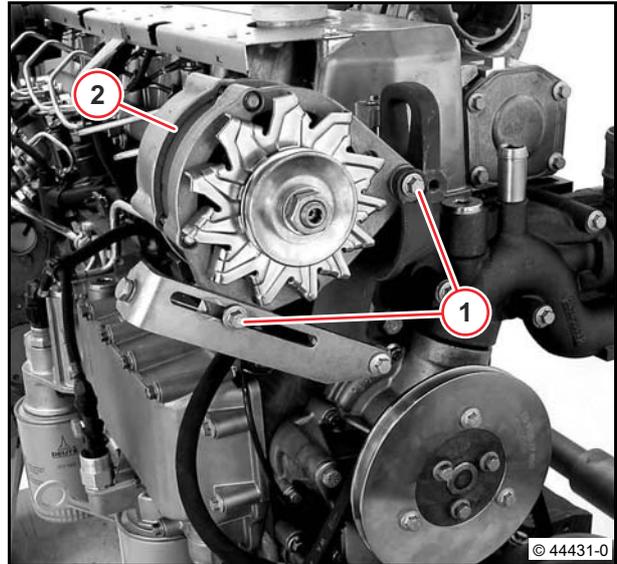


Installing the generator

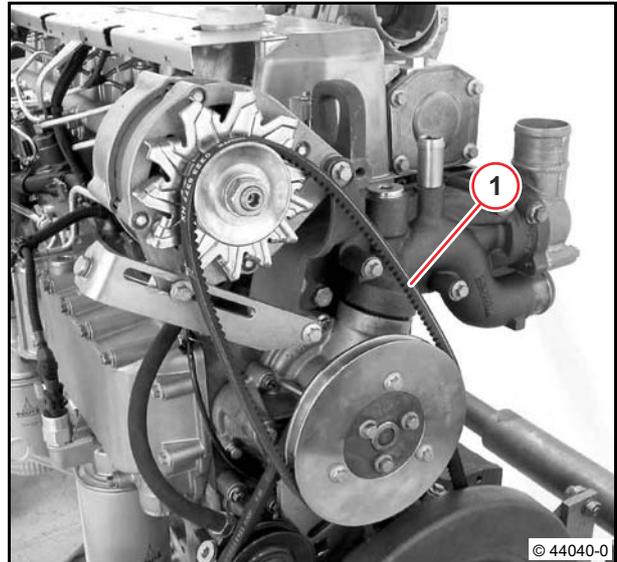
- Mount generator (2).
- Tighten screws (1).



Do not tighten screws.



- Mount V-belt (1) for generator.



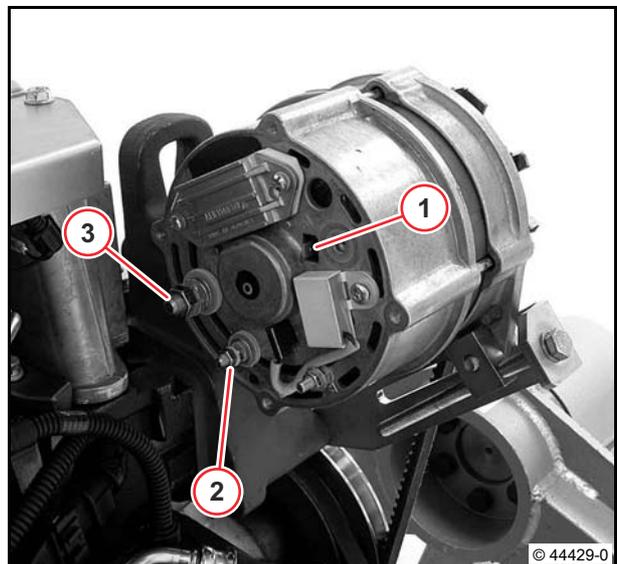
- Remove cable from generator.



Note assignment!

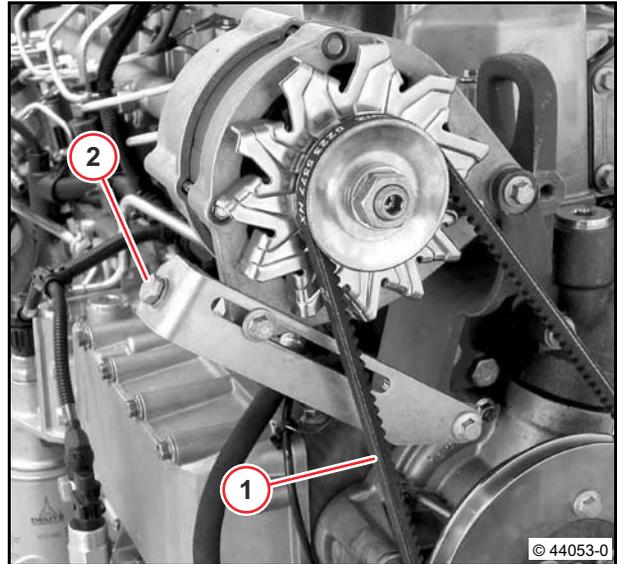
- (1) = terminal W
- (2) = terminal D+
- (3) = terminal B+

- Connect the battery's negative terminal.



- Tighten V-belt (1) by turning the clamping screw (2).
- Check V-belt tension.

 Operation manual



Removing and installing the starter



Standard tools

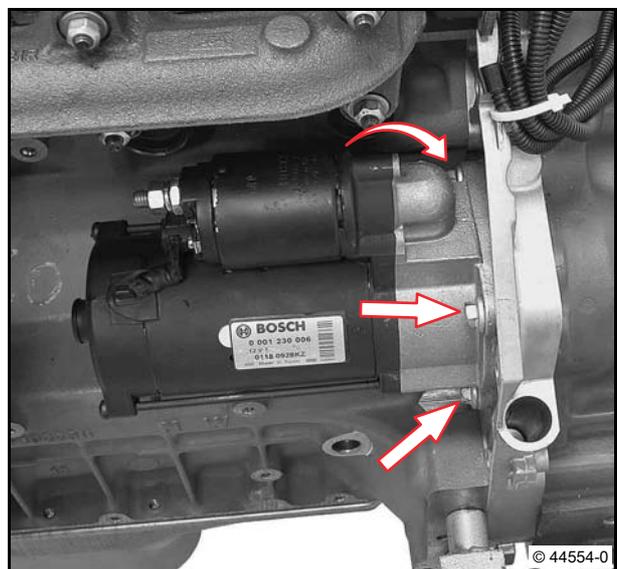
6

Removing the starter

- Disconnect the battery's negative terminal.
- Disconnect cables.



- Unscrew screws (arrows).
- Remove starter.
- Visually inspect the components.

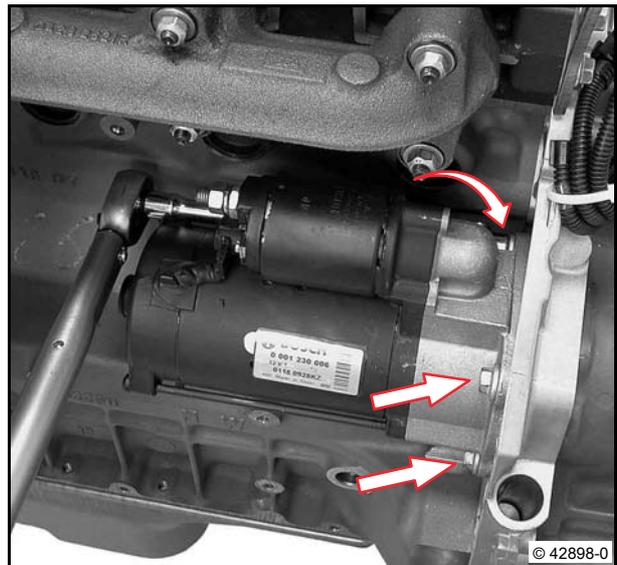


Installing the starter

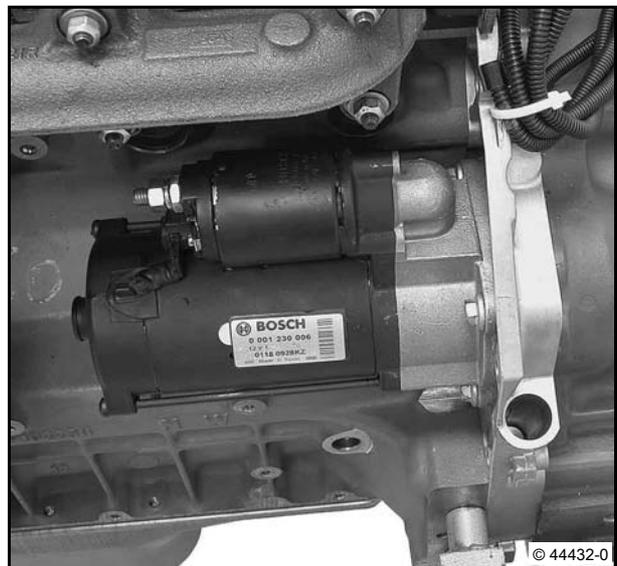
- Insert starter.
- Tighten screws (arrows).

 60 Nm

6



- Connect cables.
- Connect the battery's negative terminal.



Mounting engine on assembly block and demounting



Standard tools:

- Lifting gear
- Suspension ropes

Special tools:

- Assembly block incl. adapter plates 6066
- Clamping bracket 6066/158



- W 01-01-01
- W 47-01-01



Danger!

When using hoists (workshop crane) the safety regulations for handling hoists must be observed.

It is not permitted to stay under moving loads.

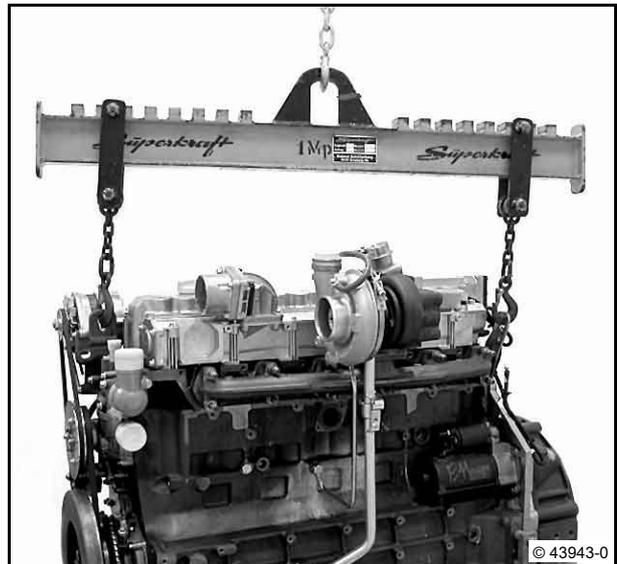
Mounting engine on assembly block

- Removing the crankcase breather.

W 01-01-01

- Hang engine on suitable workshop crane.
- Remove mounting feet.

W 47-01-01

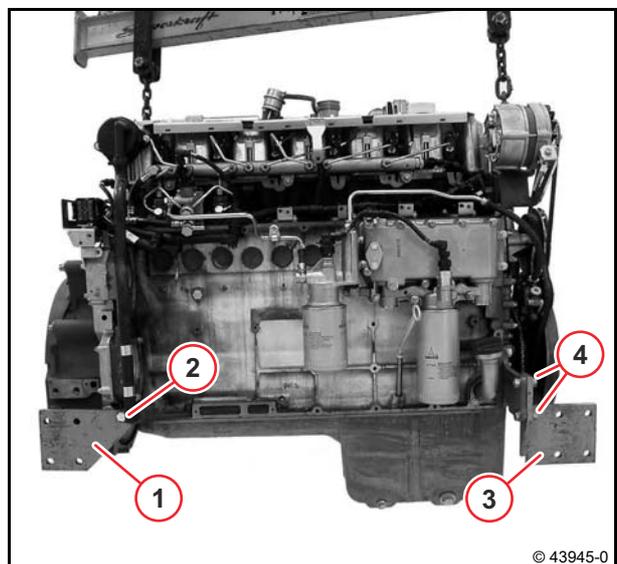


- Mount clamping bracket 6066/158-3 (1) on crankcase.
- Tighten screw (2).

90 Nm

- Mount clamping bracket 6066/158-1 (3) on holder.
- Tighten screws (4) and lock nuts.

90 Nm

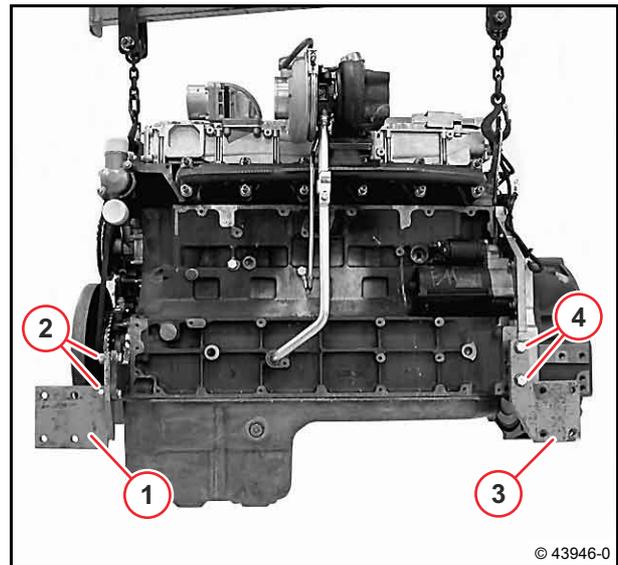


- Mount clamping bracket 6066/158-2 (1) on holder.
- Tighten screws (2) and lock nuts.

 90 Nm

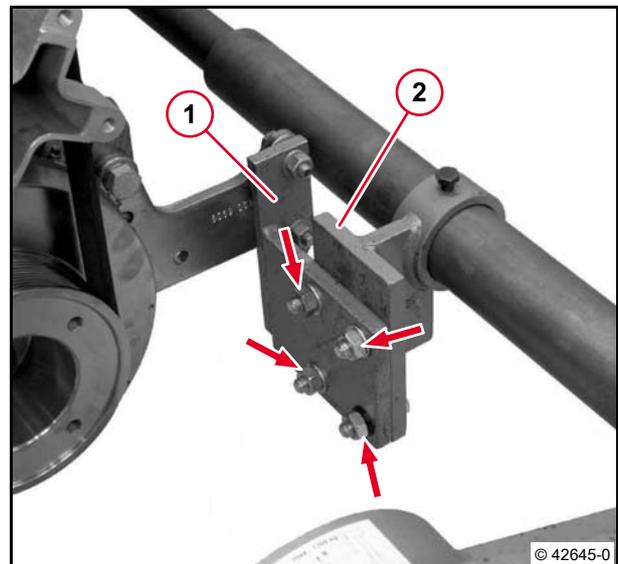
- Mount clamping bracket 6066/158-4 (3) on crank-case.
- Tighten screws (4).

 90 Nm

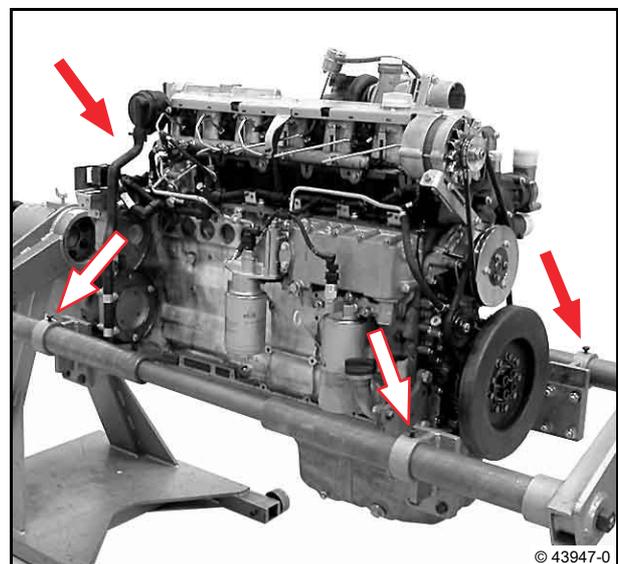


- Insert engine in engine block.
- Align all clamping brackets (1) on the adapter plates (2) of the assembly block.
- Insert screws.
- Tighten nuts (arrows).

 90 Nm

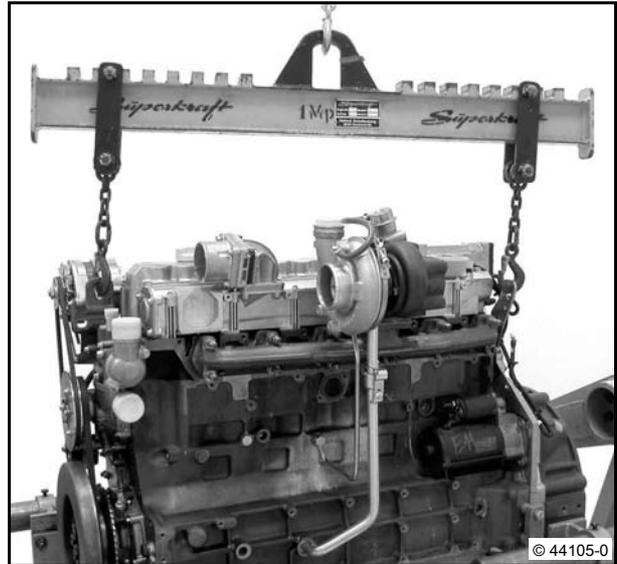


- Align engine on engine block.
- Tighten all screws (arrows).
- Unhook engine.

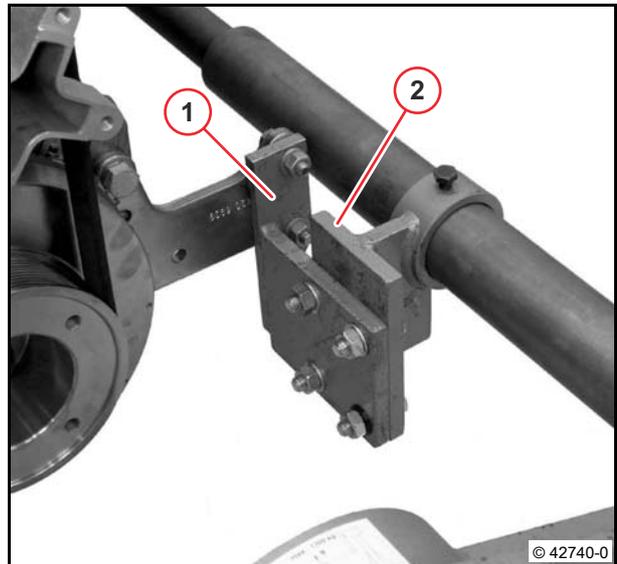


Demounting engine from assembly block

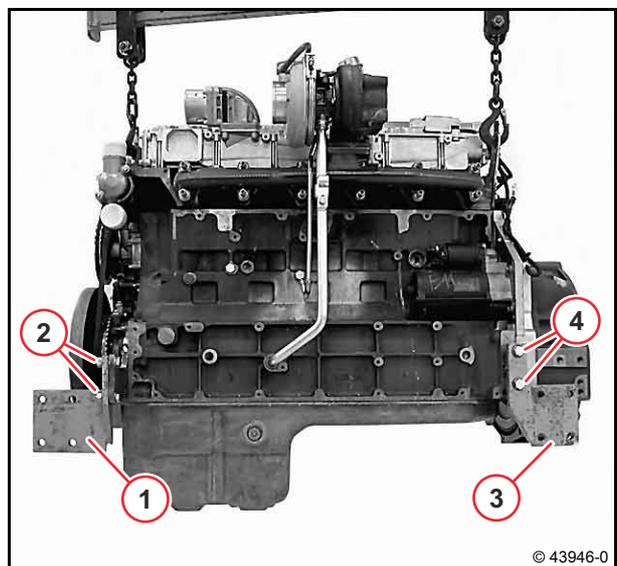
- Hang engine on workshop crane.



- Remove all clamping brackets (1) from the adapter plates (2).
- Lift engine.



- Unscrew the nuts (2).
- Remove screws (2) and lock nuts.
- Remove clamping bracket (1).
- Unscrew screws (4).
- Remove clamping bracket (3).

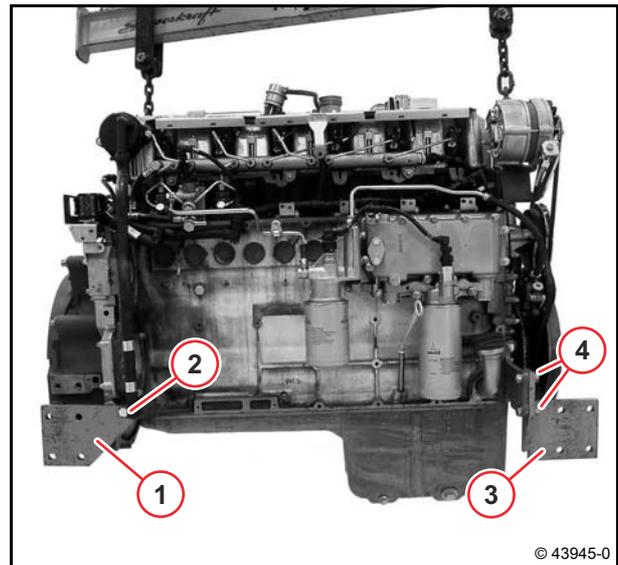


- Unscrew nuts (4).
- Remove screws (4) and lock nuts.
- Remove clamping bracket (3).
- Unscrew screw (2).
- Remove clamping bracket (1).
- Install mounting feet.

 [W 47-01-01](#)

- Install crankcase breather.

 [W 01-01-01](#)



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A00 001	Clamping holder on crankcase			90 Nm
A00 002	Clamping bracket on adapter for assembly block	Screw Nut		90 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.



Removing and installing the engine mounting (elastic mounting)



Standard tools

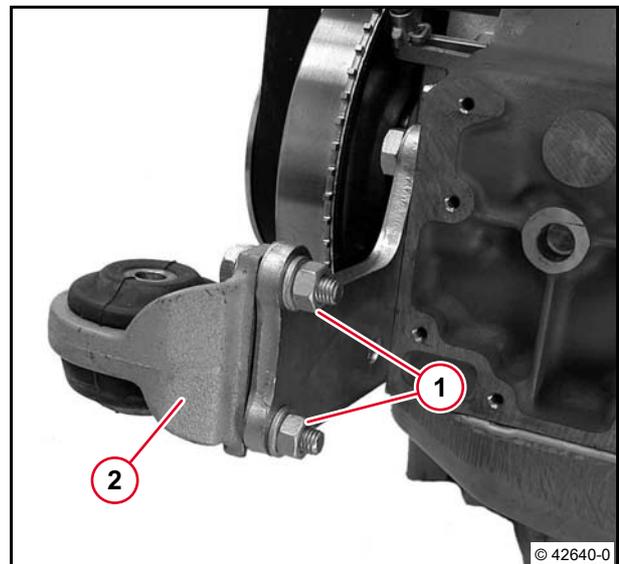
- W 01-01-01
- W 46-00-01

Remove mounting feet

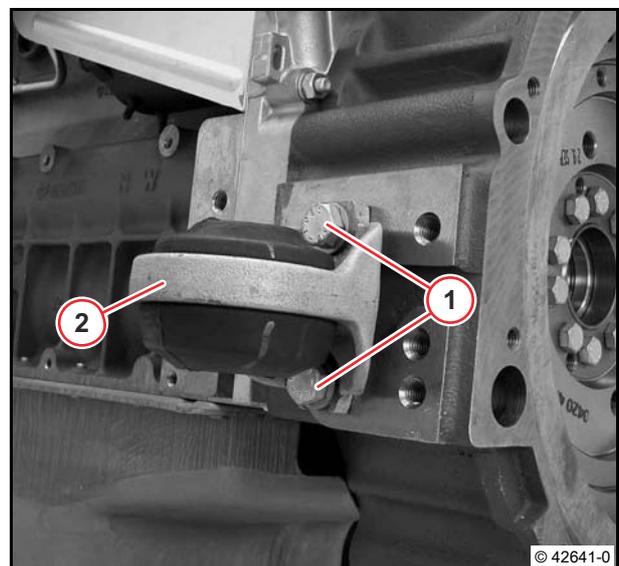
- Removing the crankcase breather.
 W 01-01-01
- Hang engine on suitable workshop crane.
 W 46-00-01
- Unscrew nuts (1).
- Remove mounting foot (2).



Remove all mounting feet.



- Unscrew screws (1).
- Remove mounting foot (2).



Mount mounting feet

- Hang engine on workshop crane.

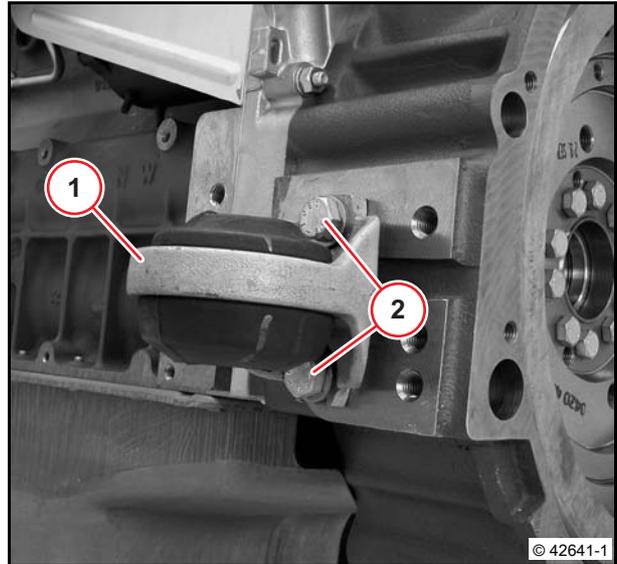
W 46-00-01

- Mount mounting foot (1).
- Tighten screw (2).
- (2) = M12

95 Nm

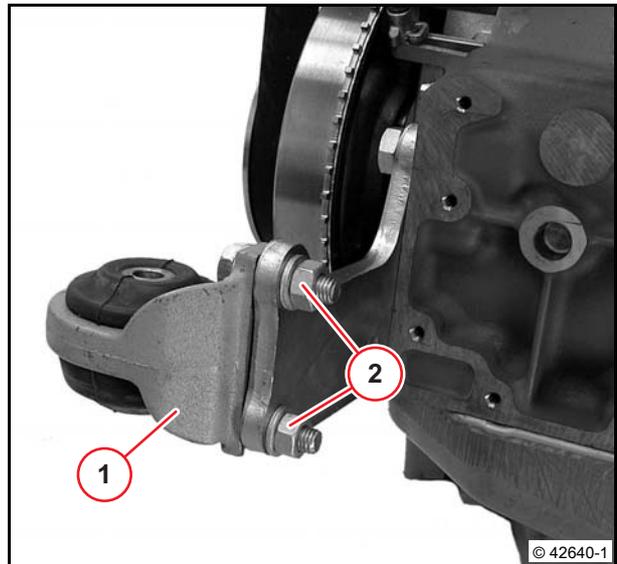


Mount all mounting feet.



- Mount mounting foot (1).
 - Tighten screw (2).
 - (2) = M12
- Set down engine.
 - Unhook engine.
 - Install crankcase breather.

W 01-01-01

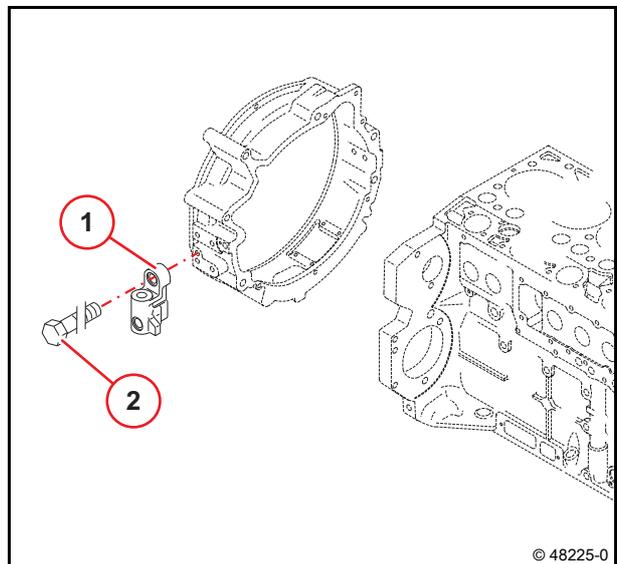


Different installation variants are shown below as examples.

Variant	

- Fit rigid mounting foot (1).
- Tighten screw (2).
- (2) = M12x60

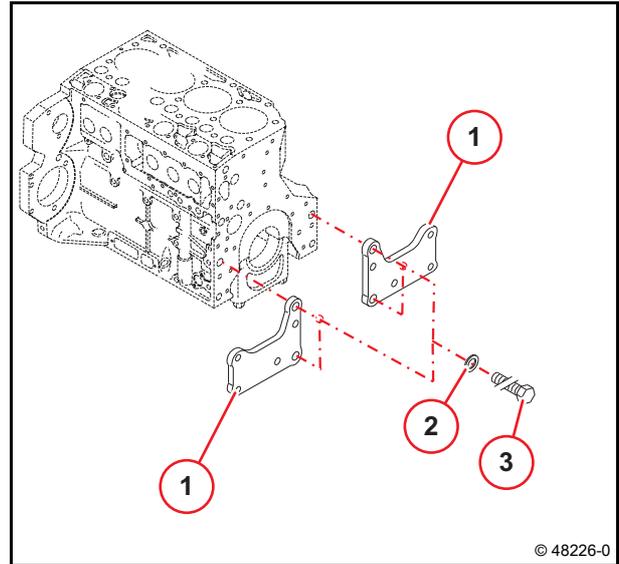
95 Nm



Variant

- Mount holder (1).
- Fit washers (2).
- Tighten screws (3).
- (3) = M16

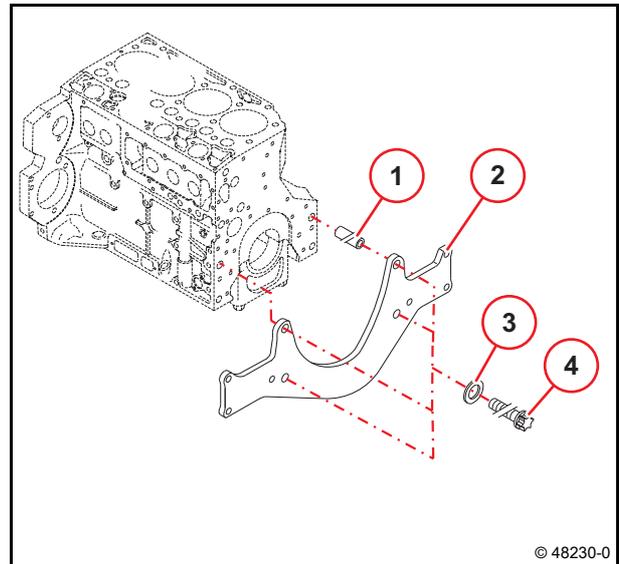
260 Nm



Variant

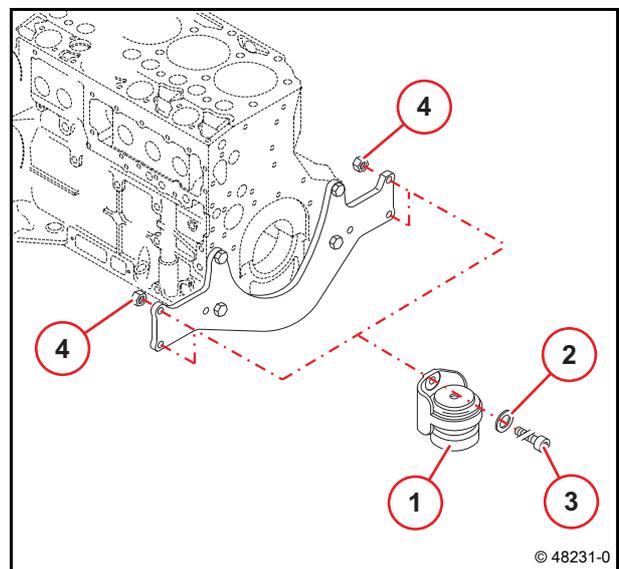
- Fit sleeves (1).
- Fit holder (2).
- Fit washers (3).
- Tighten screws (4).
- (4) = M16

260 Nm



- Fit elastic mounting foot (1).
- Fit washers (2).
- Fasten screws (3).
- Hold nut (4).
- Tighten screws (3).
- (3) = M12

95 Nm



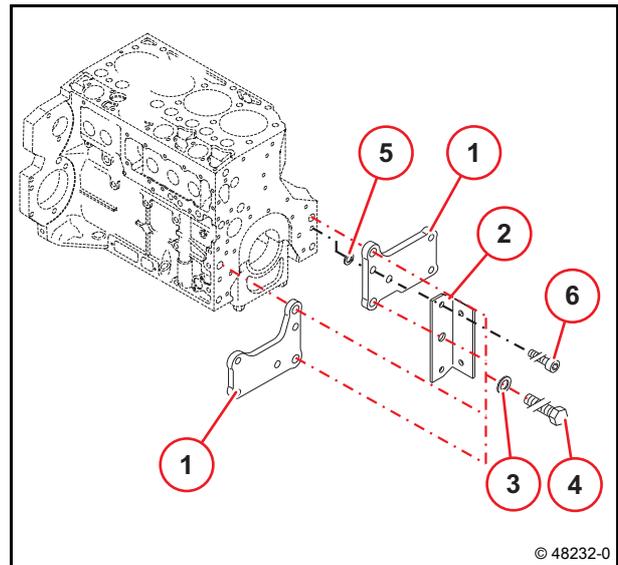
Variant

- Mount holder (1).
- Fit mounting bracket (2).
- Fit washers (3).
- Tighten screws (4).
- Fit washers (5).
- Fasten screws (6).
- Tighten screws (4).
- (4) = M16

 260 Nm

- Tighten screws (6).
- (6) = M12

 90 Nm



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A00 003	Feet/engine mounting on holder/ crankcase/connection housing/gear case	M12x35-10.9 M12x40-10.9 M12x60-10.9 M12x75-10.9 M12x85-10.9 M12x90-10.9 M12x220-10.9		95 Nm
A00 005	Holder, engine mounting on crankcase	M16x40-10.9 M16x45-10.9 M16x75-10.9 M16x85-10.9 M16x110-10.9 M16x140-10.9 M16x155-10.9 M16x220-10.9		260 Nm
A00 006	Mounting bracket on holder/ crankcase	M12x40-10.9		90 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.



Removing and installing the cable harness



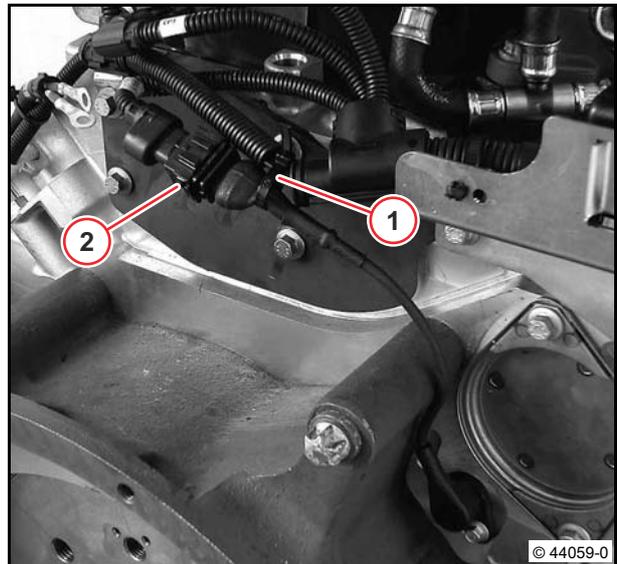
Standard tools

Removing the cable harness

- Remove cable tie (1).
- Unlock cable plug (2) and disconnect.



impulse transmitter (camshaft)



- Unlock cable plug (1) and remove.



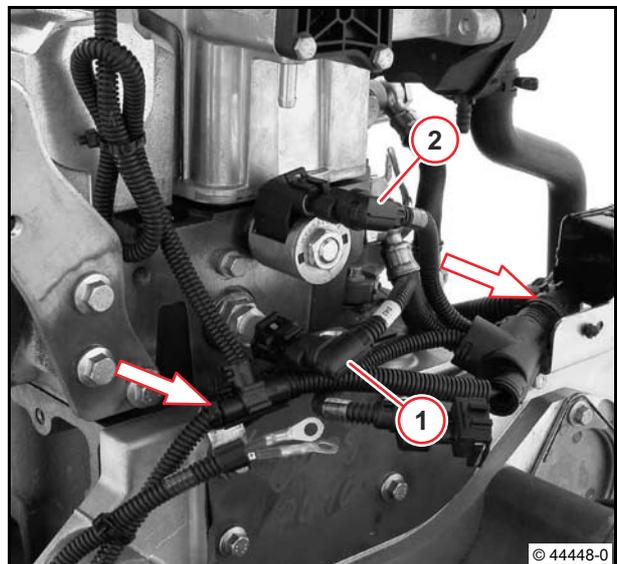
Temperature sensor

- Unlock cable plug (2) and remove.

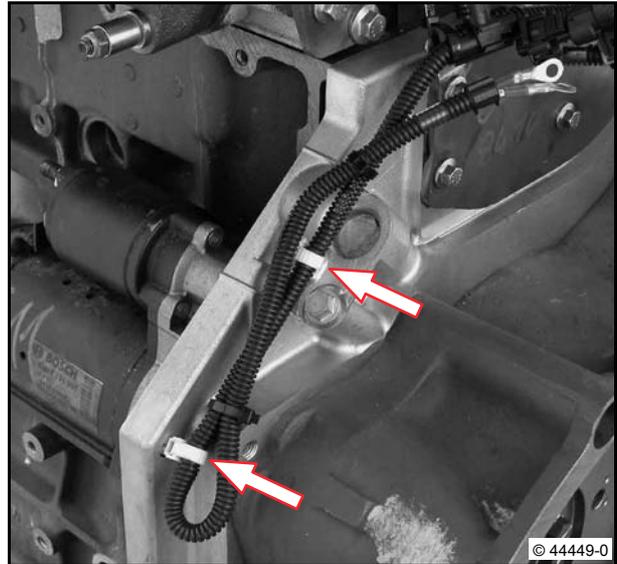


Solenoid valve (exhaust return line)

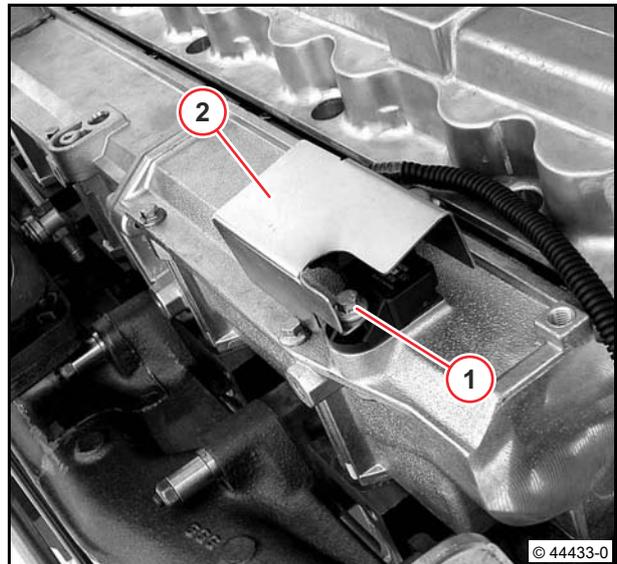
- Remove cable tie (arrows).
- Expose cable harness.



- Remove cable tie (arrows).
- Expose cable harness.



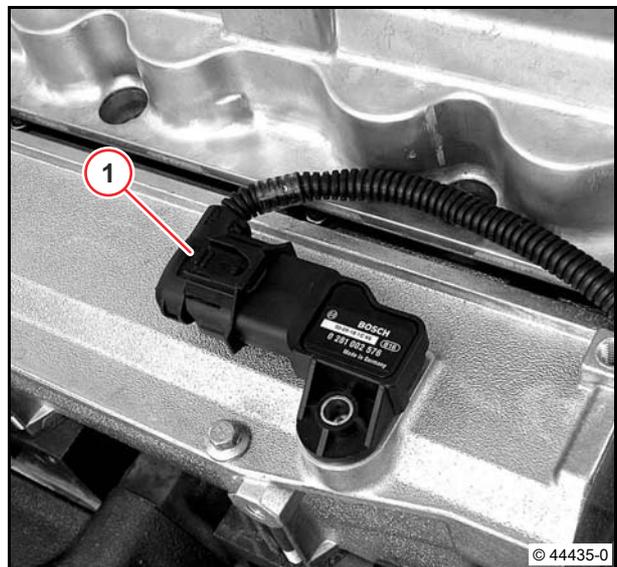
- Unscrew screw (1).
- Remove the cover (2).



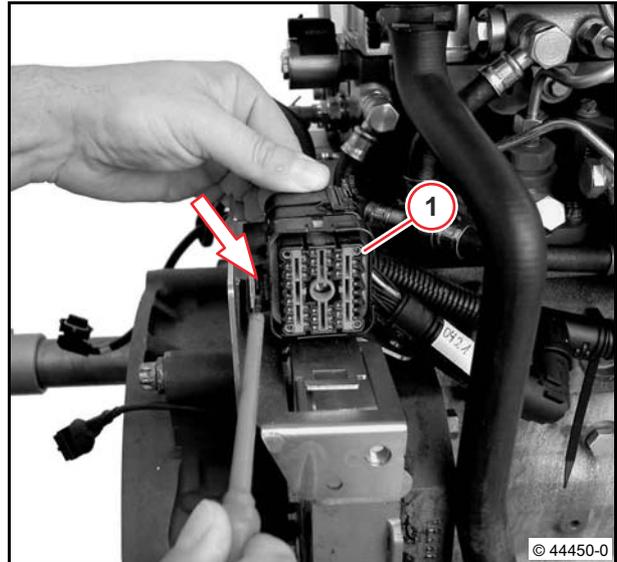
- Unlock cable plug (1) and remove.



Pressure/temperature sensor



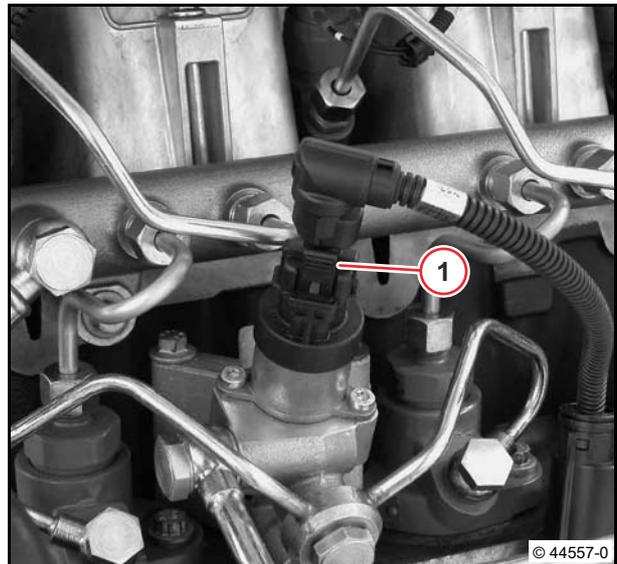
- Unlock central plug (1) (arrow) and pull off from holder.



- Unlock cable plug (1) and remove.



Control block



- Loosen the locking ring (1).
- Pull off cable plug (2).

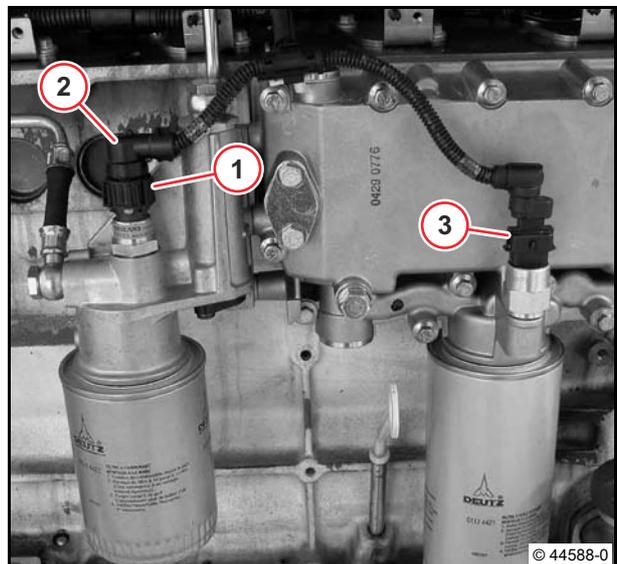


Fuel pressure sensor

- Unlock cable plug (3) and remove.



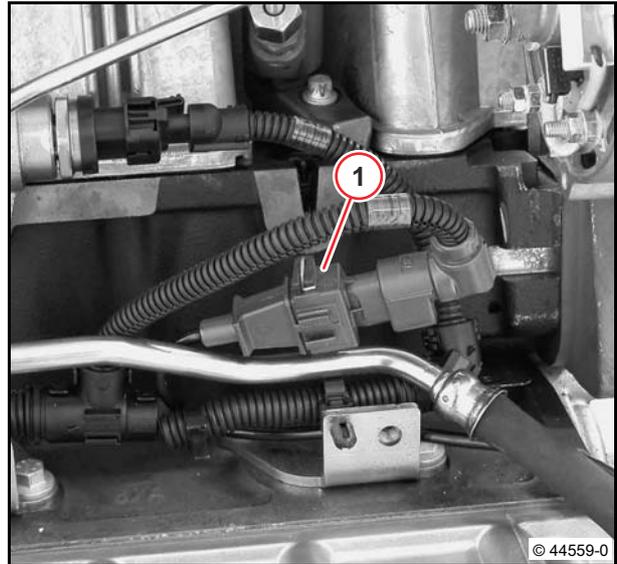
Oil pressure switch



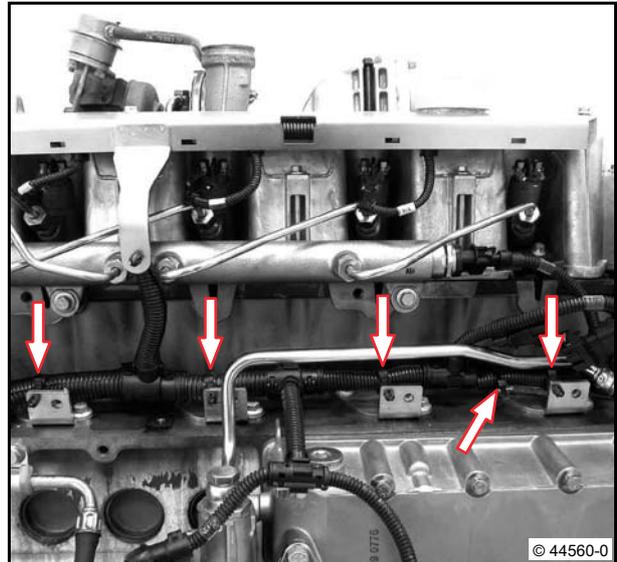
- Unlock cable plug (1) and disconnect.



Impulse transmitter (crankshaft)



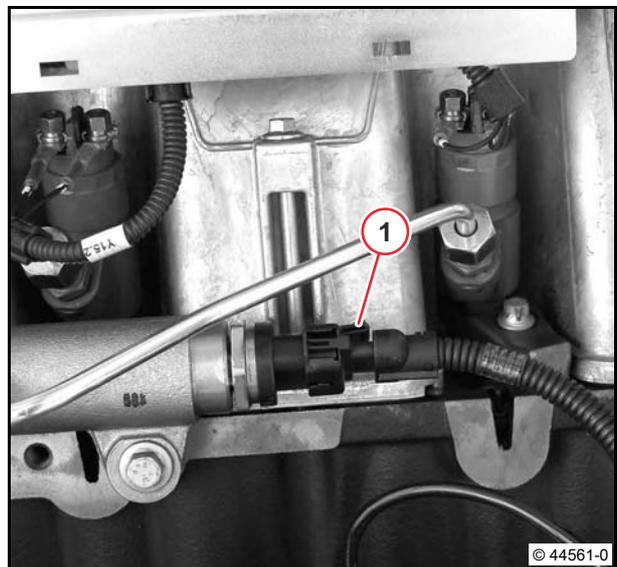
- Remove cable tie (arrows).
- Expose cable harness.



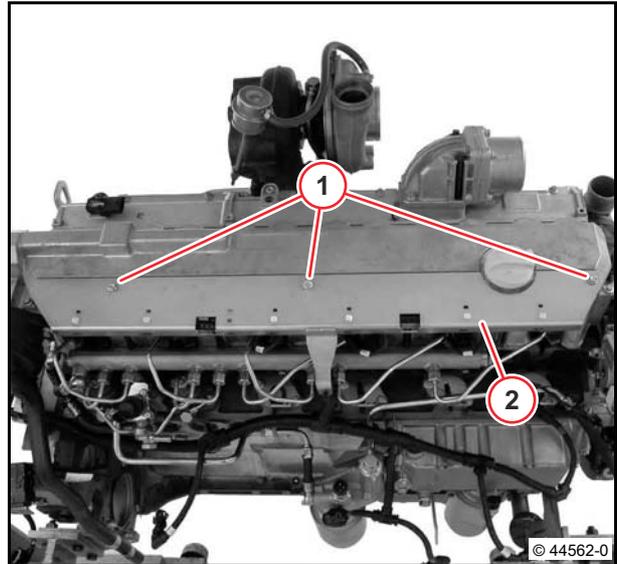
- Unlock cable plug (1) and remove.



Rail pressure sensor

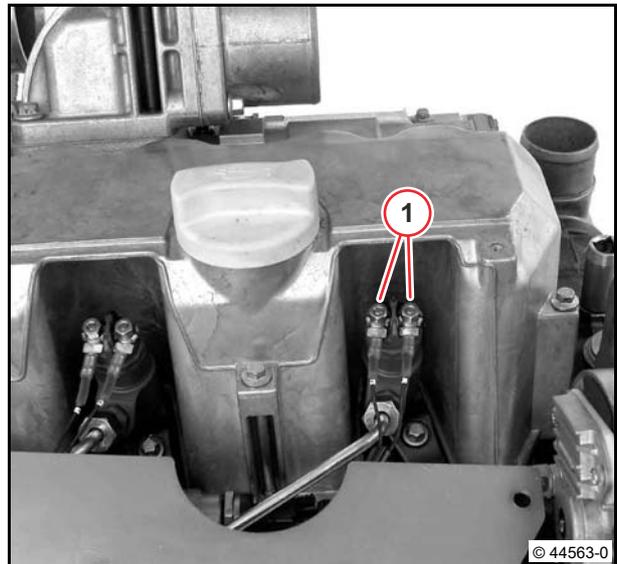


- Unscrew screws (1).
- Remove the cover (2).

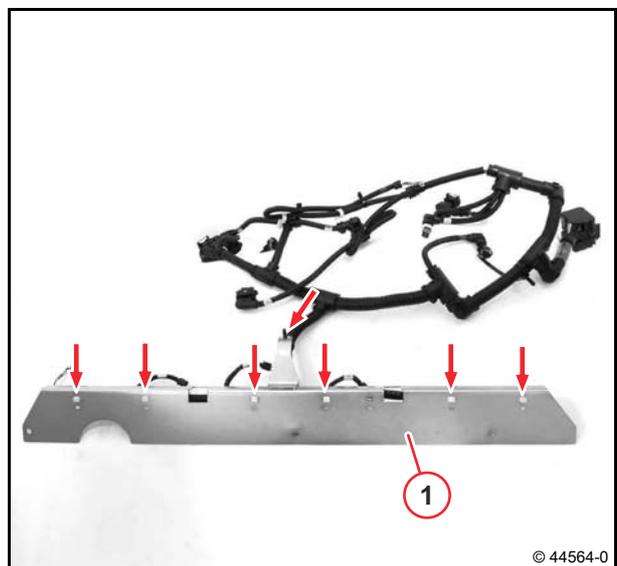


- Unscrew nuts (1).
 - Remove cable from injector.
-  Remove cables from all injectors.

- Remove cable harness.

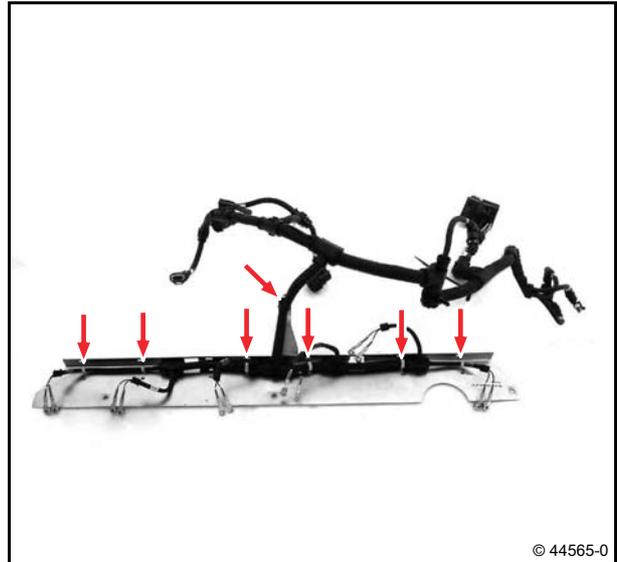


- Remove cable tie (arrows).
- Remove the cover (1).
- Visually inspect the components.



Installing the cable harness

- Position cable harness on the cover plate and fix with cable ties (arrows).



- Position the cable harness on the engine accordingly.
- Lay the cable plugs to the individual components.



- Mount cable on injector.



Mount cables on all injectors.

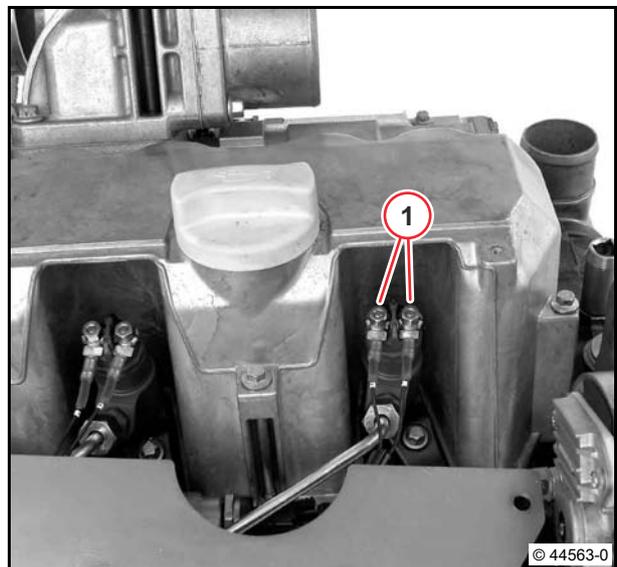
- Tighten nuts (1).



1,5 Nm

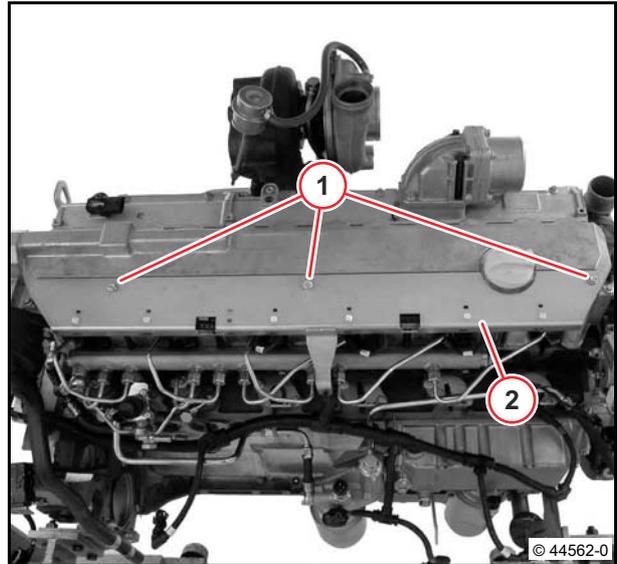


Tighten nuts of all injectors.



- Mount cover (2).
- Tighten screws (1).

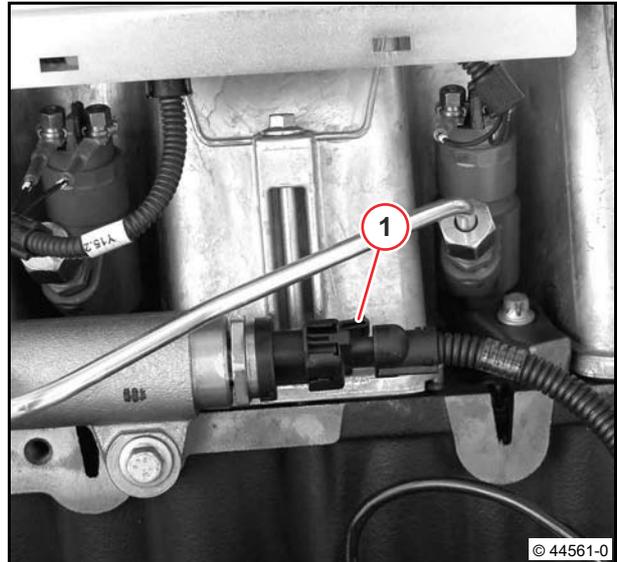
 8,5 Nm



- Plug in the cable plug (1).



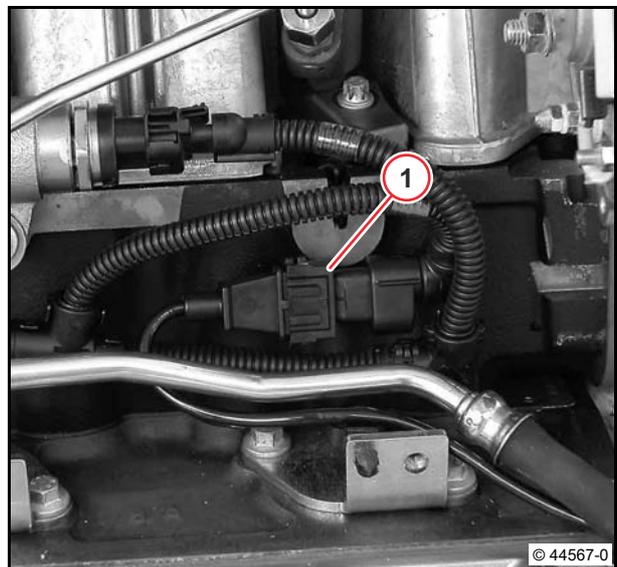
Rail pressure sensor
Ensure that the connection is perfect.



- Plug cable plugs (1) together.



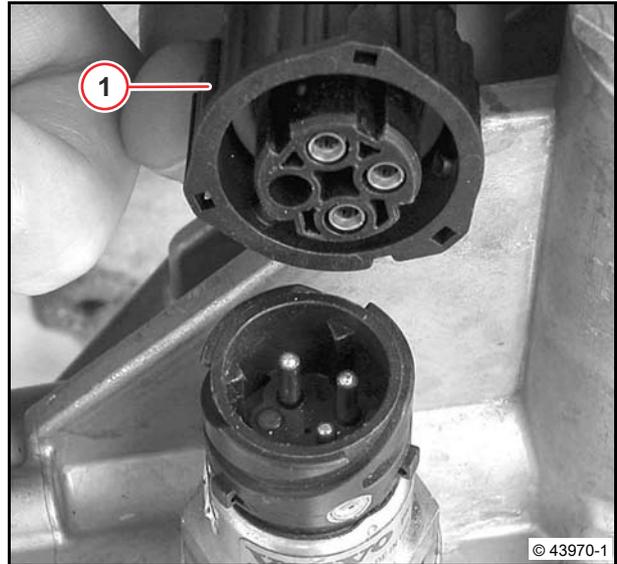
Impulse transmitter (crankshaft)
Ensure that the connection is perfect.



- Press the cable plug onto the fuel pressure sensor.
- Turn in the locking ring (1) until it snaps in.



Make sure that the contacts match up.

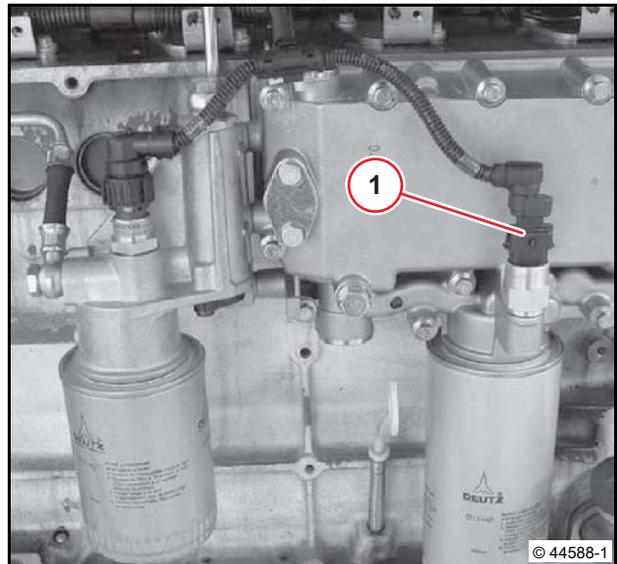


- Plug in the cable plug (1).

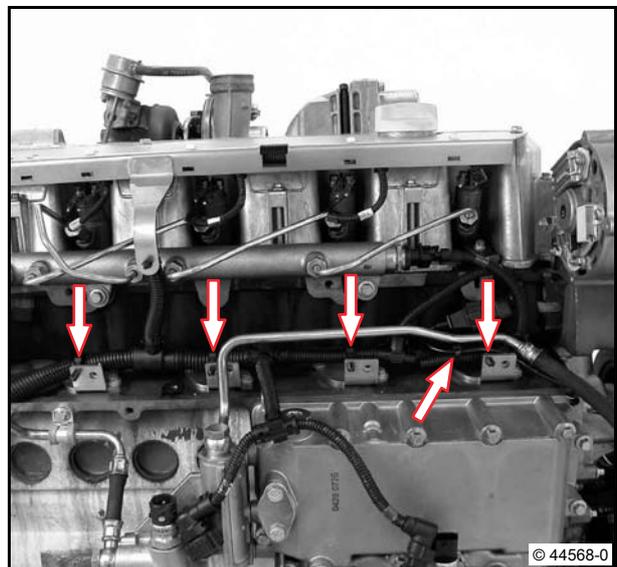


Oil pressure switch

Ensure that the connection is perfect.



- Lay cable harness and fix with cable ties (arrows).

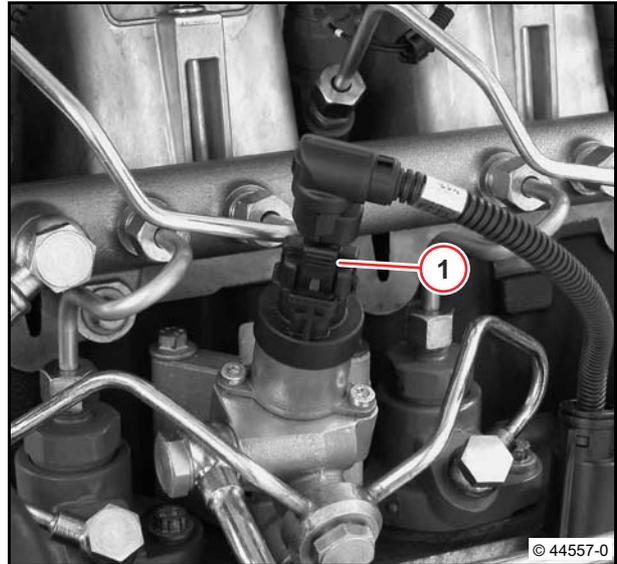


- Plug in the cable plug (1).

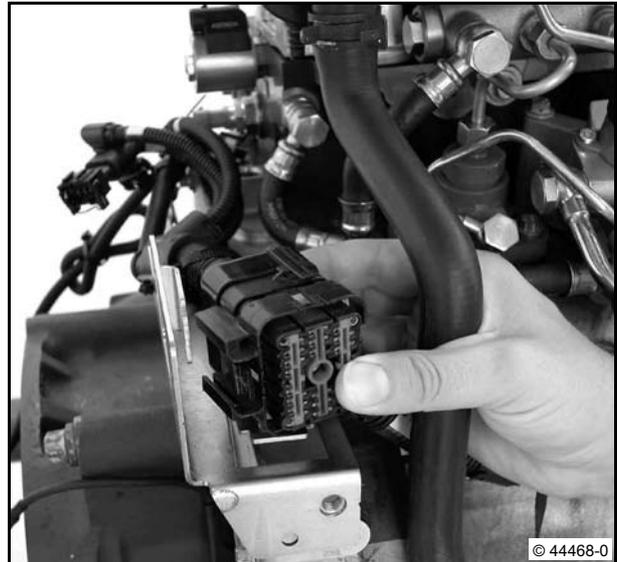


Control block

Ensure that the connection is perfect.



- Push the central plug onto the holder until it snaps in.

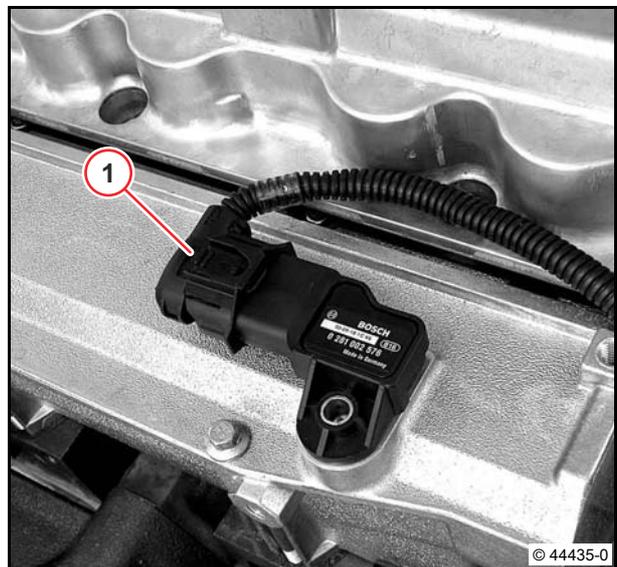


- Plug in the cable plug (1).



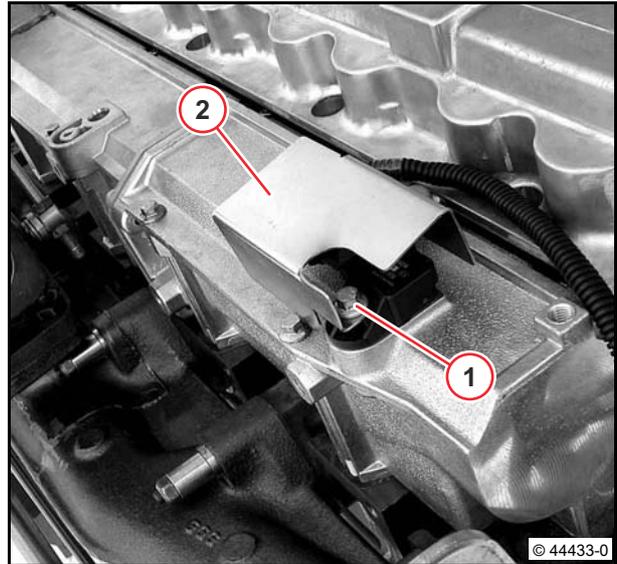
Pressure/temperature sensor

Ensure that the connection is perfect.

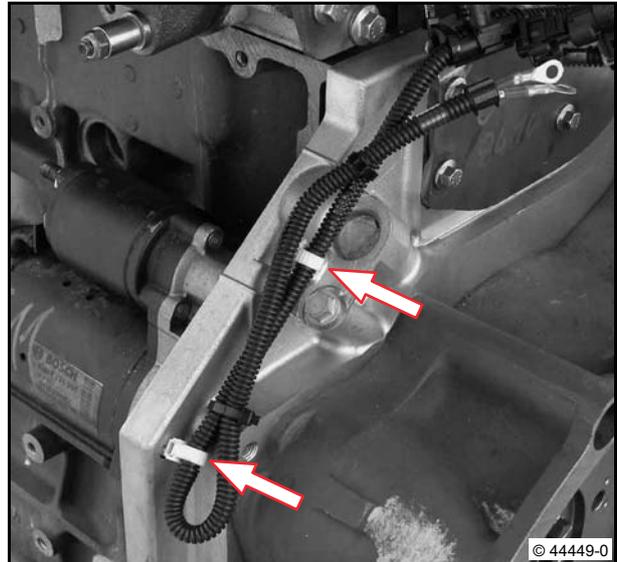


- Mount cover (2).
- Tighten screw (1).

 4,5 Nm



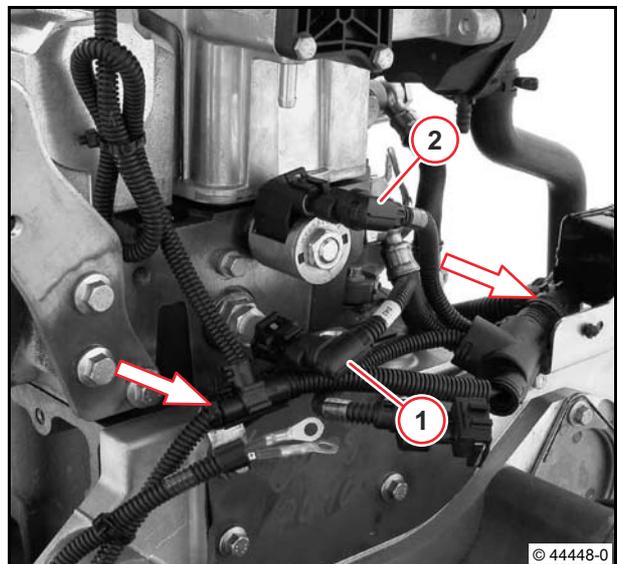
- Lay cable harness and fix with cable ties (arrows).



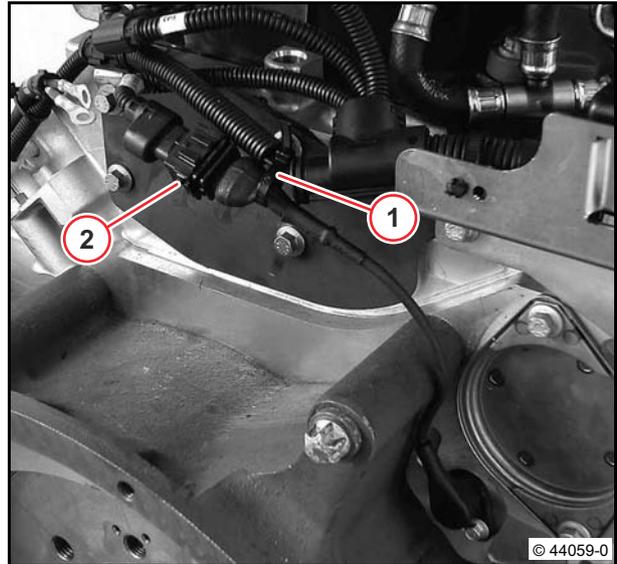
- Plug in the cable plug (1).
 Temperature sensor
Ensure that the connection is perfect.

- Plug in the cable plug (2).
 Solenoid valve (exhaust return line)
Ensure that the connection is perfect.

- Lay cable harness and fix with cable ties (arrows).



- Plug in the cable plug (1).
-  impulse transmitter (camshaft)
Ensure that the connection is perfect.
- Lay cable harness and fix with cable tie (1).





Removing and installing the impulse transmitter (crankshaft)



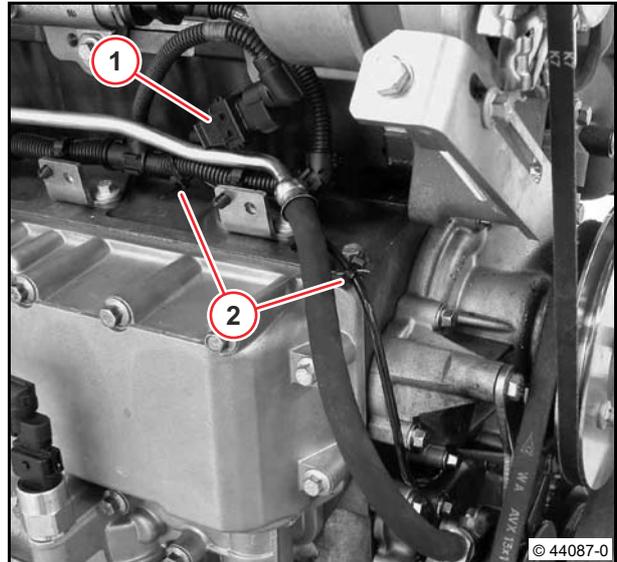
Standard tools:
– Feeler gauges



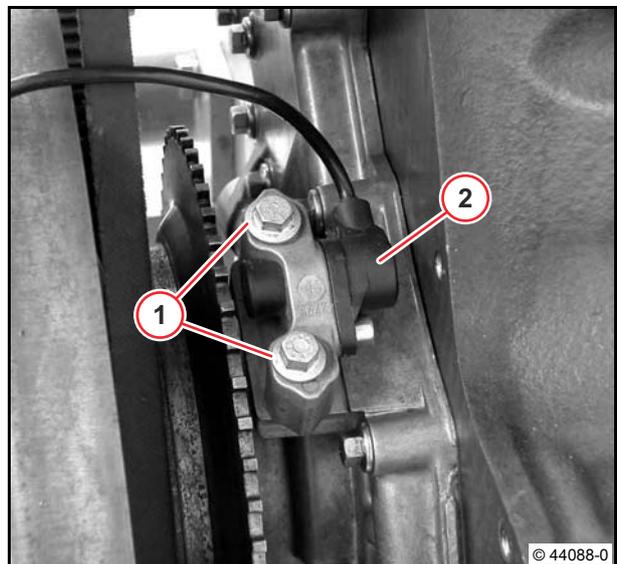
– Locking agent
DEUTZ DW 72

Removing the impulse transmitter

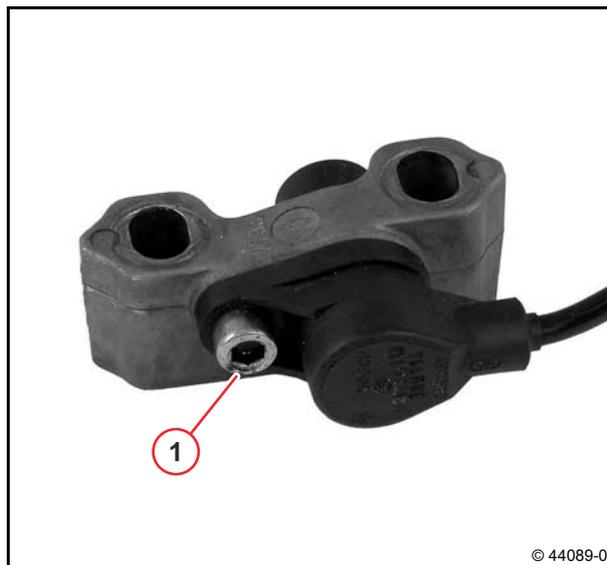
- Unlock cable plug (1) and disconnect.
- Remove cable tie (2).
- Lay cable bare.



- Unscrew screws (1).
- Remove holder with impulse transmitter (2).



- Unscrew screw (1).
- Remove impulse transmitter from holder.



6

- Visually inspect the components.



Installing the impulse transmitter

- Press impulse transmitter into holder.



Attention!

Do not knock in impulse transmitter!

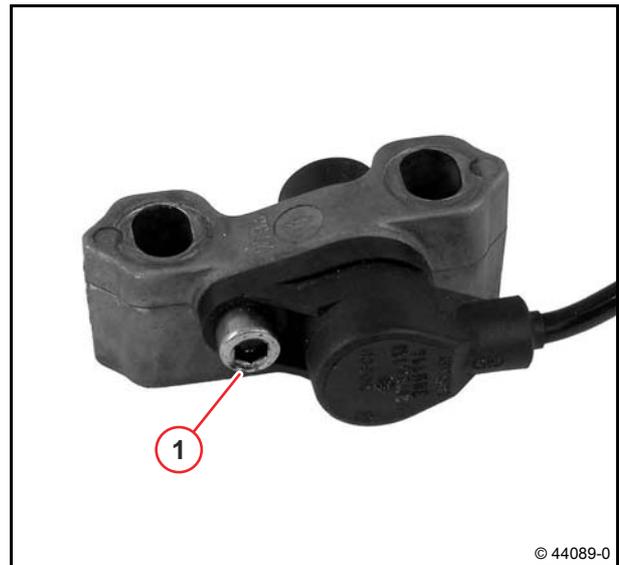


Clean thread of the screw and bore.
Insert screw (1) with safety agent
DEUTZ DW 72.



- Tighten screw (1).

 9 Nm



- Mount holder with impulse transmitter.



Clean the threads of the screws and holes.

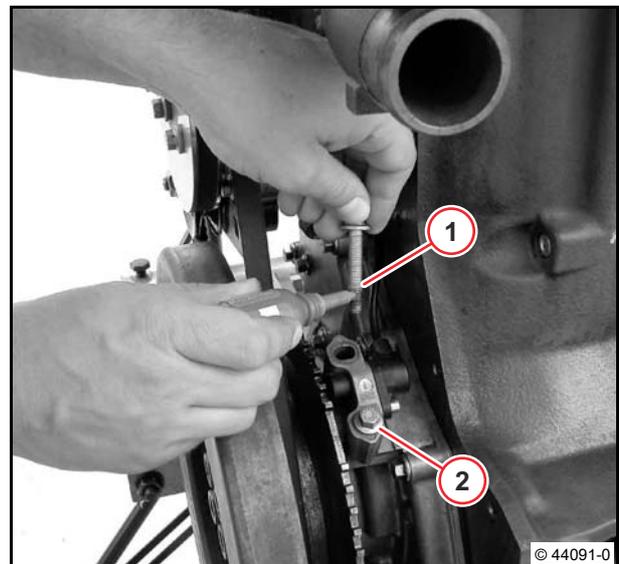
Pay attention to different screw lengths.

Screw M8 x 45 mm (1)

Screw M8 x 40 mm (2)

Insert screws with safety agent
DEUTZ DW 72.

Do not tighten screws.

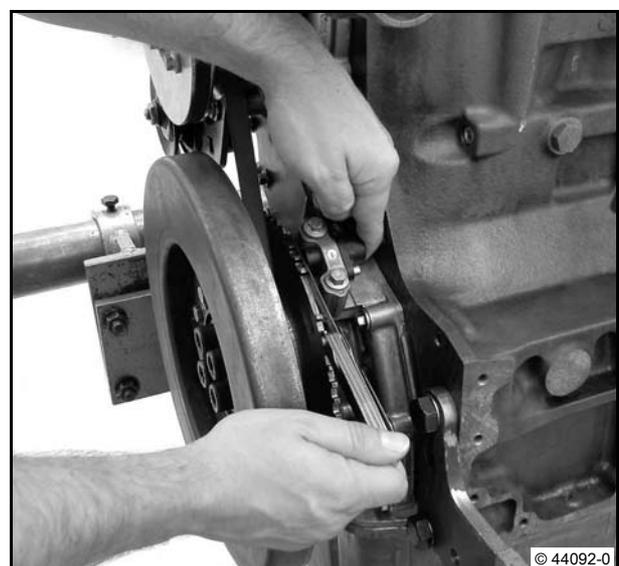


Set gap dimension for impulse transmitter (crankshaft)

- Select feeler gauge.

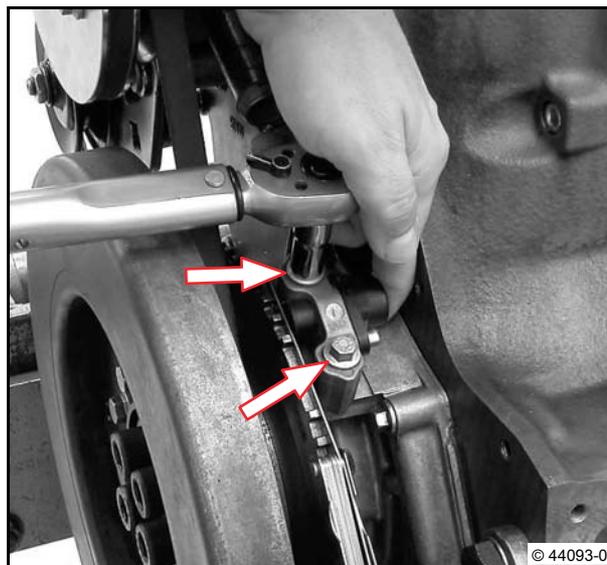
 0,6^{+0.1}/_{-0.1} mm

- Push feeler gauge blade between tooth lock washer and impulse transmitter.
- Press the impulse transmitter lightly against the feeler gauge blade.



- Press the impulse transmitter lightly against the feeler gauge blade.
- Tighten screws (arrows).

 20 Nm

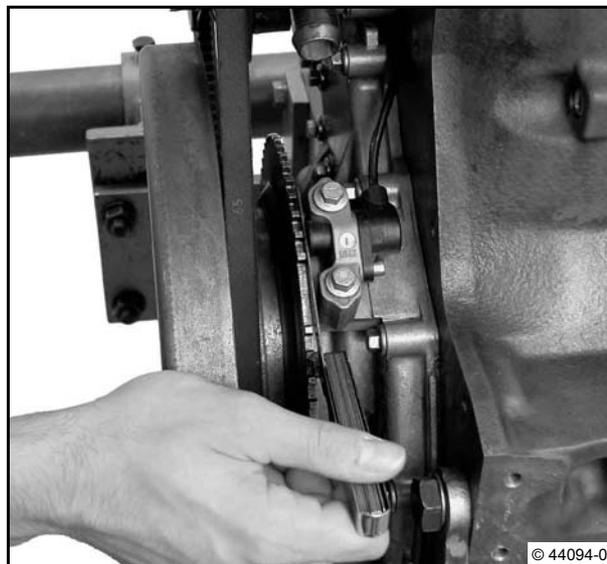


- Check gap dimension with feeler gauge blade.

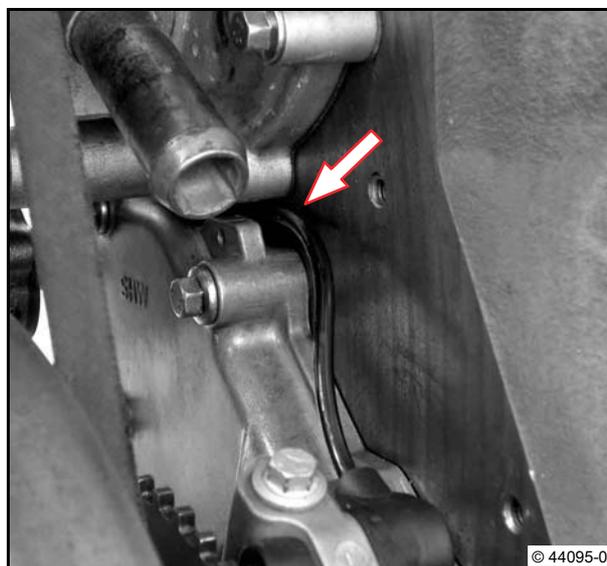
 $0,6^{+0,1}_{-0,1}$ mm



The feeler gauge blade must fit between the tooth lock washer and impulse transmitter (crankshaft) with low resistance.



- Lay cable between front cover and coolant pump (arrow).

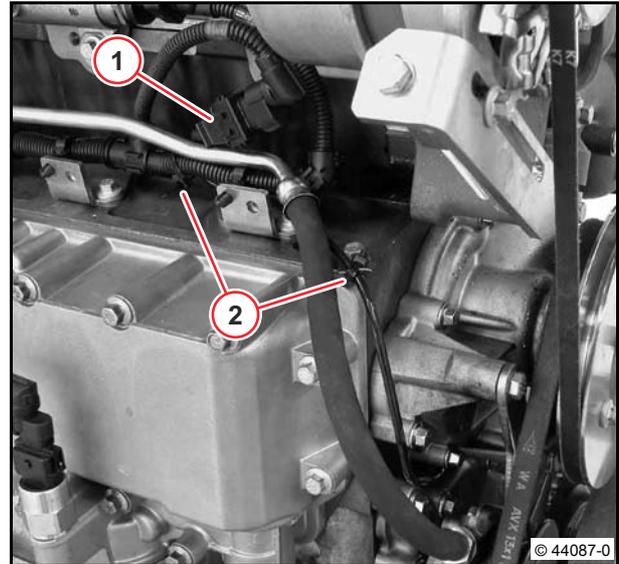


- Plug cable plugs (1) together.



Ensure that the connection is perfect.

- Lay cable.
- Fix cable with cable tie (2).





Removing and installing the impulse transmitter (camshaft)



Standard tools

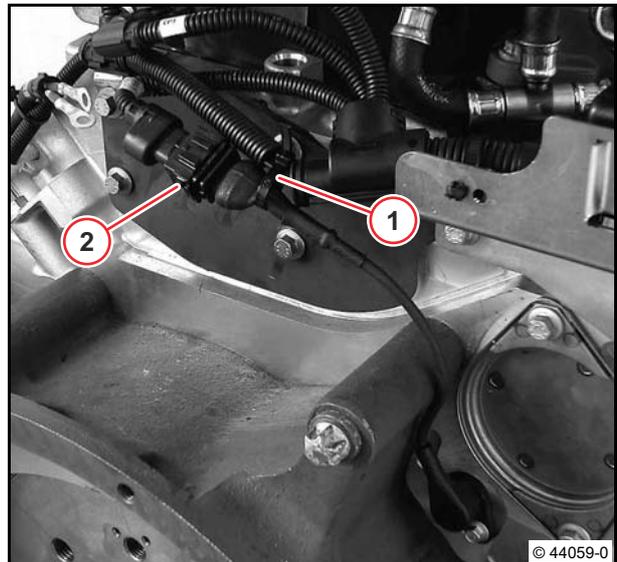


– Locking agent
DEUTZ DW 72

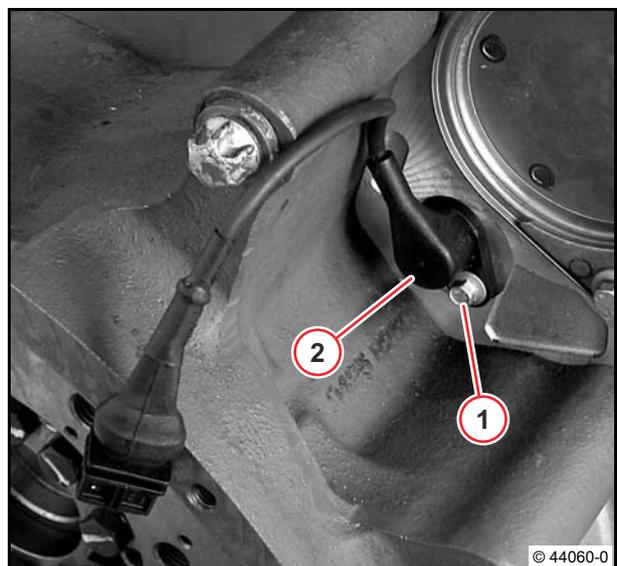
6

Removing the impulse transmitter

- Unlock cable plug (1) and disconnect.
- Pull out cable plug (2).



- Unscrew screw (1).
- Remove impulse transmitter (2).



- Visually inspect the components.



6

Installing the impulse transmitter

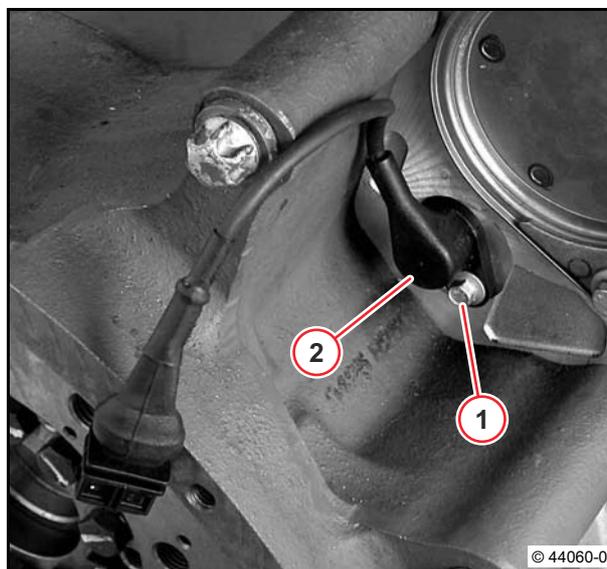
- Clean sealing surfaces on impulse transmitter and gearcase cover.
- Insert new O-ring (arrow).
- Lightly oil O-ring.



Clean thread of the screw and bore.

- Insert impulse transmitter (2).
- Insert screw (1) with locking agent.
- Tighten screw (1).

 9 Nm

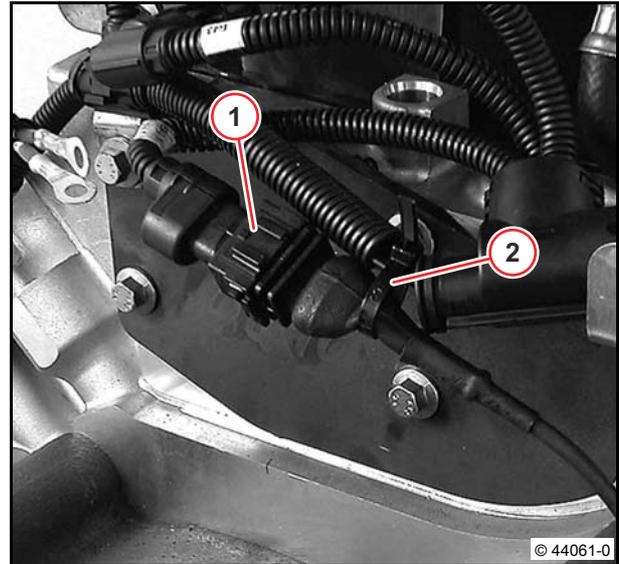


- Plug cable plugs (1) together.



Ensure that the connection is perfect.

- Lay cable.
- Fix cable with cable tie (2).





Removing and installing the pressure/temperature sensor (charge air)



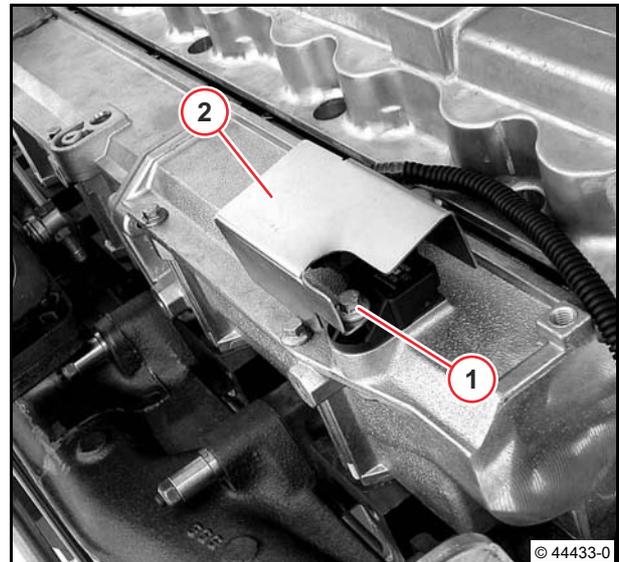
Standard tools



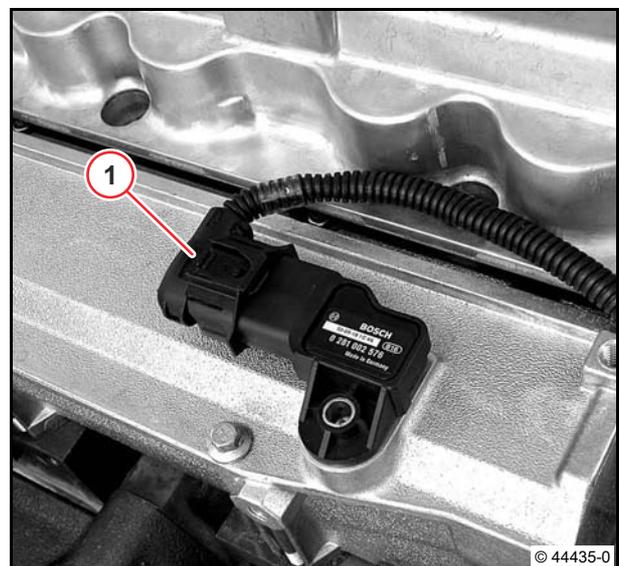
– Fitting compound
DEUTZ AP1908

Remove pressure/temperature sensor

- Unscrew screw (1).
- Remove the cover (2).

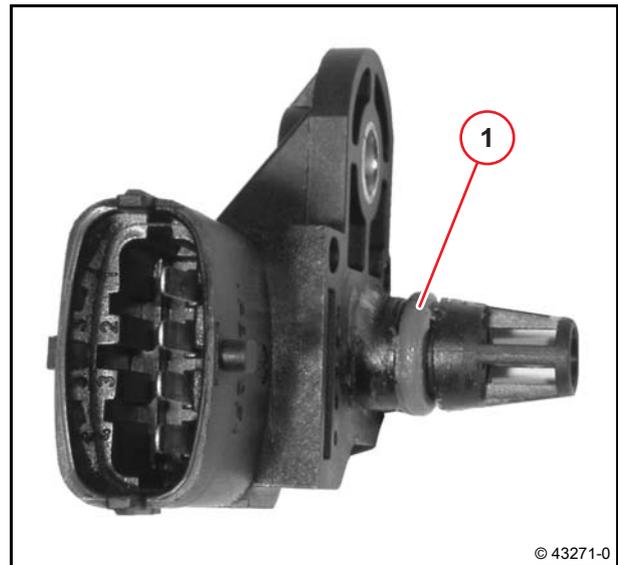


- Unlock cable plug (1) and remove.
- Remove pressure/temperature sensor



Installing the pressure/temperature sensor

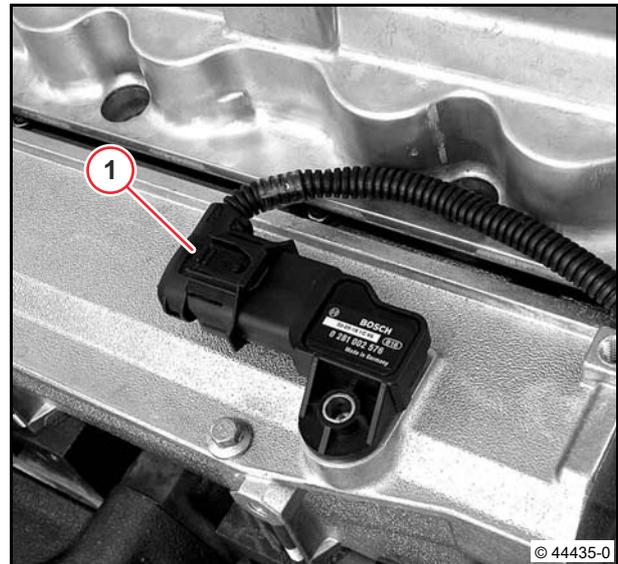
- Mount new O-ring (1).
- Lightly coat O-ring with fitting compound.



- Insert pressure/temperature sensor.
- Plug in the cable plug (1) and snap in lock.

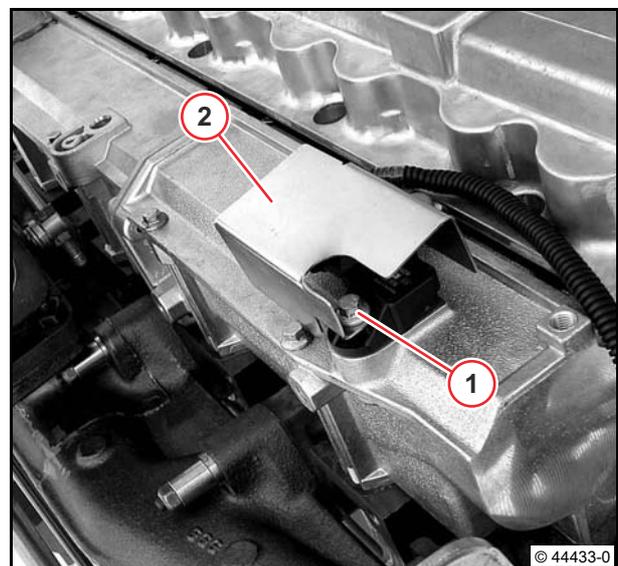


Ensure that the connection is perfect.



- Mount cover (2).
- Tighten screw (1).

 4,5 Nm



Removing and installing the oil pressure switch



Standard tools

Special tools:

- Long socket wrench insert 110700
- Plugs/caps 170160



- [User notes](#)



Pay attention to utmost cleanliness when working on the lube oil system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling lube oils.

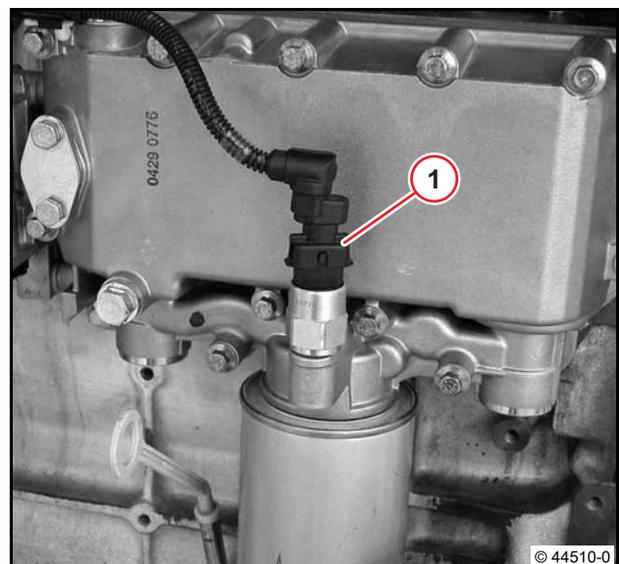
Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

6

Removing the oil pressure switch

- Unlock cable plug (1) and remove.

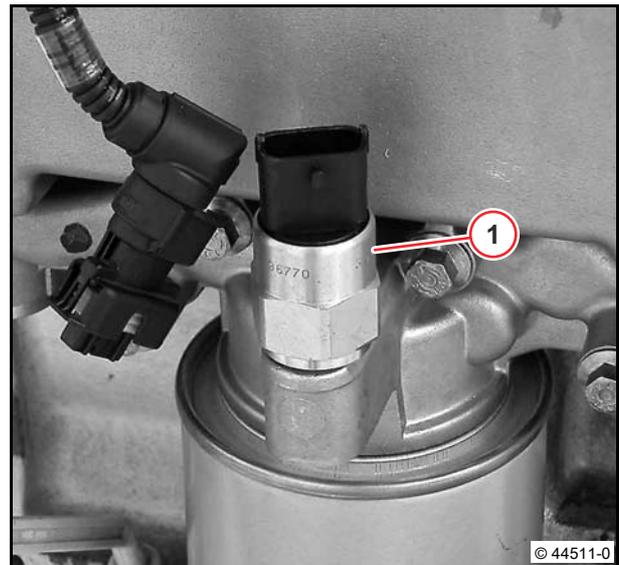


© 44510-0

- Unscrew oil pressure switch (1).



Collect lubricating oil and dispose of according to regulations.



6

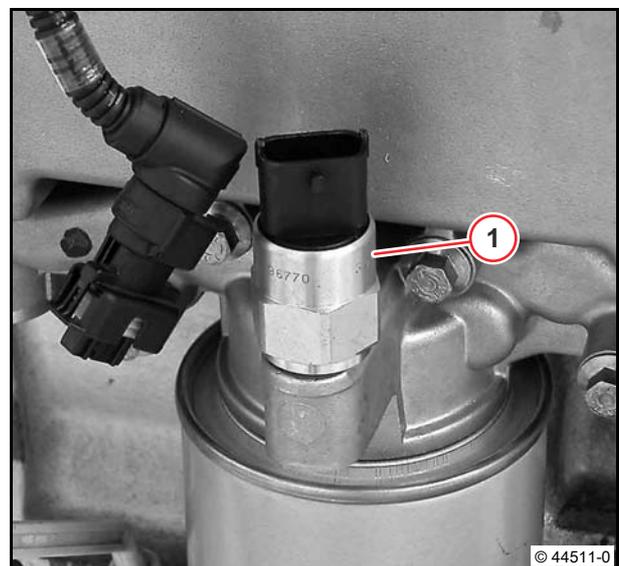
- Visually inspect the components.



Installing the oil pressure switch

- Mount new sealing ring.
- Tighten the oil pressure switch (1) with the socket wrench insert.

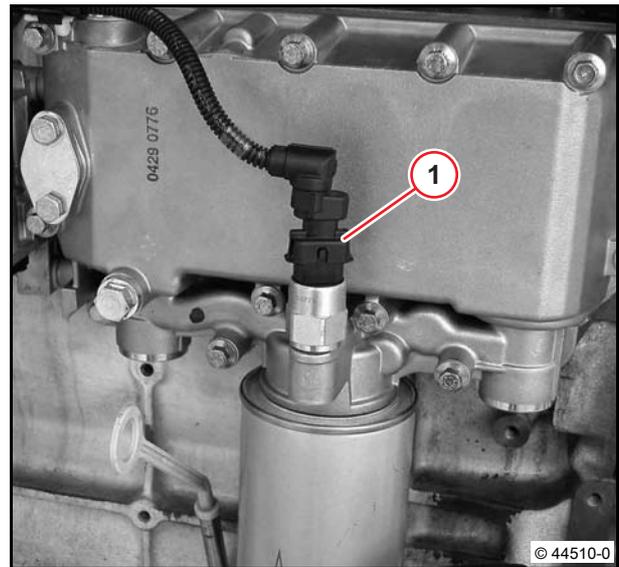
 30 Nm



- Plug in the cable plug (1).



Ensure that the connection is perfect.





Removing and installing temperature transmitter (coolant)



Standard tools



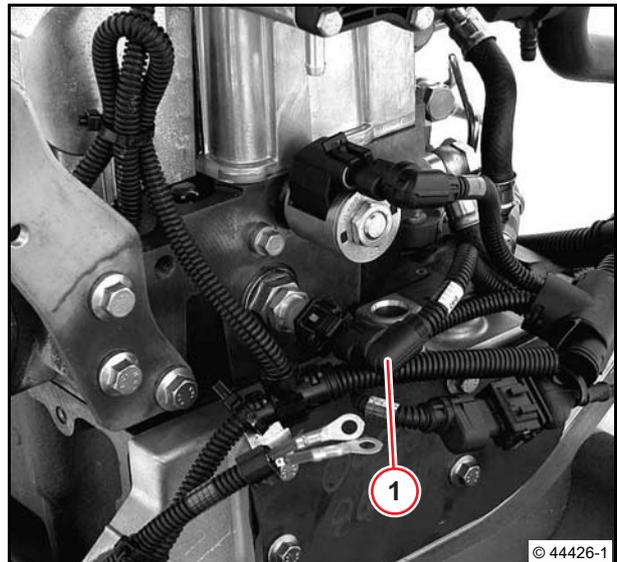
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Emptying and filling the engine with operating media must be carried out according to the operating manual and the appropriate documentation of the vehicle/equipment manufacturer.

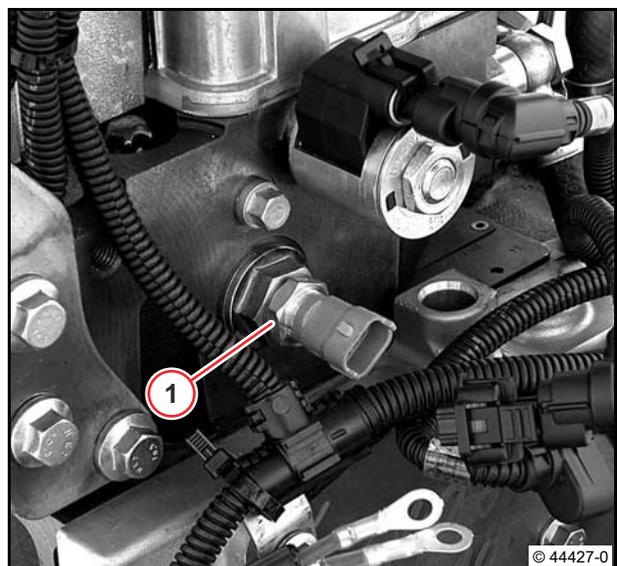
6

Removing temperature transmitter

- Unlock cable plug (1) and remove.



- Unscrew temperature transmitter (1).
- Hold the connector.



- Visually inspect the component.



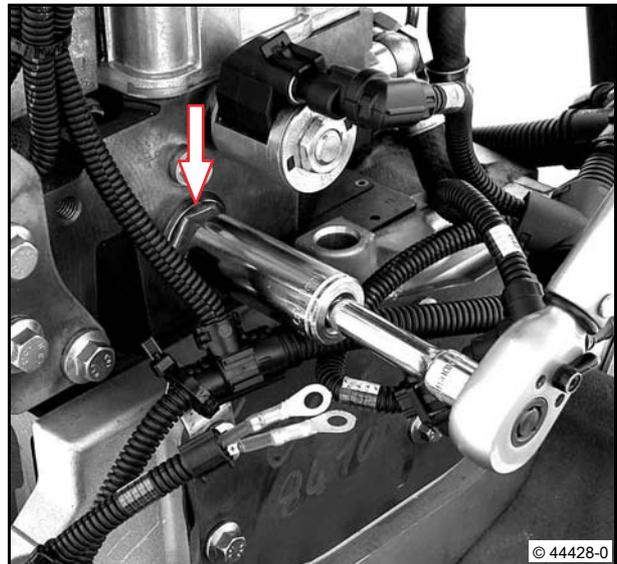
Installing temperature transmitter

- Tighten temperature transmitter (1).

 22 Nm



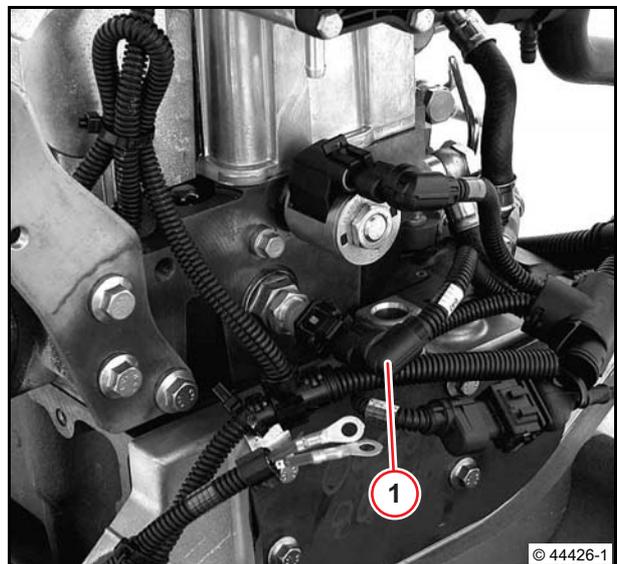
Make sure the sealing ring is in place.



- Plug in the cable plug (1).



Ensure that the connection is perfect.



Removing and installing the fuel pressure sensor



Standard tools

Special tools:

- Long socket wrench insert 110700
- Plugs/caps 170160



- [User notes](#)



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

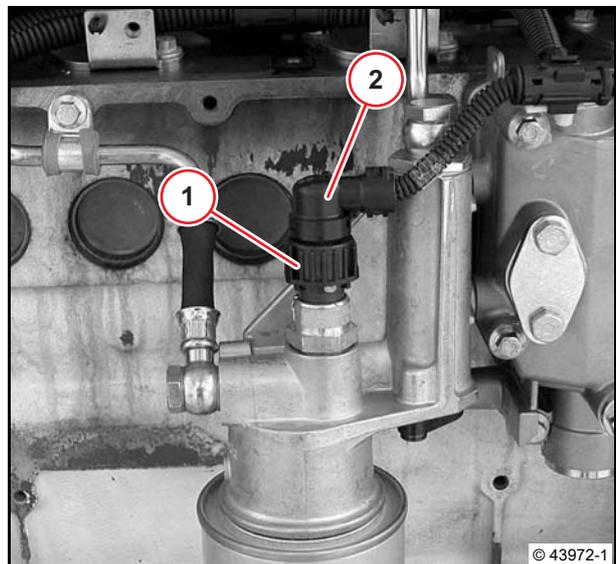
Removing the fuel pressure sensor



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

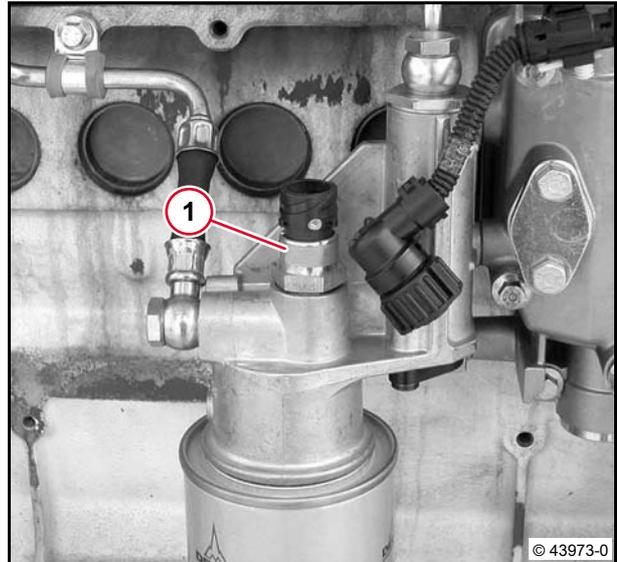
- Loosen the locking ring (1).
- Pull off cable plug (2).



- Unscrew fuel pressure sensor (1) with the socket wrench.



Collect draining fuel and dispose of according to regulations.



6

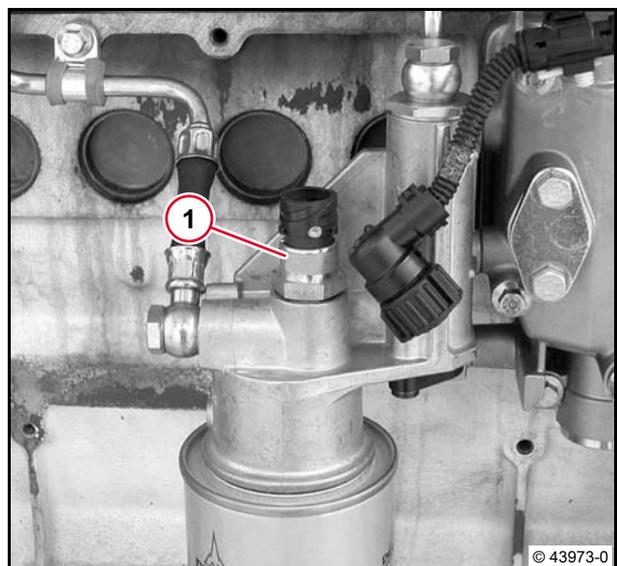
- Visually inspect the component.



Installing the fuel pressure sensor

- Mount new sealing ring.
- Install fuel pressure sensor (1) with the socket wrench.

 30 Nm

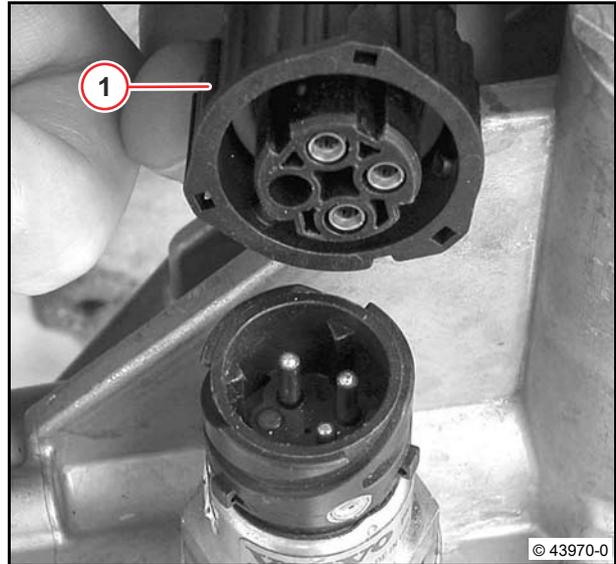


- Press the cable plug onto the fuel pressure sensor.
- Turn in the locking ring (1) until it snaps in.



Make sure that the contacts match up.

Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.





Installing and removing turning gear



Standard tools

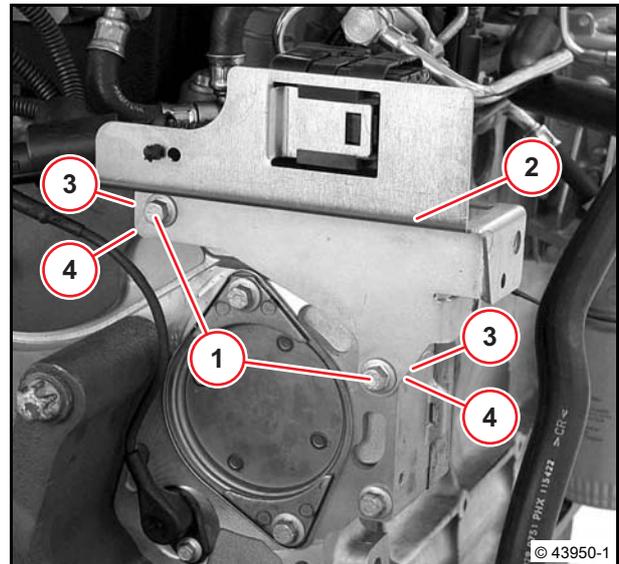
Special tools:

– Turn-over gear

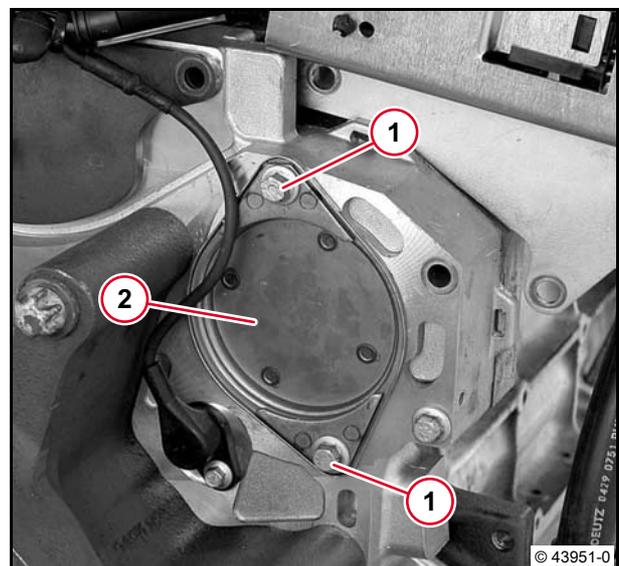
100320

Disassembly

- Unscrew screws (1).
- Remove holder (2).
- Remove sleeve (3).
- Remove spacing sleeve (4).



- Unscrew screws (1).
- Remove cover (2).



Attaching turning gear

- Insert turn-over gear (1).

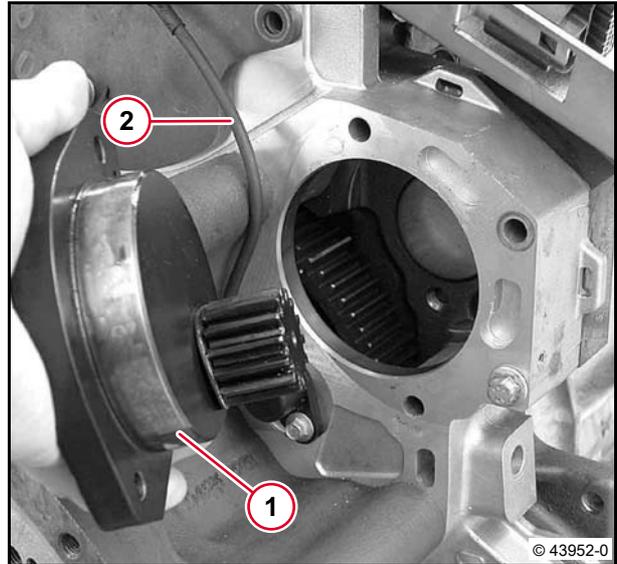


The toothed gear of the turn-over gear must grip into the teeth of the camshaft wheel.

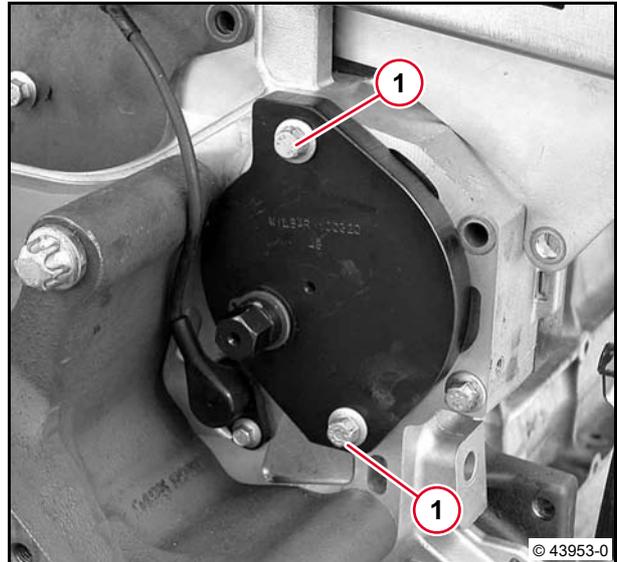


Attention!

Do not trap the cable (2).

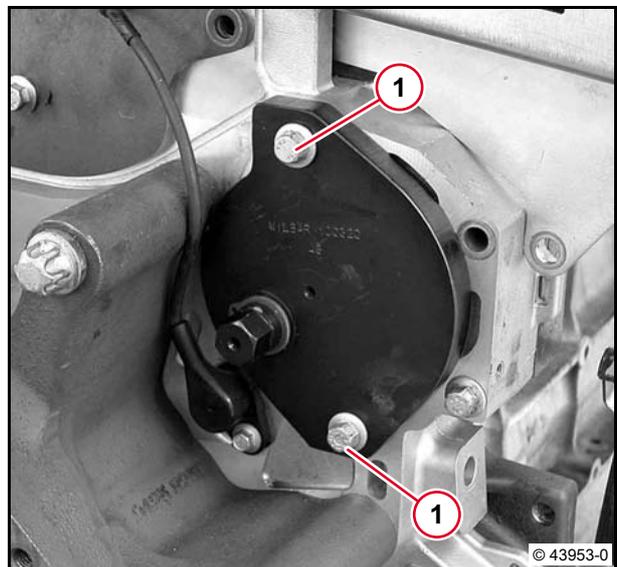


- Tighten screws (1).



Removing turning gear

- Unscrew screws (1).
- Remove turn-over gear.



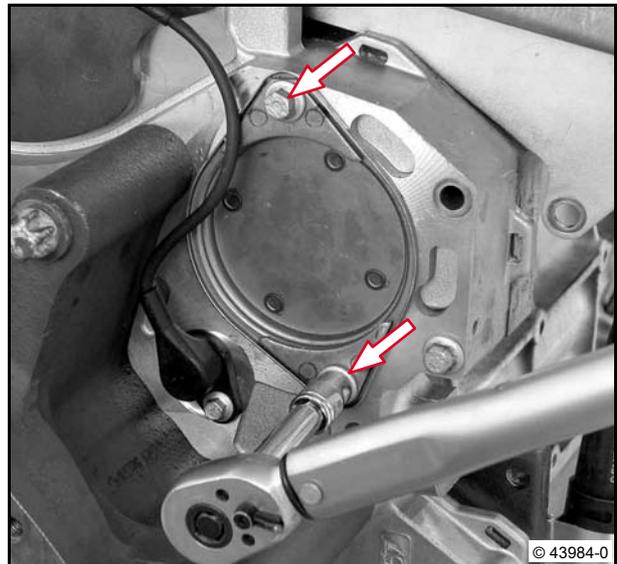
- Clean the sealing surface on cover and gearcase.
- Insert new O-ring (arrow).
- Lightly oil O-ring.



- Press in the cap to the stop.
-  Note different screw lengths.
See spare parts documentation.

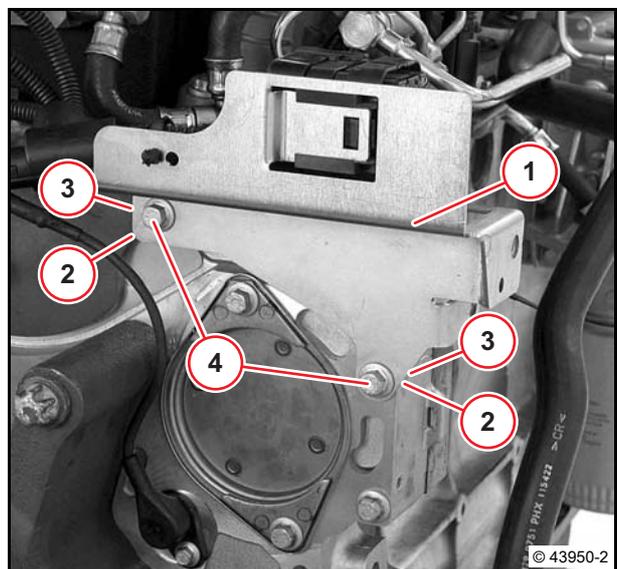
- Tighten screws (arrows).

 21 Nm



- Fit holder (1).
- Fit sleeve (2).
- Position spacing sleeve (3).
- Tighten screws (4).

 30 Nm



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A03 092	Gear case on crankcase	M8x35-10.9 M8x55-10.9 M8x80-10.9	Observe tightening sequence	30 Nm
A04 022	Locking cap on gear case	M8x55-10.9 M8x60-10.9		21 Nm
A04 025	Holder on gear case/crankcase	M8x80-10.9		30 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

Installing and removing turning gear (Torsional vibration damper)



Standard tools

Special tools:

– Turn-over gear

100380

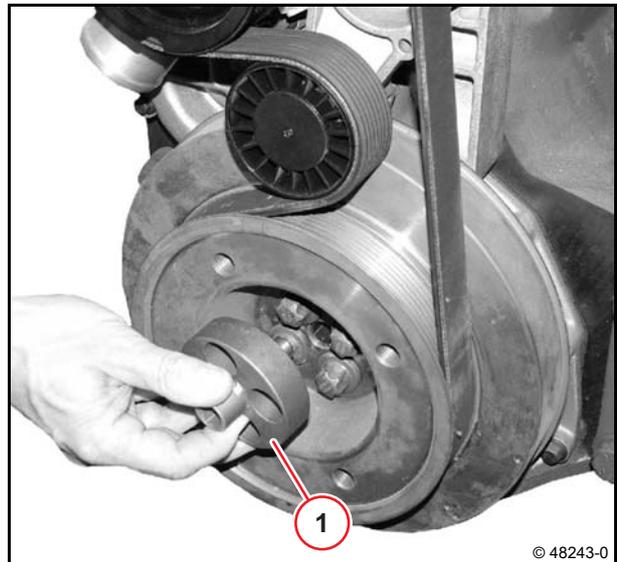


Attention!

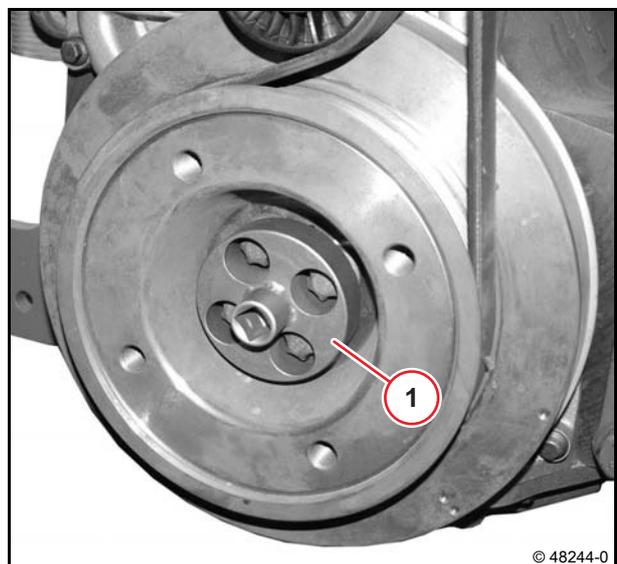
Observe engine rotation direction - see operating manual

Attaching turning gear

- Insert turn-over gear (1).



- Position turning gear (1).



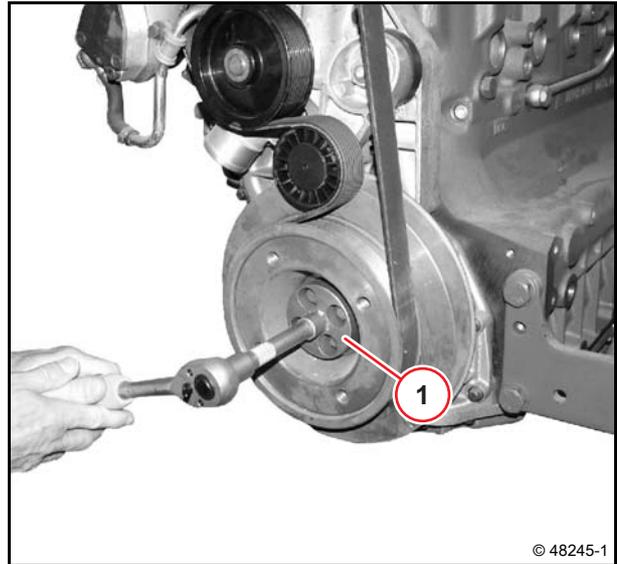
- Depending on the installation situation mount the appropriate tool on the turning gear (1) for extension.



Attention!

Observe engine rotation direction - see operating manual

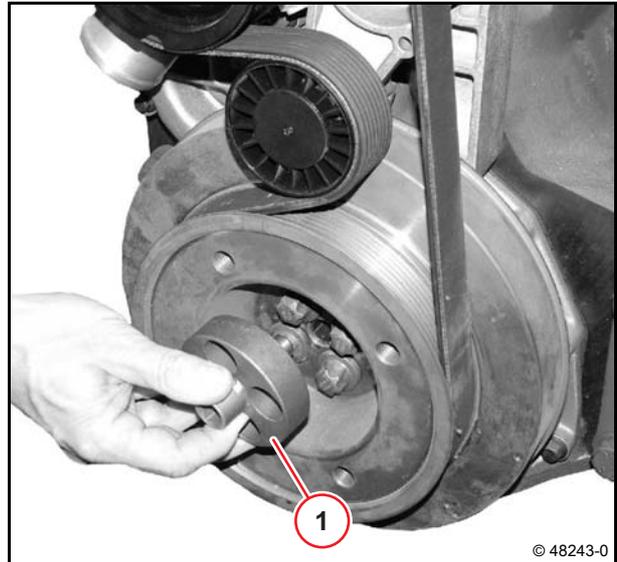
- Turn crank shaft in engine rotation direction with turning gear.



6

Removing turning gear

- Remove turning gear (1).



Removing and installing the connection housing



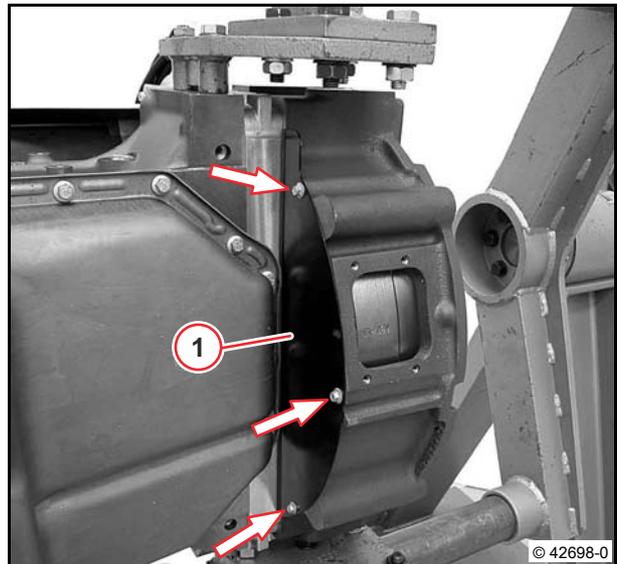
Standard tools:

- Socket wrench insert 8113
- Socket wrench insert 8114

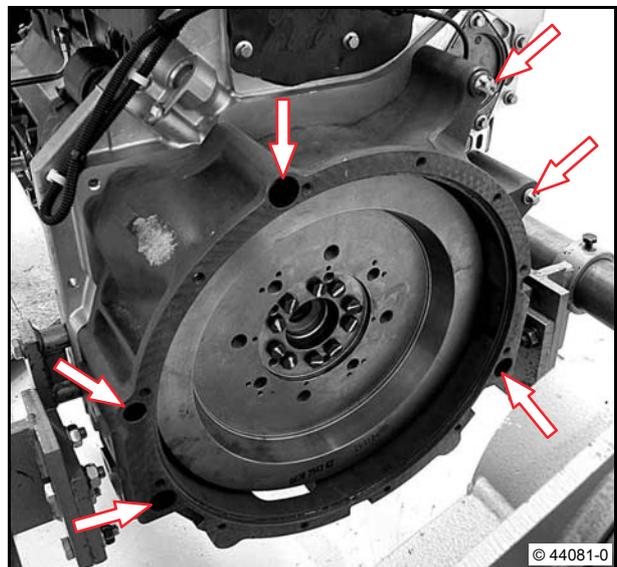
6

Removing the connection housing

- Unscrew screws (arrows).
- Remove the cover (1).



- Unscrew screws (arrows).
 - Remove connection housing.
-  Use socket wrench insert.
- Visually inspect the components.



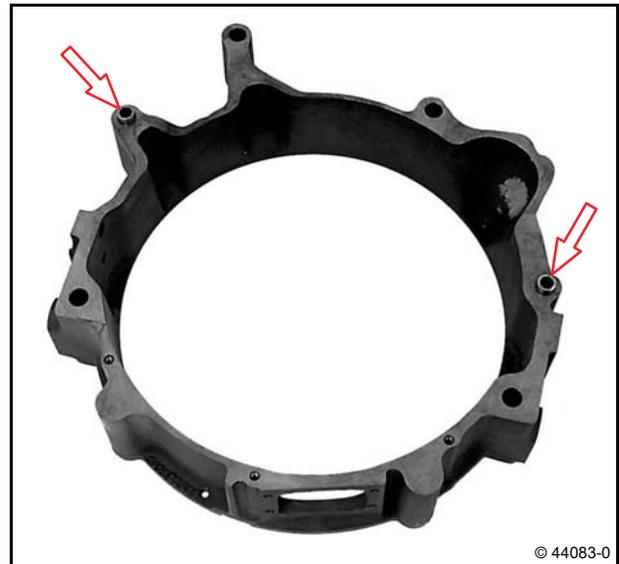
Installing the connection housing

- Clean contact surfaces.

6



- Make sure the clamping bushing (arrow) is in place.



- Mount connection housing.
- Centre connection housing over the clamping bushings.
- Fasten screws.



Note different screw lengths:

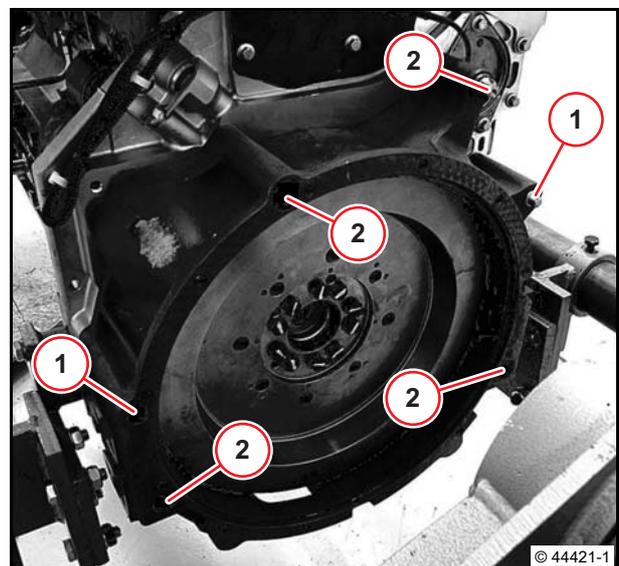
M12x85-10.9

M12x160-10.9 (1)

M16x85-10.9

M16x150-10.9 (2)

See spare parts documentation.

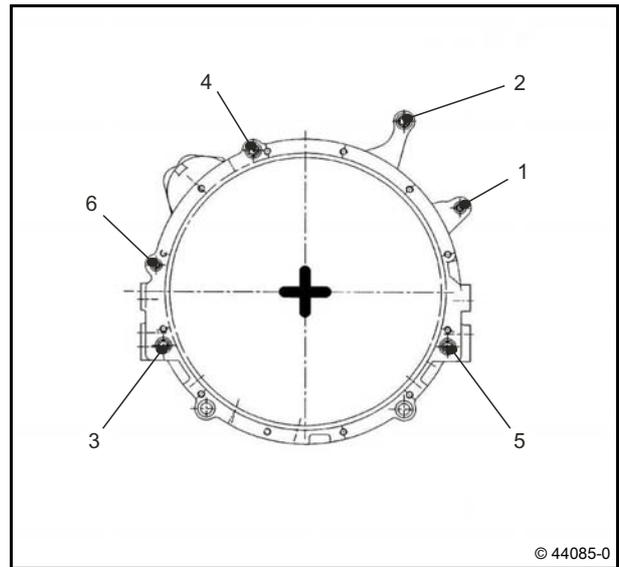


- Tighten the screws according to the tightening sequence.



See graphic for tightening sequence.
Use socket wrench insert.

- Fasten screw (1) hand tight.
- Pre-tighten screws (2), (3) (4) and (5) alternately.



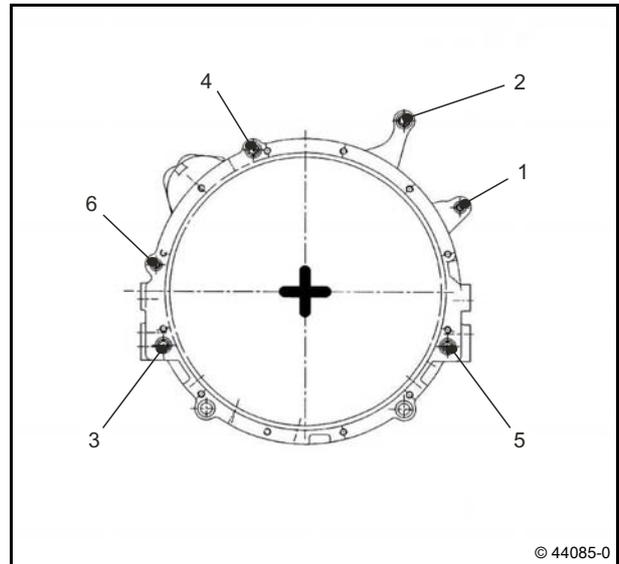
- Tighten screws (1) and (6).

99 Nm

- Tighten screws (2), (3), (4) and (5) alternately.

– Stage 1:

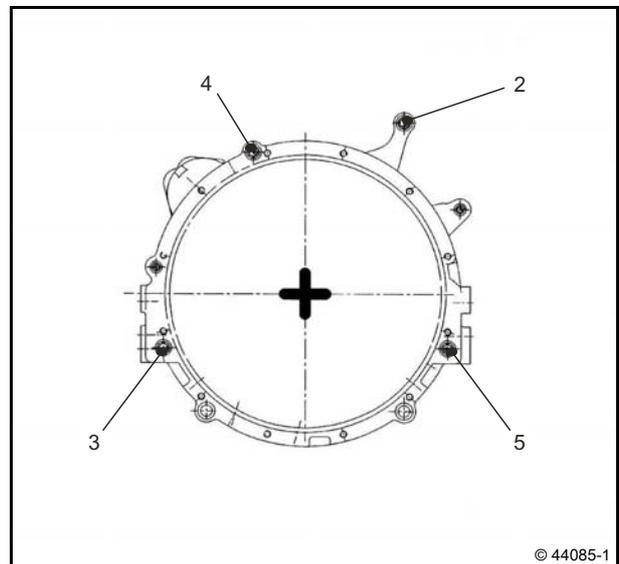
99 Nm



- Tighten screws (2), (3), (4) and (5) alternately.

– Stage 2:

243 Nm

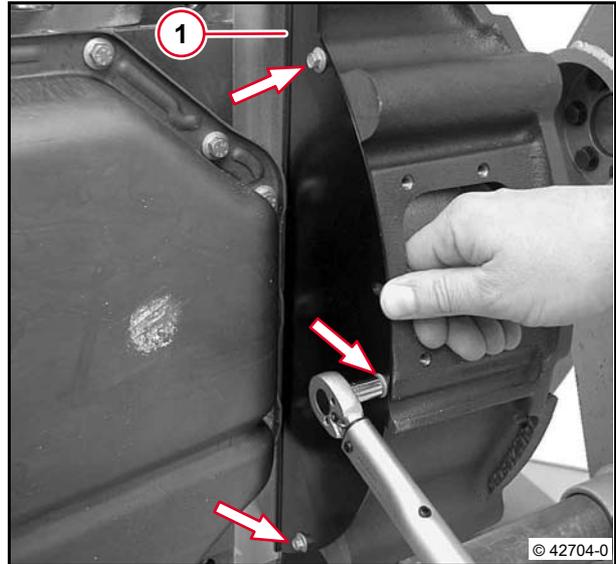


- Press on cover plate to the stop.
- Tighten screws (arrows).

 9 Nm



The hollow gorge (1) faces the lube oil tray.



Check alignment of connection housing



Standard tools:

- Magnetic measuring stand
- Self-made mandrin guide

Special tools:

- Digital dial gauge 100410



Attention!

Prerequisites:

Radial bearing clearance and axial clearance of the crankshaft in the permissible tolerance range.



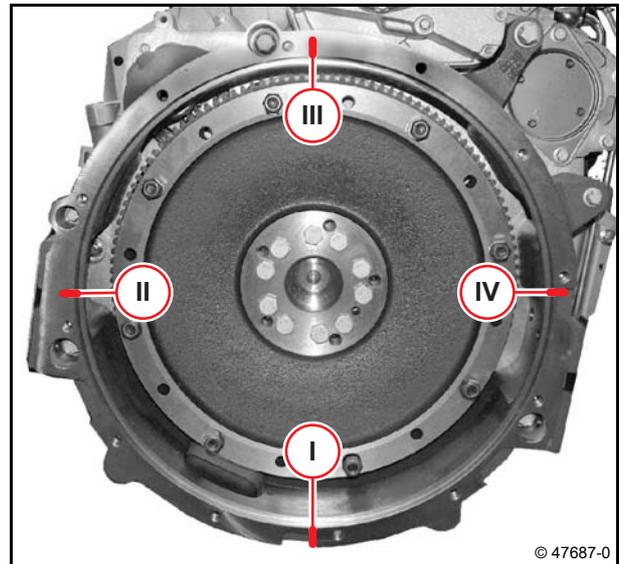
Test surfaces must be dry and free from dirt and burr!

Checking the rotation

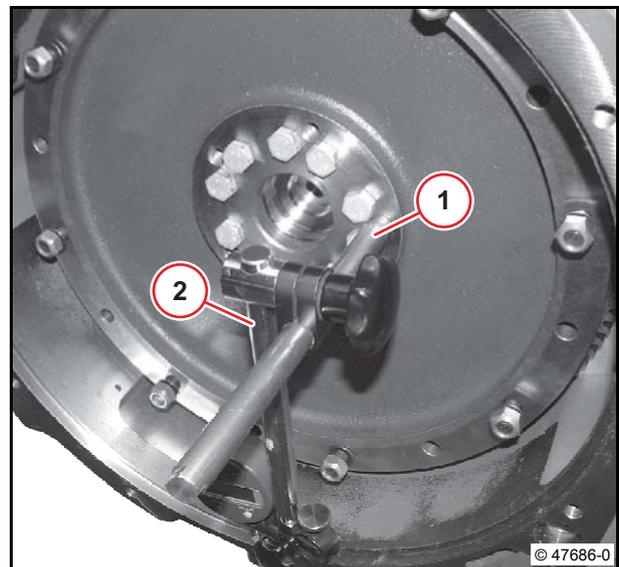
- Mount the engine on the assembly block.
- Make help marks at a distance of 90° on the connection housing.



- Position (I)
- Position (II)
- Position (III)
- Position (IV)



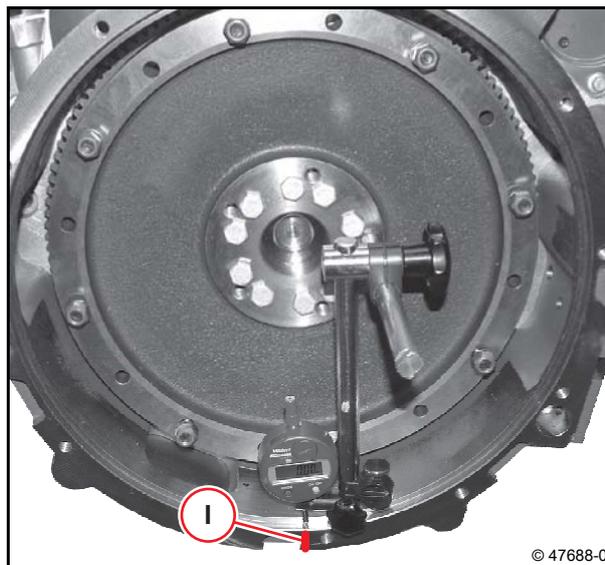
- Screw the self-made guide pin (1) tight.
- Mount the measuring stand (2) on the guide pin.
- Insert dial gauge in dial gauge holder.





Position (I)

- Set the dial gauge with probe pin to position (I) at a right angle to the connection housing.
- Apply the probe pin to the connection housing with pre-tension.



- Adjust dial gauge to "0".



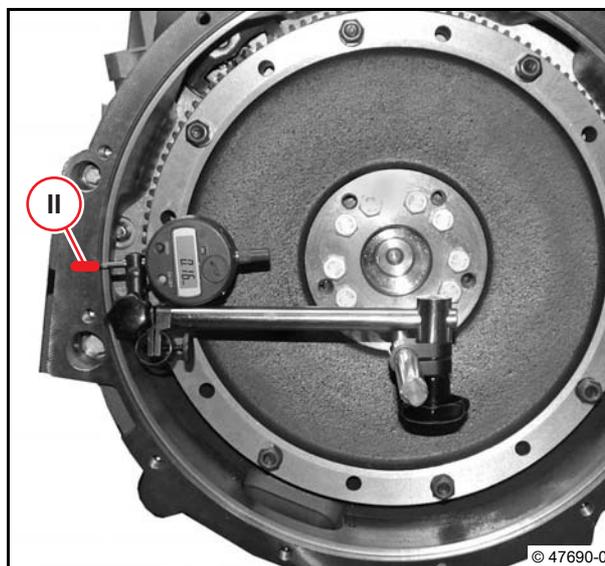
Position (II)

- Turn the crankshaft slowly to position (II).
- Read off measured value.
- Note measured value, dimension (a).



Note the sign!

- Note the measured value (a) with the appropriate sign on the measurement sheet.





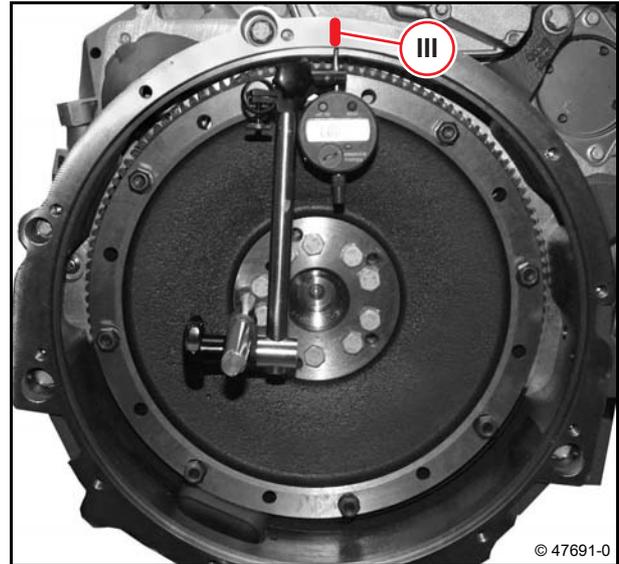
Position (III)

- Turn the crankshaft slowly to position (III).
- Read off measured value.
- Note measured value, dimension (b).



Note the sign!

- Note the measured value (b) with the appropriate sign on the measurement sheet.



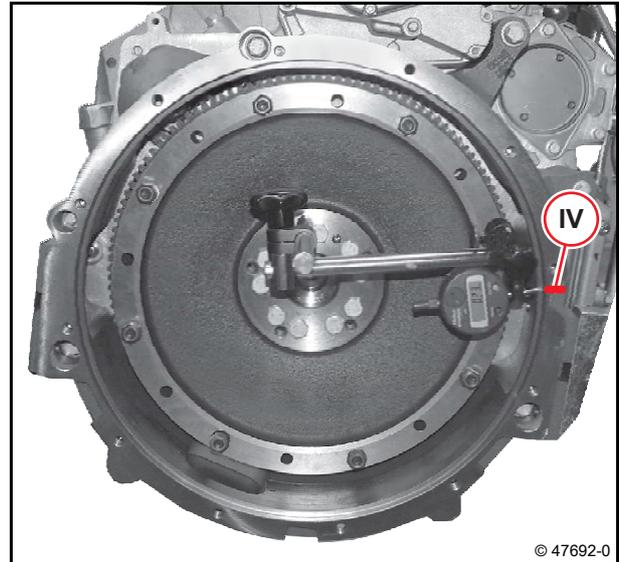
Position (IV)

- Turn the crankshaft slowly to position (IV).
- Read off measured value.
- Note the measured value, dimension (c).



Note the sign!

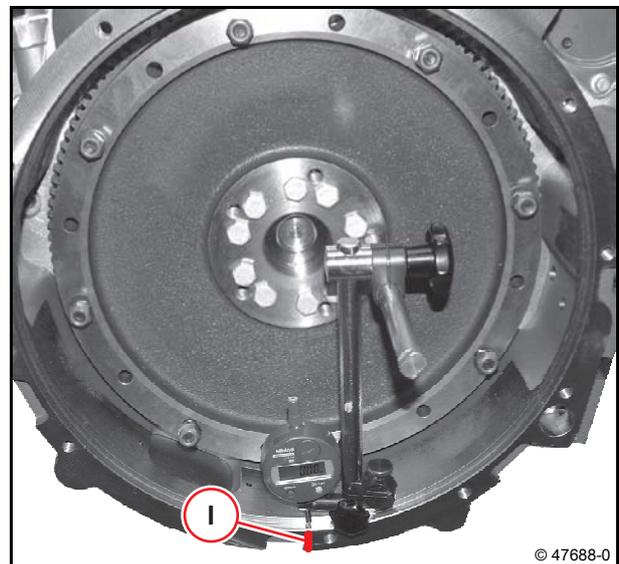
- Note the measured value (c) with the appropriate sign on the measurement sheet.



- Turn the crankshaft slowly to position (I).
- The dial gauge must indicate measured value "0" again.
- Make the calculation according to the example in table 1.



In case of a radial run-out deviation above the specified run-out limit value, the connection housing must be disconnected.



- Press the connection housing in the appropriate direction and align.



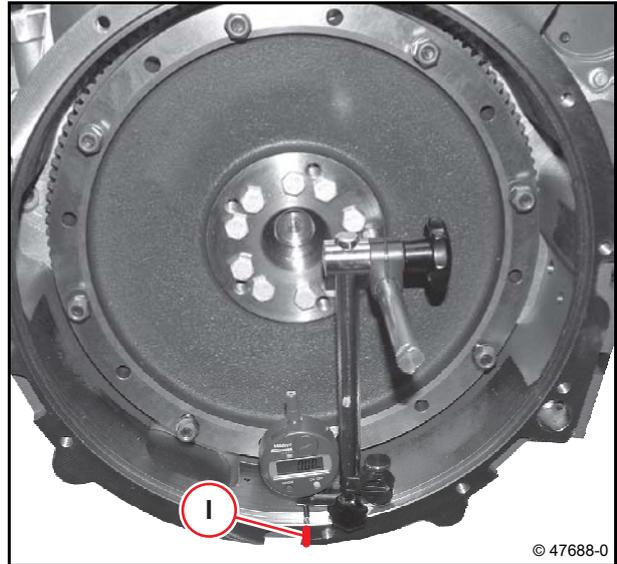
Attention!

Never hit the connection housing with a hammer.

- Tighten the screws according to the tightening sequence.



[W 52-01-01](#)



© 47688-0

Technical Data

Table 1 (example)

		Connection housing SAE3			
		Position			
		(I)	(II)	(III)	(IV)
1	Display on dial gauge 100410	0	a = 0.16	b = -0.08	c = 0.23
1a	Arithmetic value (reversal of the sign)		a1 = -0.16	b1 = +0.08	c1 = -0.23
2	Correction radial bearing clearance (d) (d) = 0.06 mm	-	-	d = -0.06	-
3	Half of the bearing clearance correction (d/2)	-	d/2 = -0.03	-	d/2 = -0.03
4	Corrected vertical total dial gauge display (L _v)	L _v = 0.02			
5	Corrected horizontal dial gauge display (E ₁ , E ₂)	-	E ₁ = -0.19	-	E ₂ = -0.26
6	Horizontal total dial gauge display (L _H)	L _H = 0.07			

6

Calculation example on connection housing SAE 03, radial run-out limit value 0.29 mm	
L _v = b1 + d	L _v = +0.08 + -0.06 L _v = 0.02
E ₁ = a1 + d/2	E ₁ = -0.16 + -0,03 E ₁ = -0.19
E ₂ = c1 + d/2	E ₂ = -0.23 + -0,03 E ₂ = -0.26
L _H = E ₁ - E ₂	L _H = -0.19 - -0.26 L _H = 0.07
$L_R = \sqrt{(L_v)^2 + (L_H)^2}$	$L_R = \sqrt{(0,02)^2 + (0,07)^2}$ L _R = 0.0730
L_R = determined radial run-out limit value (t)	0.0730 mm
Determined radial run-out limit value (t) = 0.0730 mm is lower than the permissible radial run-out limit value (t) = 0,29 mm. No alignment of the connection housing necessary.	

A determined radial run-out limit value (t) greater than 0.29 mm requires alignment of the connection housing.



The sign indicated in the display of the dial gauge is dependent on the dial gauge!

If the dial gauge indicates a positive value when the probe pin moves outwards, the measured value must be noted with a positive sign, in this case, line 1a is omitted.

If the dial gauge indicates a negative value SAE when the probe pin moves outwards, the measured value must be noted with a positive sign, in this case, dial gauge 100410.

Table 2 - connection housing / radial run-out limit value

Connection housing SAE size	Inside diameter (mm)	(t) Radial run-out limit value (mm)
SAE 0	647,7	0,45
SAE 1	511,18	0,36
SAE 2	447,68	0,31
SAE 3	409,58	0,29



SAE 4	361,95	0,25
SAE 5	314,32	0,25

Measurement sheet - connection housing / radial run-out limit value

		Issued by:			
		Date:			
		Engine number:			
		Connection housing:			
		Position			
		(I)	(II)	(III)	(IV)
1	Display on dial gauge 100410	0	a =	b =	c =
1a	Arithmetic value (reversal of the sign)		a1 =	b1 =	c1 =
2	Correction radial bearing clearance (d) (d) = 0.06 mm	-	-	d =	-
3	Half of the bearing clearance correction (d/2)	-	d/2 =	-	d/2 =
4	Corrected vertical total dial gauge display (L _v)	L _v =			
5	Corrected horizontal dial gauge display (E ₁ , E ₂)	-	E ₁ =	-	E ₂ =
6	Horizontal total dial gauge display (L _H)	L _H =			
Calculation					
L _v = b1 + d		L _v =			
E ₁ = a1 + d/2		E ₁ =			
E ₂ = c1 + d/2		E ₂ =			
L _H = E ₁ - E ₂		L _H =			
$L_R = \sqrt{(L_v)^2 + (L_H)^2}$		$L_R = \sqrt{()^2 + ()^2}$			
L _R = determined radial run-out limit value (t)		L _R =			
		t =			

Connection housing SAE size	(t) Radial run-out limit value (mm)		Radial run-out alignment in order	New alignment necessary
	Nominal	Actual		
SAE 0	0,45			
SAE 1	0,36			
SAE 2	0,31			
SAE 3	0,29			
SAE 4	0,25			
SAE 5	0,25			

Removing and install the heating flange



Standard tools



Attention!

See the spare parts documentation.

6

Removing the heating flange

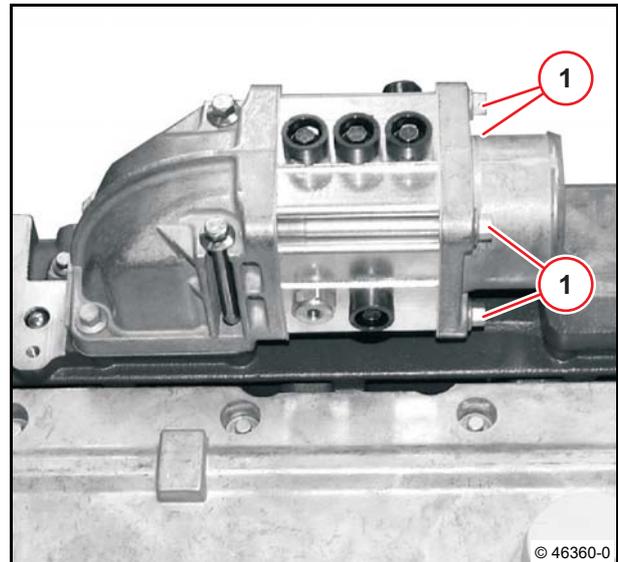
- Disconnect cables.



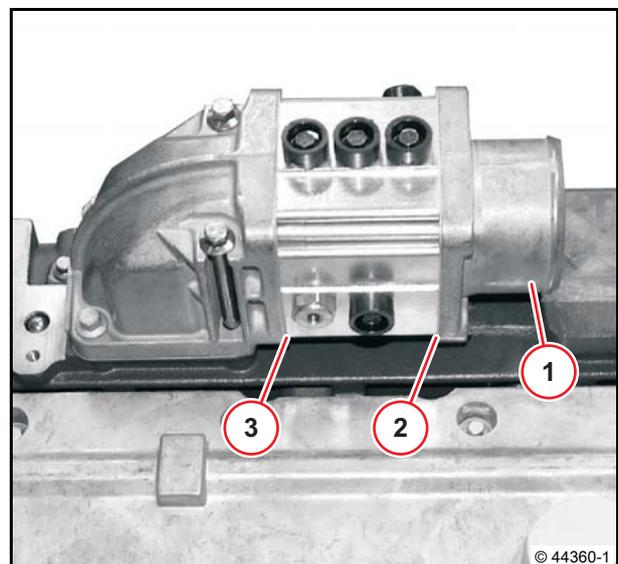
Attention!

Hold on the hexagon of the plus pole screw.

- Unscrew screws (1).



- Remove hose nozzles (1).
- Remove gasket (2).
- Remove heating flange.
- Remove gasket (3).



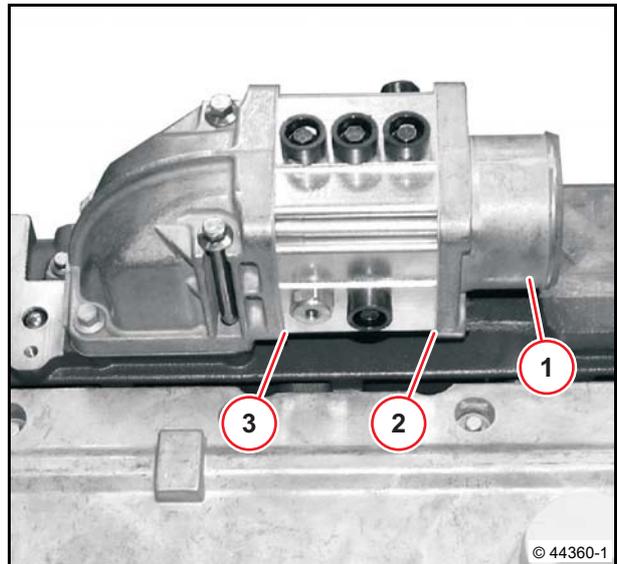
- Visually inspect the component.



6

Installing the heating flange

- Mount gasket (3).
- Mount heating flange.
- Mount gasket (2).
- Mount hose nozzles (1).



- Tighten screws (1).
- Tighten screws (1) alternately.

– Stage 1:



– Stage 2:

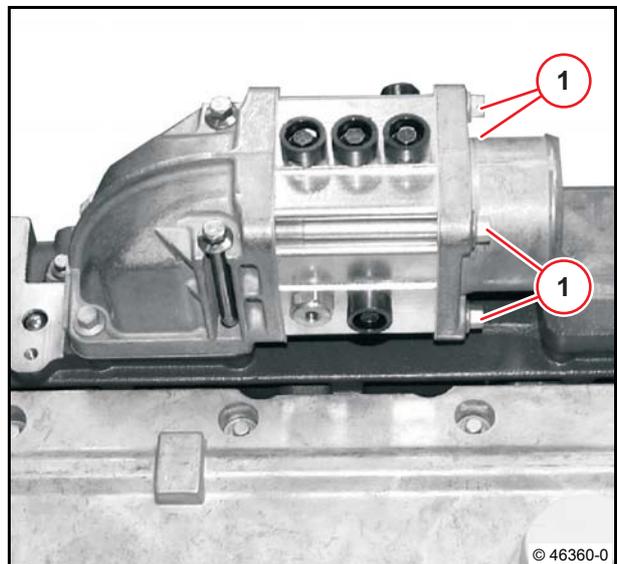


- Connect cable.



Attention!

Hold on the hexagon of the plus pole screw.



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A06 042	Heating flange on charge air manifold	M8x100-10.9	Stage 1:	3 Nm
A06 042	Heating flange on charge air manifold	M8x100-10.9	Stage 2:	30°
A13 065	Cable connection on heater flange		Hexagonal, pole screw locked	20 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.



Removing and installing the glow plugs



Standard tools

Special tools:

– Assembly tool

120440



– [User notes](#)

– [W 19-01-01](#)



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Pay attention to utmost cleanliness when working on the fuel system.

Remove residue paint and particles of dirt before removing.

Clean the respective affected parts carefully. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

After all work on the fuel system, it must be bled - see the operation manual, chapter "6 Fuel system".

Removing the glow plugs

- Unscrew nuts (1).
- Remove cable (arrows).
- Remove injectors.



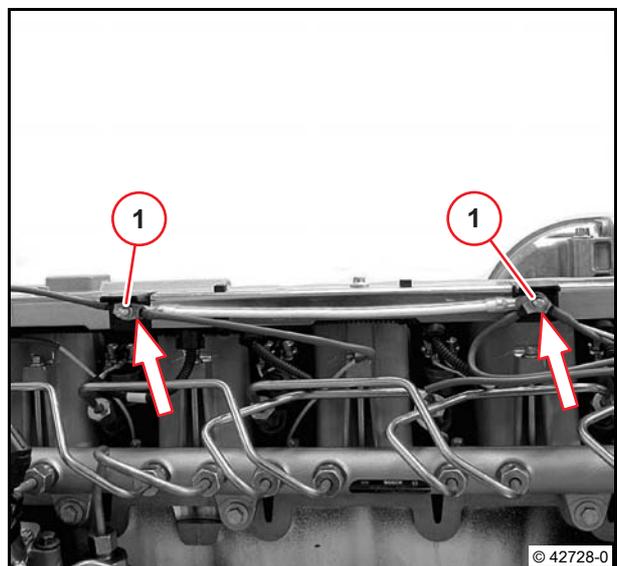
[W 19-01-01](#)



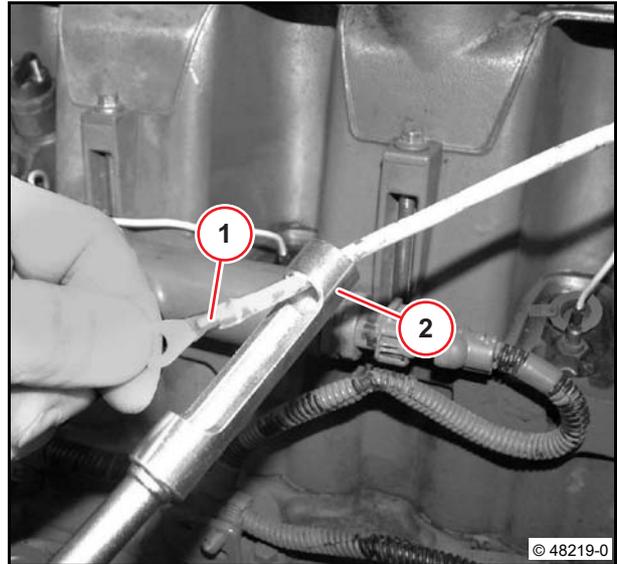
Attention!

Remove residue paint and particles of dirt from the injector before removing it.

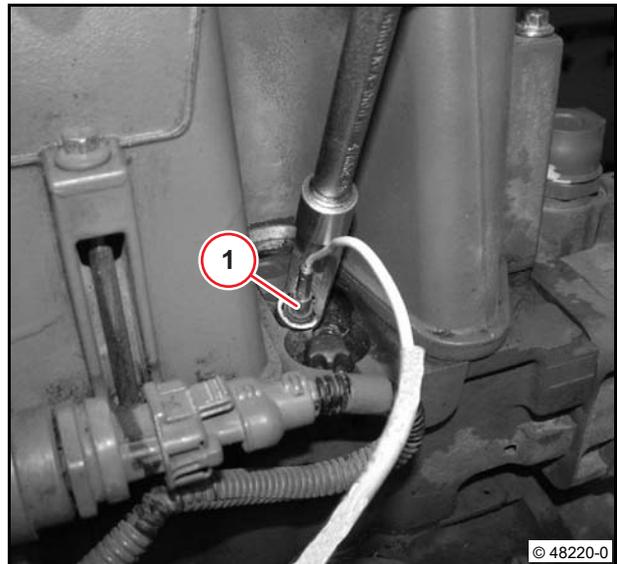
Carefully clean the area around the injector.



- Feed cable (1) through assembly tool (2).



- Unscrew heating plug (1) with assembly tool.
- Visually inspect the component.



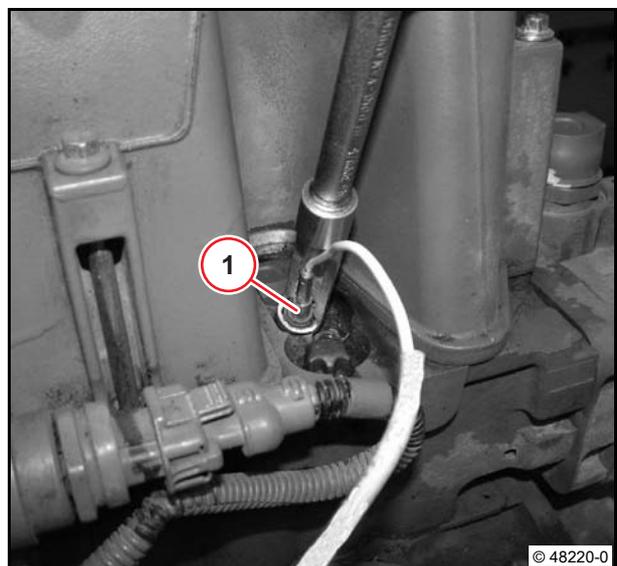
Installing the glow plugs

- Screw in heating plug (1).
- Tighten heating plug (1) with assembly tool.

 20 Nm

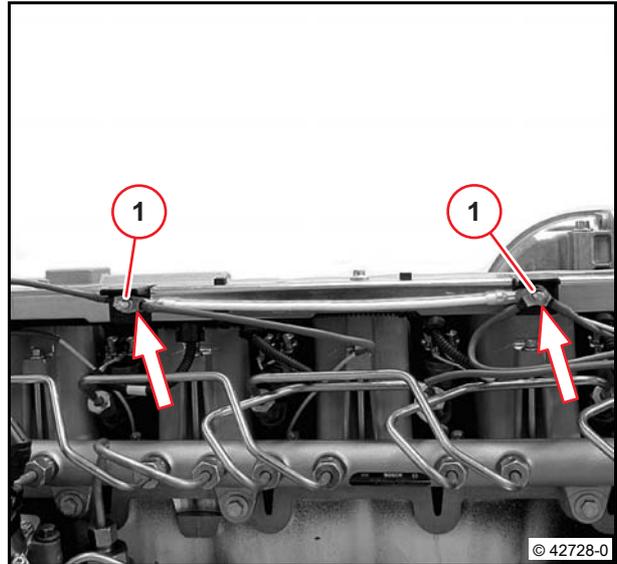
- Install the injectors.

 W 19-01-01



- Install cable (arrows).
- Tighten nuts (1).

 3 Nm



Technical Data

Tightening specifications

ID no.	Name	Screw type	Notes / Remark	Value
A13 030	Cable shoe on connection bolt	M6		3 Nm
A13 032	Heating plug / screw cap on cylinder head			20 Nm



For the tightening procedure according to torque using a torque wrench, a maximum variation of the tightening torque of +/- 10% is permissible.

7 Standard tools

Orders

The tools can be ordered directly, stating the order number, from:

WILBAER
Wilhelm Bäcker GmbH & Co.KG
Postfach 14 05 80
42826 Remscheid
Germany
Tel.: +49 (0) 2191 9339-0
Fax: +49 (0) 2191 9339-200
E-mail: info@wilbaer.de
Web: <http://www.deutz-tools.com>



Conventional tools / special tools:

These must be ordered directly from WILBAER with specification of the order number.

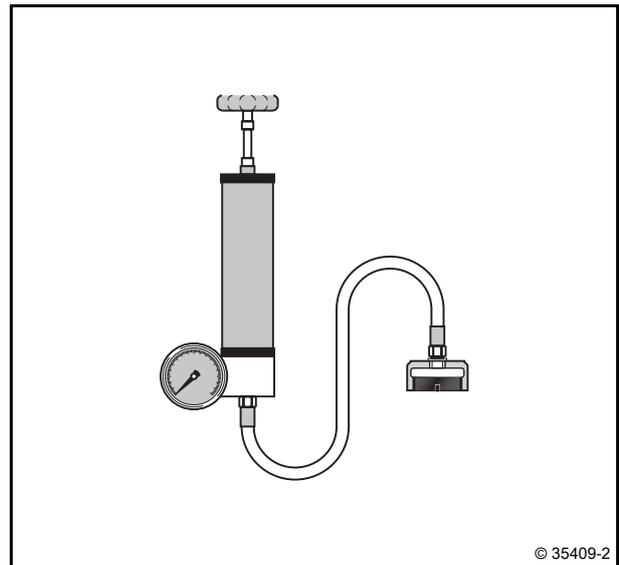
Common Rail test instruments:

These must be ordered like normal DEUTZ spare parts.

8002

Pressure pump

Checking cooling system for leak-tightness



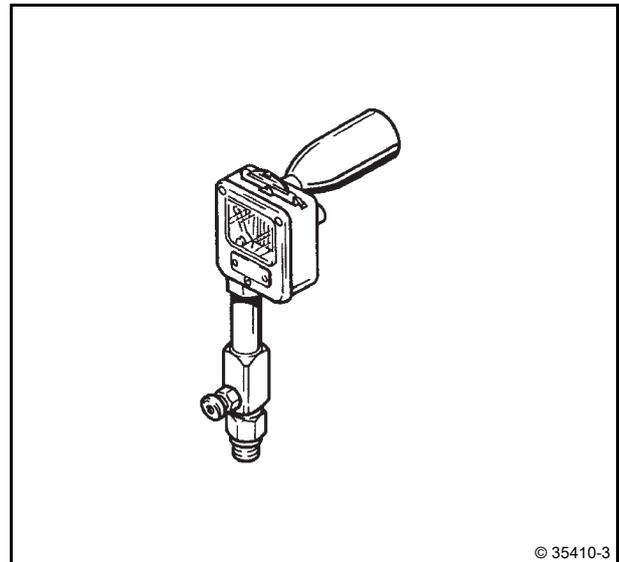
8005

Compression pressure tester

for diesel engines

10 - 40 bar

Checking compression pressure

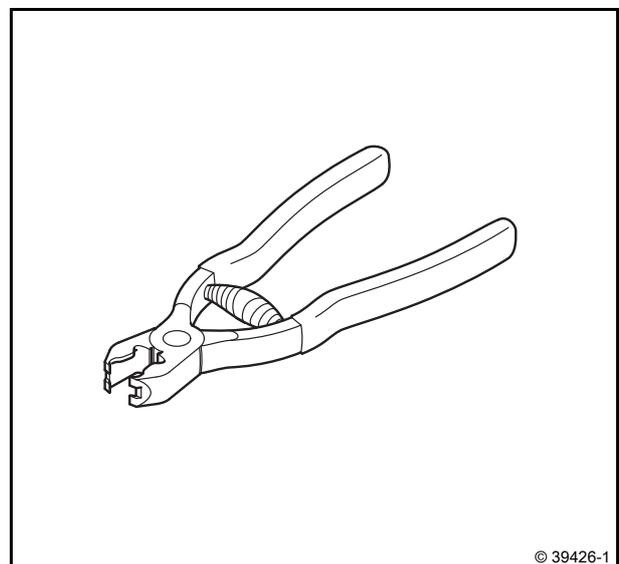


8011

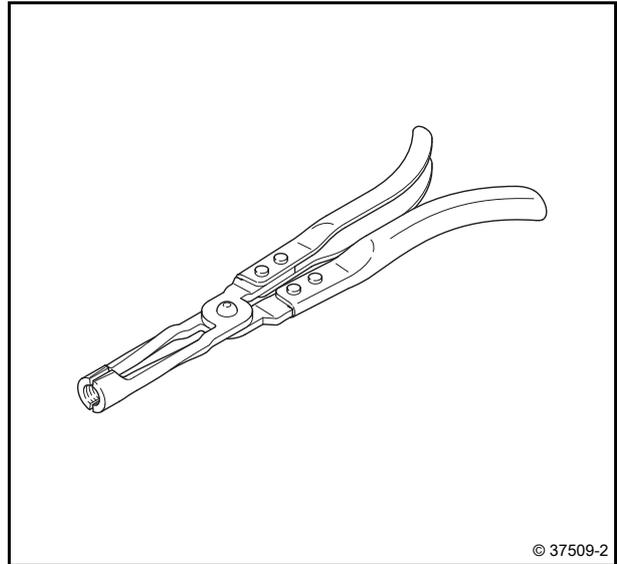
Hose clip pliers

Loosen and fasten hose clips

e. g. fuel return pipe

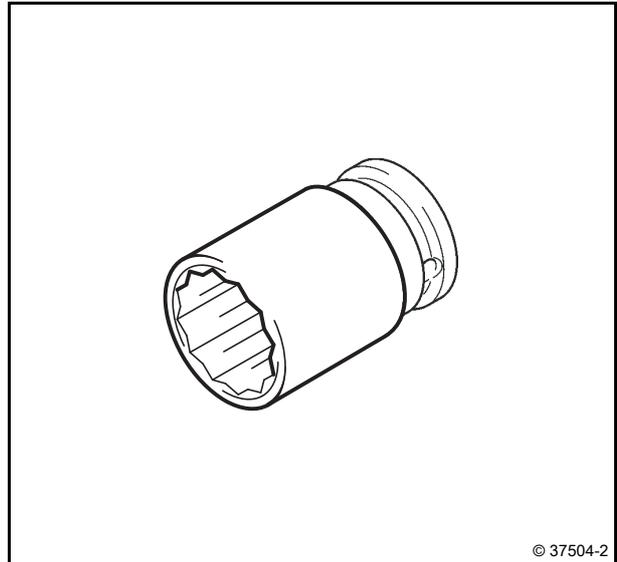


8024
Assembly pliers
Removing valve shaft seals



7

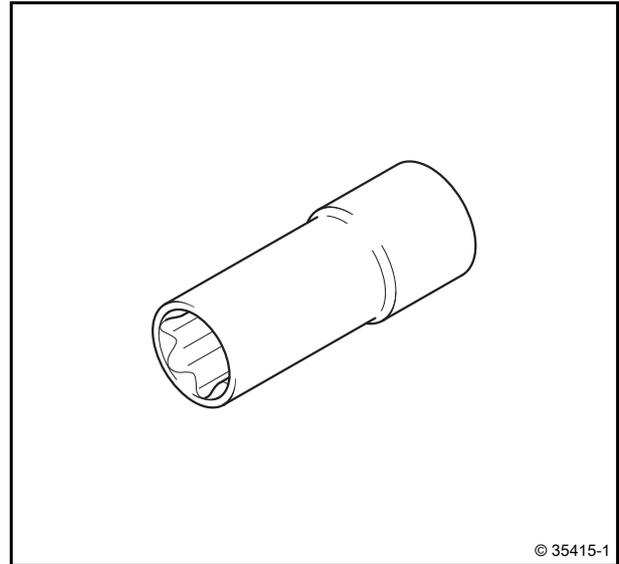
8035
Socket wrench insert
reinforced, size 22
removing and installing main bearing



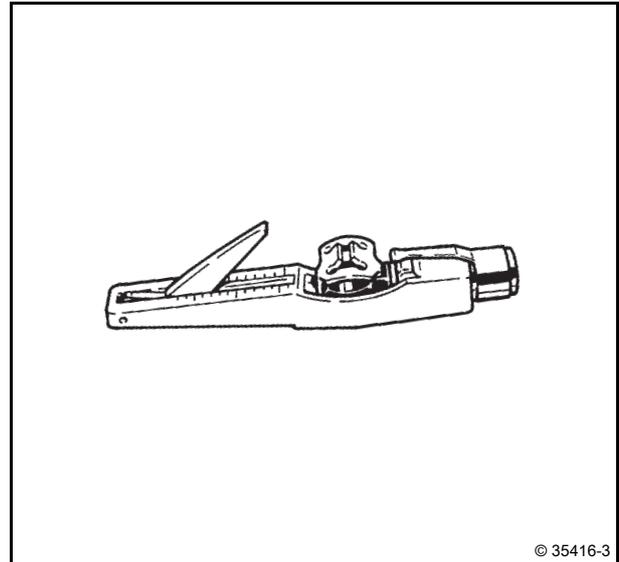
8113
Socket wrench insert
Torx - E 14



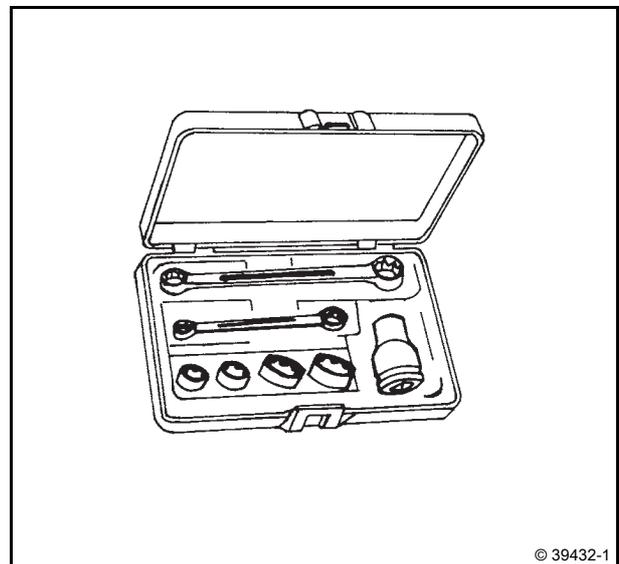
8114
Socket wrench insert
Torx - E 20



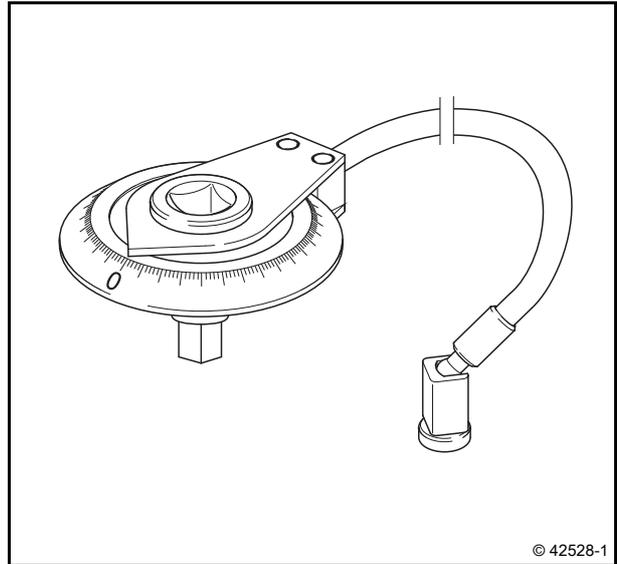
8115
V-belt tension measuring device
150 to 600 N
Check V-belt tension



8189
Torx tool set
Contents of case:
- Double-ended ring spanner E6/E8
- Double-ended ring spanner E10/E12
Socket wrench insert E8 and E10 (1/4 inch)
- Socket wrench insert E10 and E12 (3/8 inch)
- Socket wrench insert E18 (1/2 inch)



8190
Rotation angle disc
with magnet
Setting valve clearance

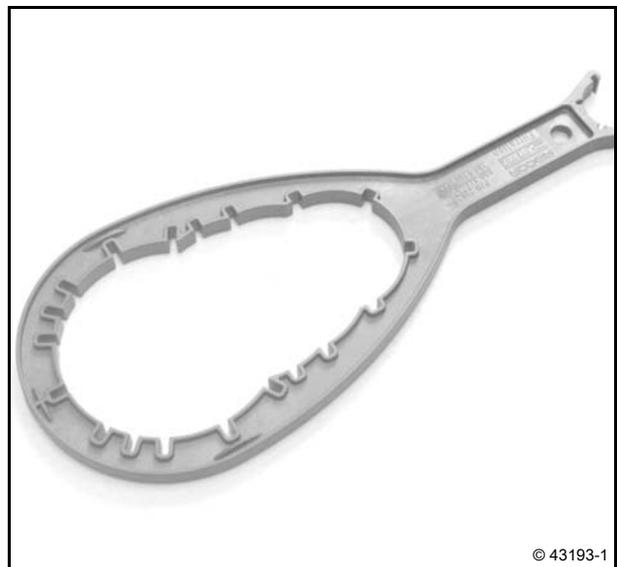


7

8191
Screwdriver insert
for slotted screw
Valve clearance setting



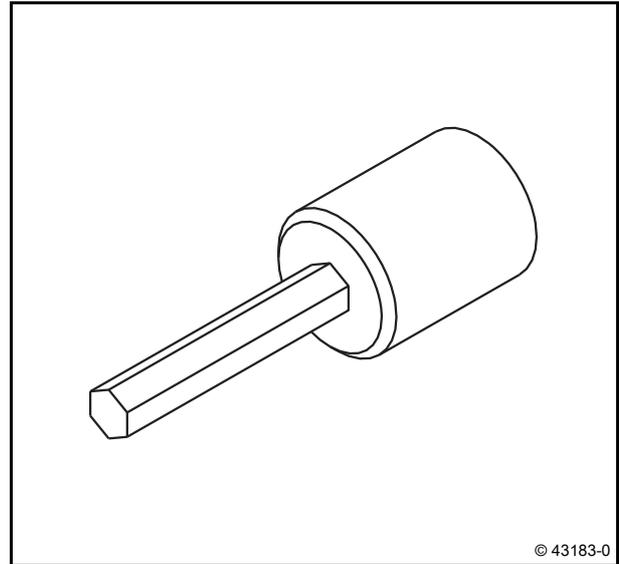
8192
Bowl wrench
Fuel pre-filter (type: Racor)



8193

Screwdriver insert

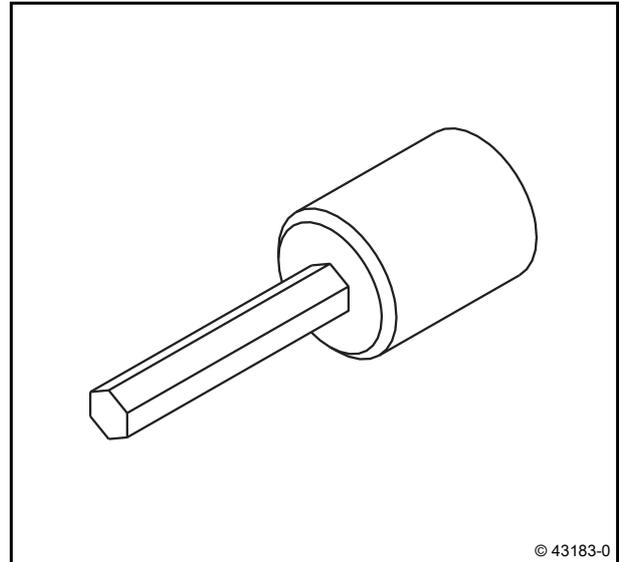
with pressed in hexagonal pin (5 mm),
1/2 inch, long version
(in conjunction with rotation angle disc 8190)



8194

Screwdriver insert

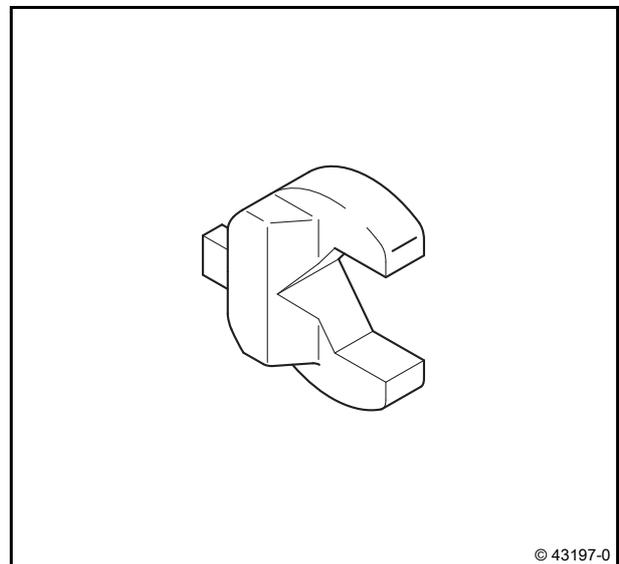
with pressed in hexagon pin (4 mm),
3/8 inch, long version
(in connection with rotation angle disc 8190 and reducer 1/2 to 3/8 inch)



8196

Open end wrench adapter

Size 13,
for torque wrench
Tighten lock nut of the valve clearance setting screw.

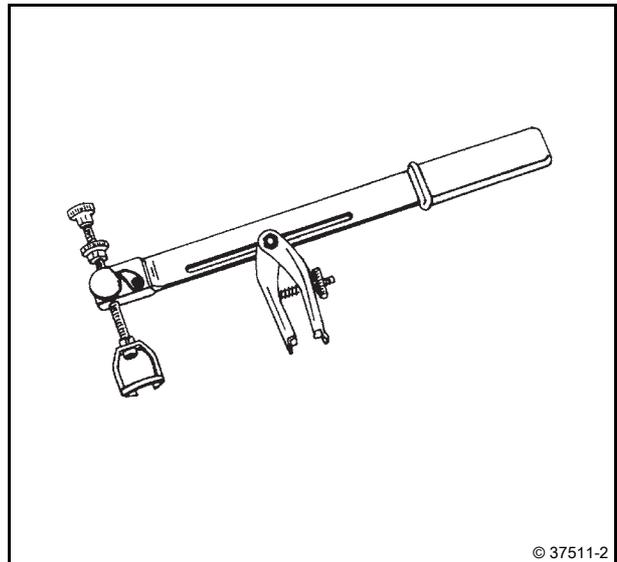


8198
Pricker
Removing rotary shaft lip seal

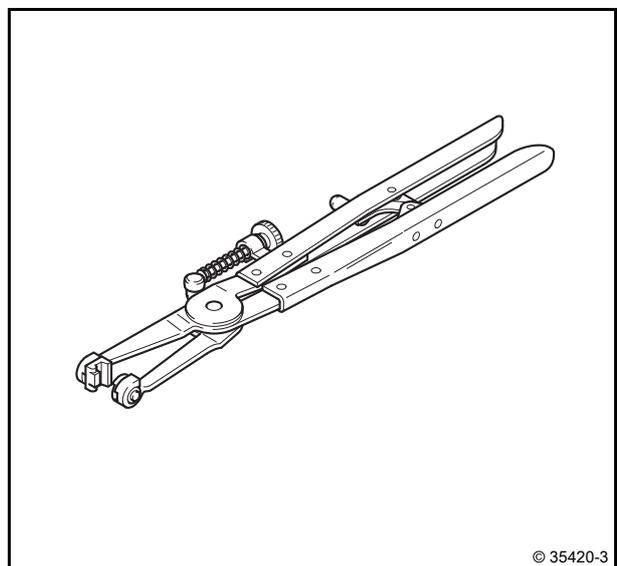


7

9017
Assembly lever
e. g. removing and installing valves



9090
Spring band pliers
320 mm
Tighten spring clamp



8 Special tools

Orders

The tools can be ordered directly, stating the order number, from:

WILBAER
Wilhelm Bäcker GmbH & Co.KG
Postfach 14 05 80
42826 Remscheid
Germany
Tel.: +49 (0) 2191 9339-0
Fax: +49 (0) 2191 9339-200
E-mail: info@wilbaer.de
Web: <http://www.deutz-tools.com>



Conventional tools / special tools:

These must be ordered directly from WILBAER with specification of the order number.

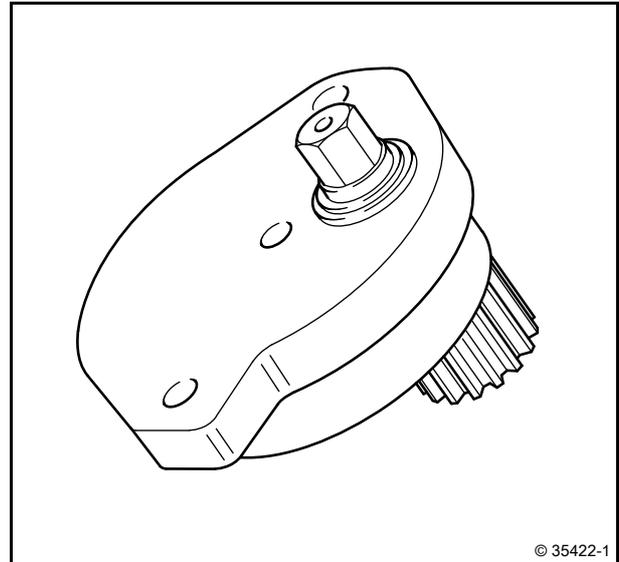
Common Rail test instruments:

These must be ordered like normal DEUTZ spare parts.

100190
Connector
(in conjunction with compression pressure tester 8005)



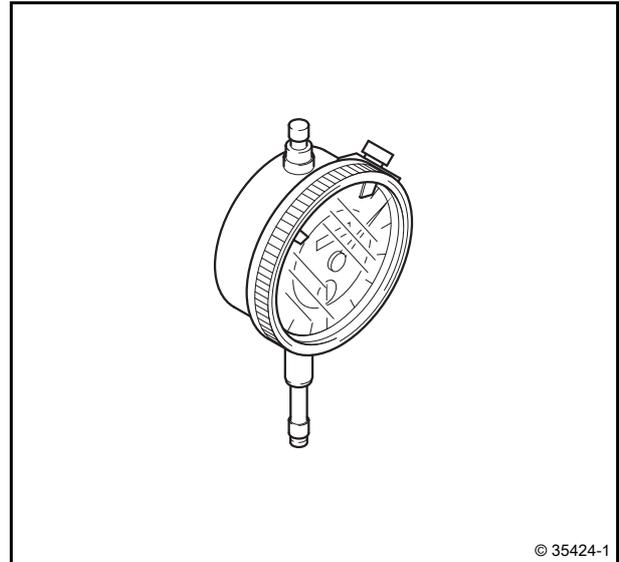
100320
Turning gear
flywheel side



100380
Turning gear
on hub torsional vibration damper/V-belt pulley

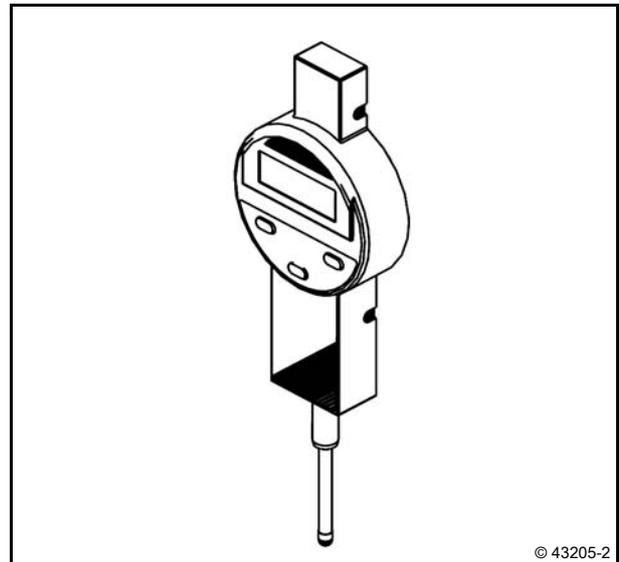


100400
Dial gauge with fixing wheel
Measuring range 0 - 10 mm / 0.01 mm

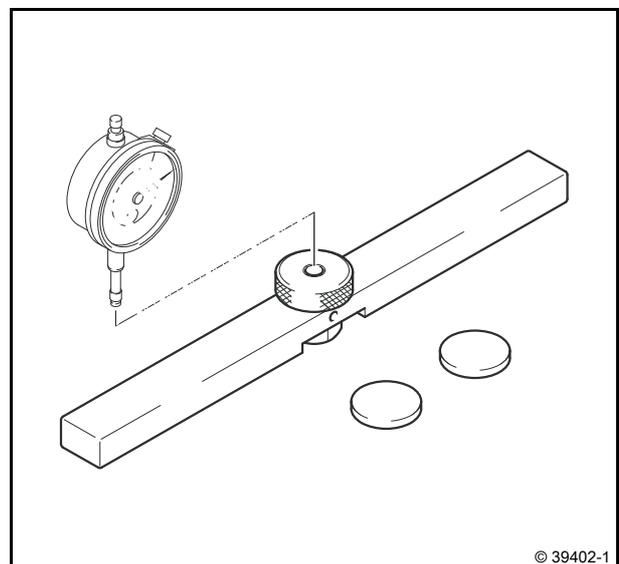


8

100410
Digital gauge
Measuring range 0 - 30 mm / 0.01 mm



100750
Measuring device
Measuring bar with two shims
(in conjunction with 100400 and 100410)
Checking valve lag dimension
Checking piston projection



103050

Socket wrench insert

Size 15

for valve clearance setting with removed exhaust return module

(in connection with 8190)



103140

Crowfoot wrench

with installed EGR module



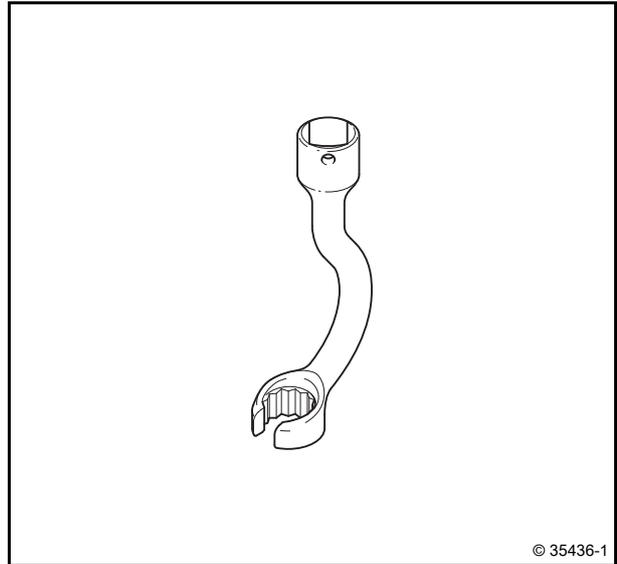
103220

Special pliers

for removing the roller tappet



110500
Special wrench
Wrench size 17
Removing and installing high-pressure lines



8

110620
Lever tool
Removing the injector



110640
Lever tool
Removing the injector
with removed rail

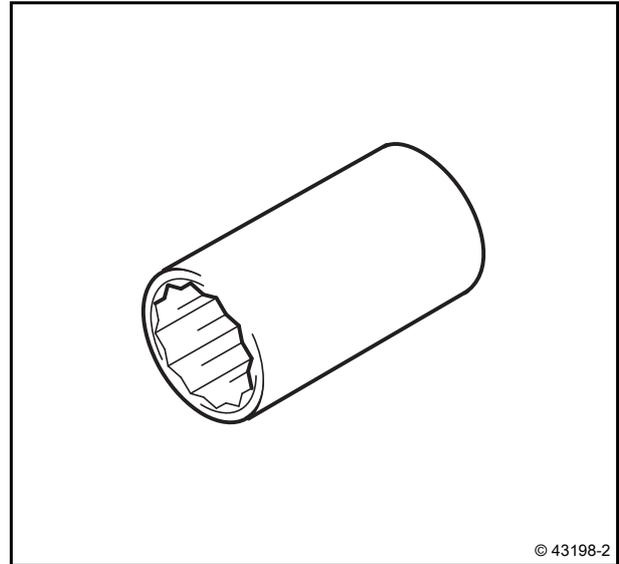


110700

Socket wrench insert

long

Installing and removing pressure sensors
(rail pressure, oil pressure, fuel pressure)



© 43198-2

110900

Assembly case

Case for O-rings, complete with:

Disassembly tool 110901 and three
assembly sleeves with guide:

- High pressure pump (Ø 36), 110902
- Injector, 2V motor (Ø 16), 110903
- Injector, 4V motor (Ø 23), 110904

Removing and installing O-rings

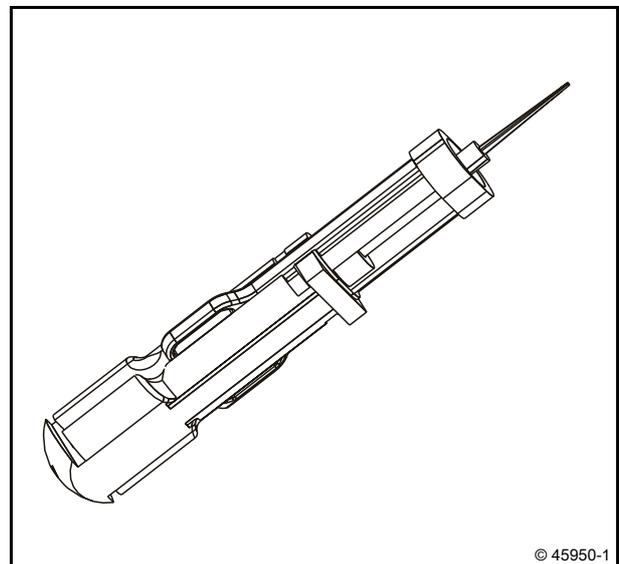


© 43208-0

110901

Disassembly tool

Removing and installing the O-rings



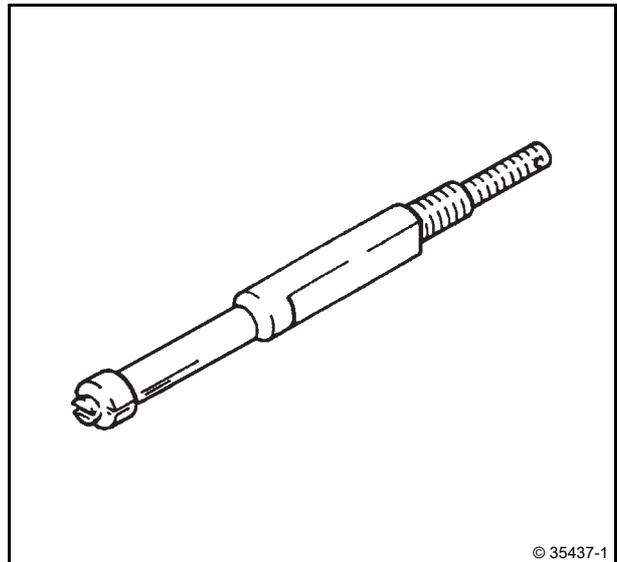
© 45950-1

120440
Assembly tool
Removing and installing the glow plugs

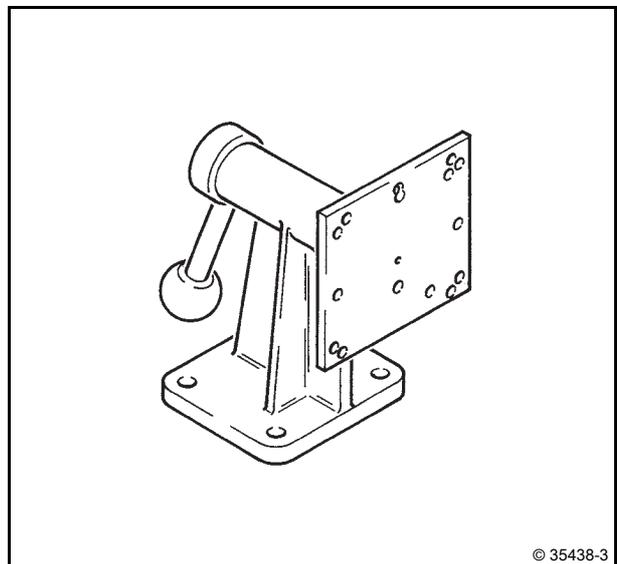


8

120680
Puller
(in conjunction with slide hammer 150800)
Removing jammed injector sealing ring



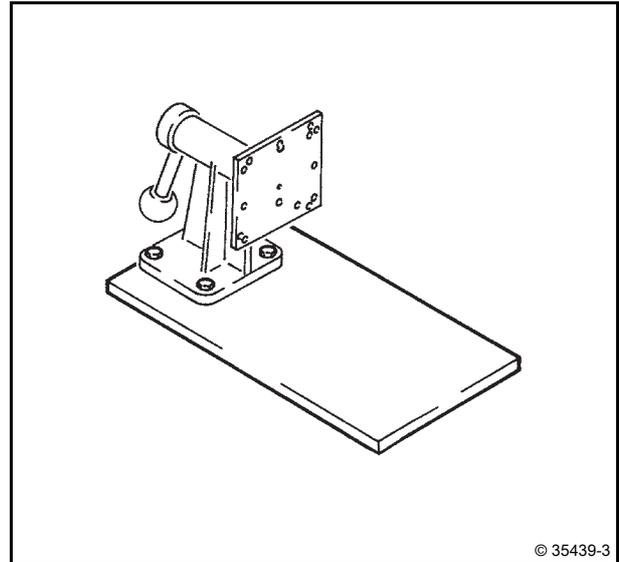
120900
Support bracket
pivoting
Clamping cylinder head



120910

Base plate

(in conjunction with support bracket 120900 if support bracket is not screwed tightly)

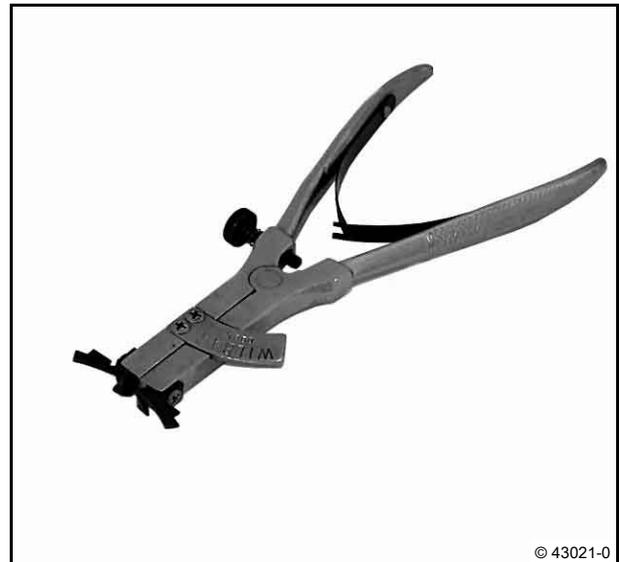


© 35439-3

130300

Universal piston ring pliers

Removing and installing the piston rings

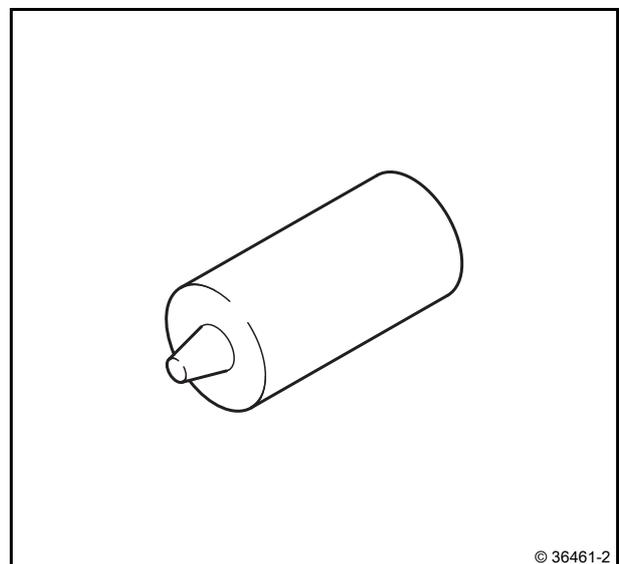


© 43021-0

130420

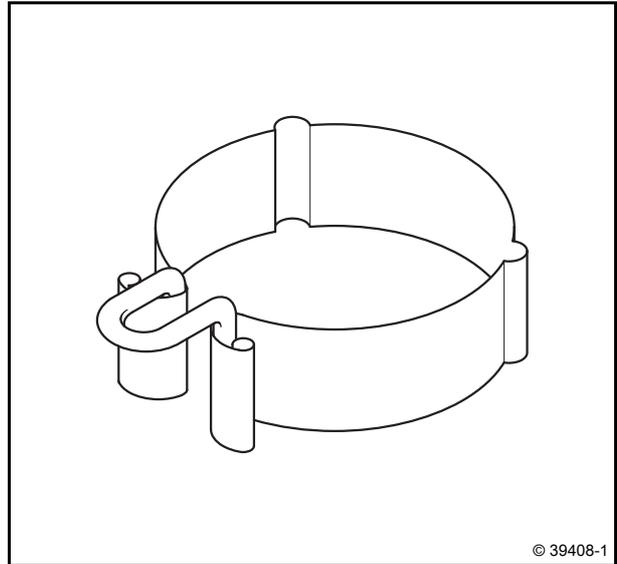
Trapezoidal groove wear gauge

Piston diameter 108 mm



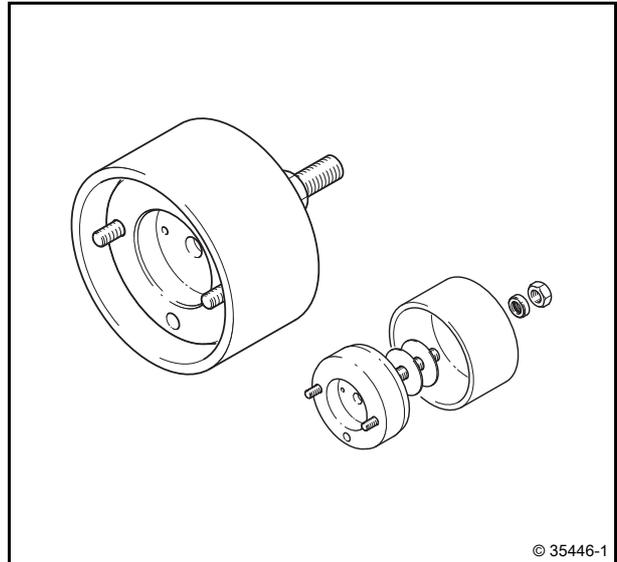
© 36461-2

130640
Piston ring compressor
Piston diameter 108 mm

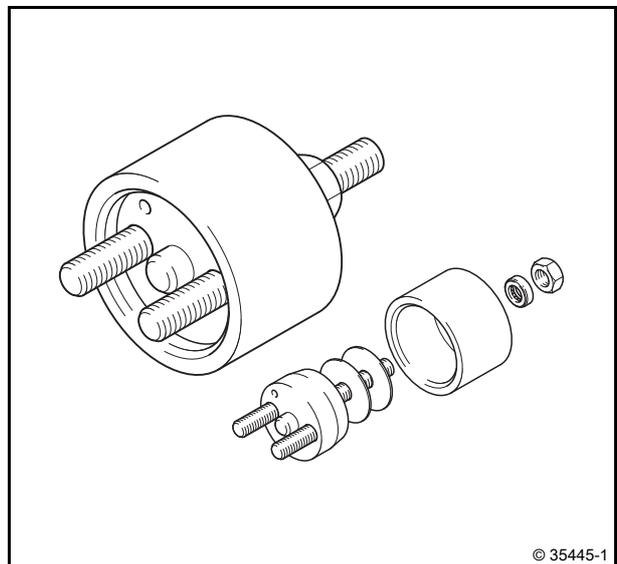


8

142810
Assembly tool
Installing crankshaft sealing ring
(flywheel side)



142820
Assembly tool
Installing crankshaft sealing ring
(opposite side to flywheel)

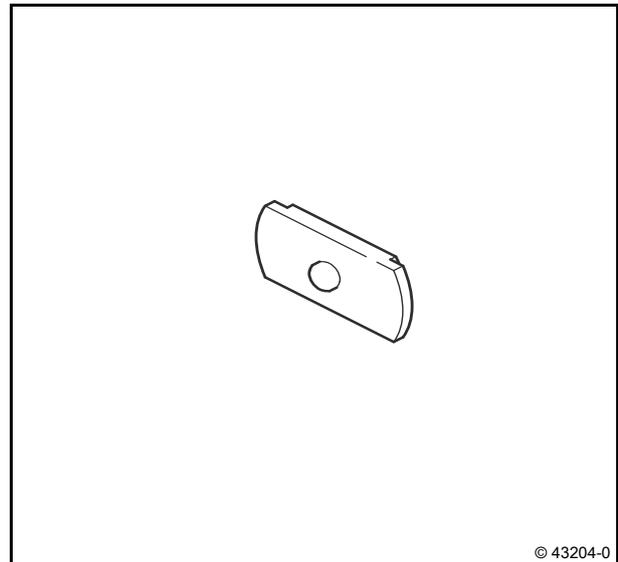


150170**Puller, universal**

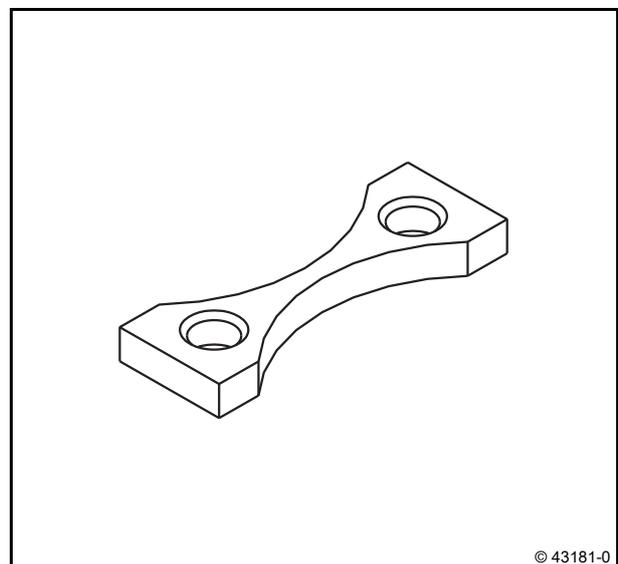
comprising traverse, support and threaded rod
(in conjunction with disc 150171)
Removing cylinder liner

**150171****Tension plate**

(in conjunction with disassembly device 150170)
for liner diameter: 108 mm
Removing cylinder liner

**150180****Liner holder**

(Set comprises 7 holders)
Turning crankshaft with cylinder head removed



150190

Assembly lever

Lever with bolts

(in conjunction with disc 150191)

Installing cylinder liner



8

150191

Washer

(in conjunction with assembly lever 150190)

for liner diameter: 108 mm

Installing cylinder liner

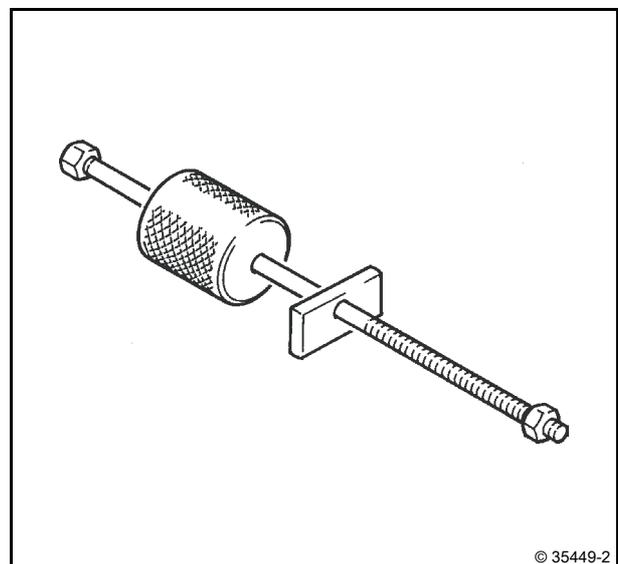


150800

Slide hammer

(in conjunction with disassembly device 120680)

Disassembling injector sealing ring



151500

Separating tool

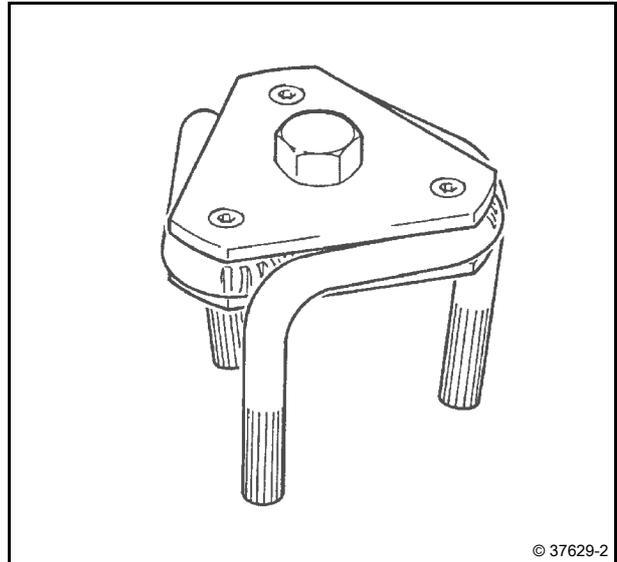
Removing metal sheet lubricating oil pan from crankcase



170050

Special wrench

Unscrewing the filter cartridges



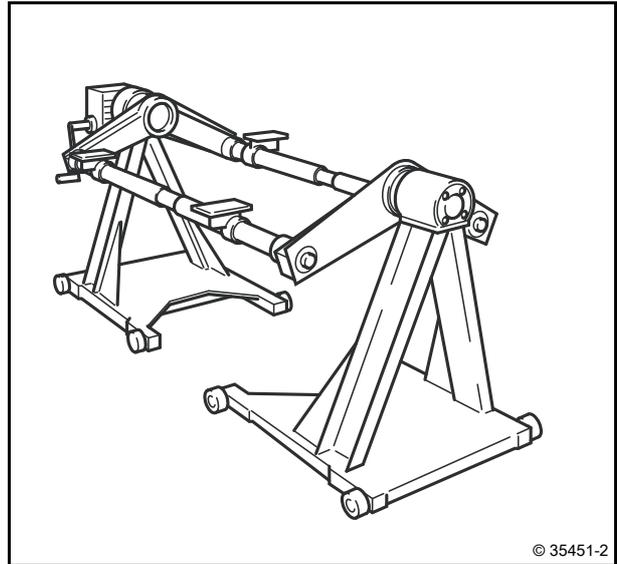
170160

Stoppers/caps

1 set of differently-sized stoppers and caps
Sealing openings on the fuel system

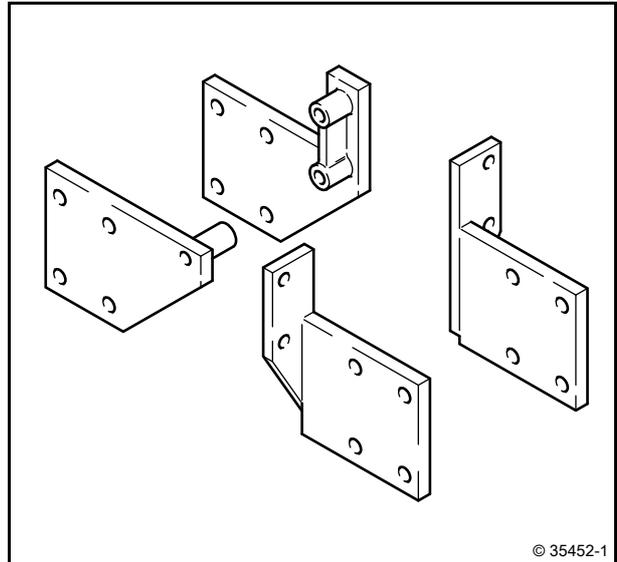


6066
Assembly block
Engine clamping, double-sided



8

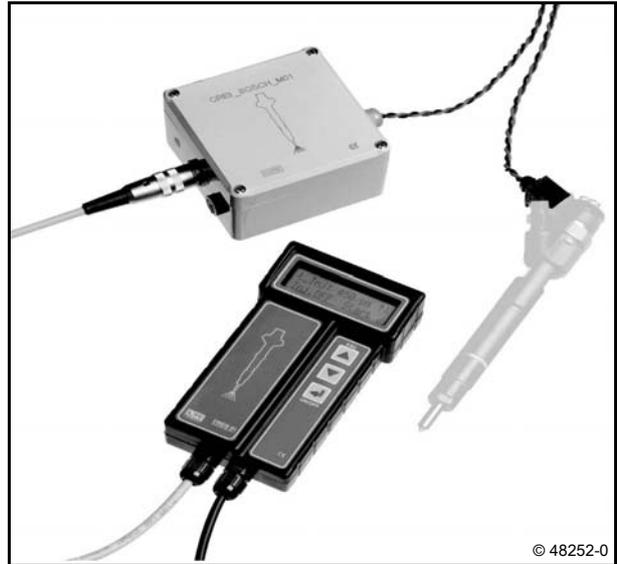
6066/158
Clamping bracket
consisting of:
1 holder 6066/158-1 rear right,
1 holder 6066/158-2 rear left,
1 holder 6066/158-3 front right,
1 holder 6066/158-4 front left
(in connection with assembly block 6066)
Clamping of the engine, double-sided



6068
Engine lifting device
Load (2000 kg), 3-point suspension, spindle clamp,
cross member, chains and hooks



02937495
Control signal transmitter
Testing Common Rail Injectors



02937496
Hydraulic pressure generation



02937497
Pressure loss tester
Top dead centre gauge



02937498
High pressure tester
2500 bar

