ID no.	Designation	Information	Series			Value	Unit
General engine data							
P00 01	Length of engine		TCD 2012	L6	2V	1108	mm
P00 02	Width of engine		TCD 2012	L6	2V	742	mm
P00 03	Height of engine		TCD 2012	L6	2V	901,5	mm
		Deep oil tray				1101,05	
P00 04	Engine weight according to DIN 70020-A	approx.	TCD 2012	L4	2V	410	kg
				L6	2V	530	
P00 10	Working principle		TCD 2012		2V	Four-stroke	-
P00 20	Combustion process		TCD 2012		2V	Diesel direct injection	-
P00 30	Total volume		TCD 2012	L4	2V	4038	cm^3
				L6	2V	6067	
P00 31	Bore		TCD 2012		2V	98	mm
						101	
						101,5	
P00 32	Stroke		TCD 2012		2V	126	mm
P00 40	Compression ratio		TCD 2012		2V	18	-
P00 50	Direction of rotation	looking onto the flywheel	TCD 2012		2V	left	-
P00 51	Compression pressure		TCD 2012		2V	30 - 38	bar
						3000 - 3800	kPa
P00 71	Ignition sequence		TCD 2012	L4	2V	1 - 3 - 4 - 2	-
				L6	2V	1 - 5 - 3 - 6 - 2 - 4	
Cylinder head							
P01 01	Valve seat ring bore, inlet	Standard, fit H7	TCD 2012		2V	$46^{+0,025}_{-0}$	mm
P01 02	Valve seat insert bore, outlet	Standard, fit H7	TCD 2012		2V	$39,9^{+0,025}_{-0}$	mm

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ID no.	Designation	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A00 001	Clamping bracket on crankcase			TCD 2012		2V	70 Nm	
A00 002	Clamping bracket on adapter for assembly block			TCD 2012		2V	90 Nm	
A00 003	Mounting feet/engine mounting on crankcase			TCD 2012		2V	95^{+10}_{-10} Nm	
A01 001	Cylinder head on crankcase		Note tightening order. Lightly oil screws. Use 3 times with written proof, otherwise use new screws every time they are loosened.	TCD 2012		2V	30 Nm	80 Nm +90°
A01 002	Rocker arm bracket on cylinder head	Cylinder head screw	Installation advice: rocker arm symmetrical to the valve center axles, see A01 001	TCD 2012		2V	30 Nm	
A01 003	Lock nut valve clearance setting screw			TCD 2012		2V	20^{+2}_{-2} Nm	
A01 004	Cylinder head cover on cylinder head	M6		TCD 2012		2V	13 Nm	
A01 011	Exhaust return module on cylinder head		Observe tightening sequence	TCD 2012		2V	10 Nm	30 Nm
A01 012	Lock nut setting screw exhaust return module			TCD 2012		2V	20^{+2}_{-2} Nm	
A01 013	Solenoid valve (exhaust return line) on cylinder head			TCD 2012		2V	24 Nm	
A01 016	Locking screw on cylinder head	M14x12	Renew sealing ring	TCD 2012		2V	34 Nm	
A02 010	Main bearing on crankcase		Can be used 3 times with written proof, otherwise use new screws every time they are loosened.	TCD 2012		2V	50 Nm	+60°
A02 020	Con rod bearing cover on con rod		Use new screws every time they are loosened.	TCD 2012		2V	30 Nm	+60°
A03 020	Front cover on crankcase		Wet rotors with engine oil before installing.	TCD 2012		2V	3 Nm	21 Nm

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Checking the compression pressure

Commercial available tools:
– Compression pressure tester 8005
– Torx tool set 8189

Special tools:
– Connector 100 190

– W 01-01-01
– W 07-15-11

Checking the compression pressure

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

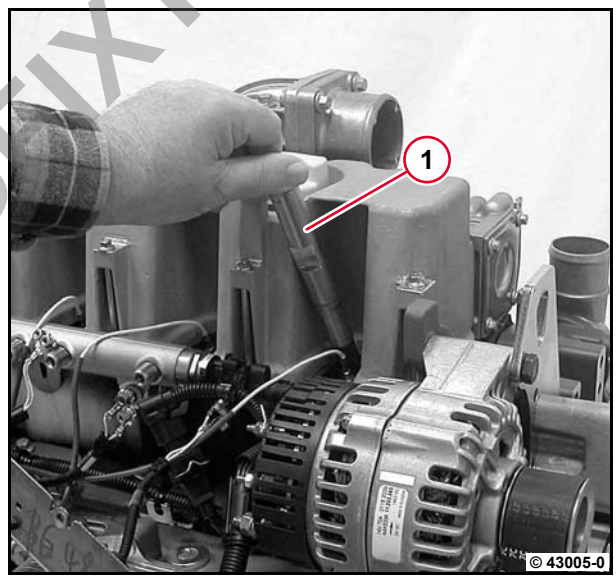
  W 01-01-01

- Remove injectors.

  W 07-15-11

- Insert connector (1) with sealing ring.

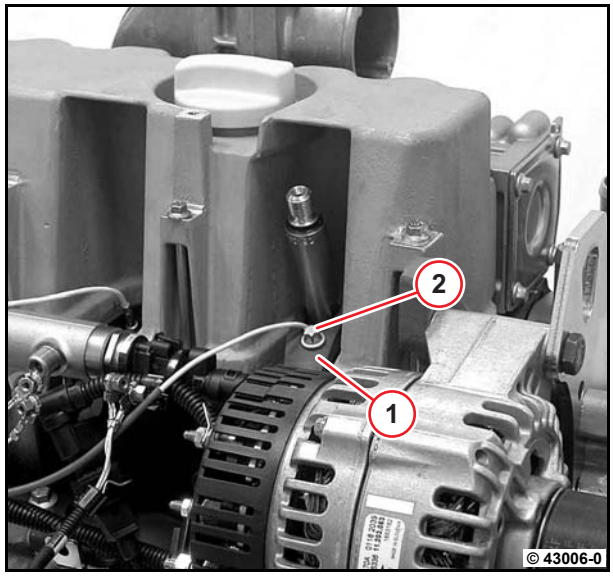
  Use sealing ring for injector.



- Mount clamping shoe (1) and tighten screw (2).

  A07 001

  When installing the connector on cylinders 2 to 5, the clamping shoe must be inserted together with the connector.



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ID no.	Designation	Information	Series			Value	Unit
P01 05	Valve guide, bore in cylinder head	Standard, fit H6	TCD 2012		2V	$8{,}008^{+0{,}025}_{-0}$	mm
P01 08	Cylinder head, height	Standard	TCD 2012		2V	90	mm
Valve seat insert							
P01 21	Valve seat insert outside diameter, inlet	Standard, 30 degrees	TCD 2012		2V	$46{,}09^{0}_{0{,}02}$	mm
P01 22	Valve seat insert outside diameter, outlet	Standard, 45 degrees	TCD 2012		2V	$39{,}99^{0}_{0{,}02}$	mm
Valve							
P01 31	Valve shaft diameter, inlet	Standard, fit h7	TCD 2012		2V	$7{,}94^{0}_{-0{,}04}$	mm
P01 32	Valve shaft diameter, outlet	Standard, fit h7	TCD 2012		2V	$7{,}94^{0}_{-0{,}04}$	mm
P01 33	Valve stem clearance, inlet		TCD 2012		2V	0,012	mm
P01 34	Valve stem clearance, outlet		TCD 2012		2V	0,014	mm
P01 35	Valve edge thickness, inlet		TCD 2012		2V	2,36	mm
P01 36	Valve edge thickness, outlet		TCD 2012		2V	1,8	mm
P01 37	Valve head diameter, inlet		TCD 2012		2V	$44{,}4^{+0{,}1}_{-0{,}1}$	mm
P01 38	Valve head diameter, outlet		TCD 2012		2V	$38{,}7^{+0{,}1}_{-0{,}1}$	mm
Valve seat							
P01 45	Valve lag dimension, inlet		TCD 2012		2V	$0{,}9^{+0{,}15}_{-0{,}1}$	mm
P01 46	Valve lag dimension, outlet		TCD 2012		2V	$0{,}9^{+0{,}15}_{-0{,}1}$	mm
P01 47	Valve seat angle, inlet		TCD 2012		2V	30	°
P01 48	Valve seat angle, outlet		TCD 2012		2V	45	°
Valve spring							
P01 51	Valve spring length (unclamped normal)		TCD 2012		2V	$59^{+1{,}9}_{-1{,}9}$	mm
	Valve spring wire diameter					$4^{+0{,}03}_{-0{,}03}$	

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ID no.	Designation	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A03 030	Oil tray on crankcase		Observe tightening sequence	TCD 2012		2V	30 Nm	
A03 031	Locking screw on oil tray (aluminum or sheet steel)	M18x1.5	Cu sealing ring	TCD 2012		2V	55 Nm	
A03 060	Crankcase ventilation on cylinder head			TCD 2012		2V	21 Nm	
A03 062	Return line to return stop valve	Hollow screw		TCD 2012		2V	30^{+3}_{-3} Nm	
A03 063	Return stop valve on crankcase			TCD 2012		2V	80^{+8}_{-8} Nm	
A03 065	Hold oil return line (pipe clip)			TCD 2012		2V	30 Nm	
A03 080	Connection housing to crankcase	M12x80 mm	Observe tightening sequence	TCD 2012		2V	99 Nm	
		M12x150 mm						
A03 082	Connection housing to crankcase	M16x75	Observe tightening sequence	TCD 2012		2V	243 Nm	
		M16x140 mm						
A03 085	Cover plate to connection housing			TCD 2012		2V	8.5 Nm	
A03 091	Gearcase on crankcase	M16x60-10.9	Observe tightening sequence	TCD 2012		2V	70^{+5}_{-5} Nm	
A03 092	Gearcase on crankcase	M8x35-10.9	Observe tightening sequence	TCD 2012		2V	30^{+3}_{-3} Nm	
		M8x45-10.9						
		M8x50-10.9						
A04 022	Cap on gearcase			TCD 2012		2V	21 Nm	
A05 011	Impulse transmitter (crankshaft) on holder on front cover			TCD 2012		2V	9 Nm	
A05 012	Impulse transmitter (camshaft) on gearcase			TCD 2012		2V	9 Nm	
A05 013	Holder impulse transmitter (crankshaft) on front cover			TCD 2012		2V	9 Nm	
A06 001	Exhaust manifold on cylinder head		Observe tightening sequence	TCD 2012		2V	25 Nm	
A06 020	Turbocharger on exhaust manifold			TCD 2012		2V	42 Nm	

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Mounting engine on assembly block and demounting

Commercial available tools:
– Hoisting equipment
– Suspension ropes

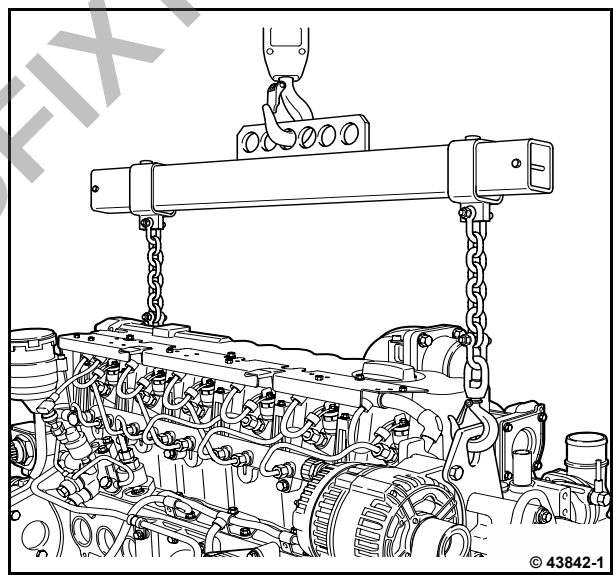
Special tools:
– Assembly block incl. adapter plates 6066
– Clamping bracket 6066/158

Different customer scopes are not taken into account in the repair sequence shown here, add-on parts which deviate from the standard equipment are not shown.

Mounting engine on assembly block

- Hang engine on suitable workshop crane.

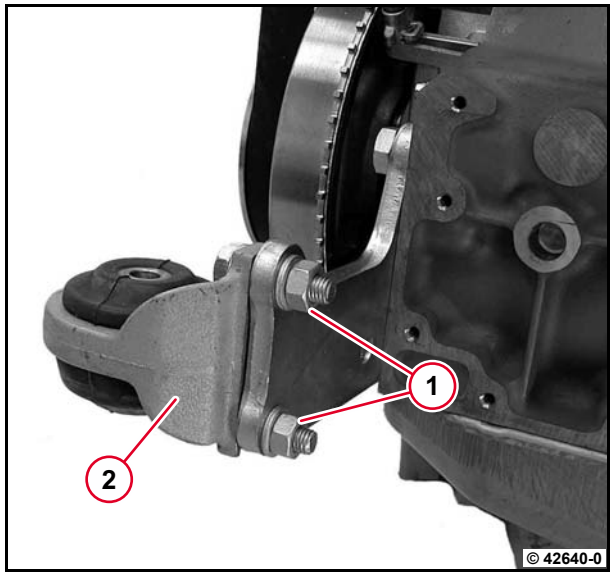
P00 04



Remove mounting feet.

- Unscrew nuts (1) and remove mounting foot (2) from the holder.

Remove all mounting feet.



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ID no.	Designation	Information	Series			Value	Unit
Valve clearance							
P01 61	Valve clearance, inlet (on cold engine)	on cold engine, oil temperature < 80 °C, after a cooling down time of at least 0.5 h	TCD 2012		2V	75	°
P01 62	Valve clearance, outlet (on cold engine)	on cold engine, oil temperature < 80 °C, after a cooling down time of at least 0.5 h	TCD 2012		2V	120	°
P01 63	Valve clearance setting	Valve overlap as per setting diagram, see: Table T01 63	TCD 2012		2V	-	-
P01 64	Clearance between control piston and rocker arm		TCD 2012		2V	144	°
Rocker arm/bracket							
P01 72	Rocker arm, bore, diameter, outlet		TCD 2012		2V	$21{,}02^{+0{,}033}_{-0}$	mm
P01 73	Rocker arm, bore, diameter, inlet		TCD 2012		2V	$21{,}02^{+0{,}033}_{-0}$	mm
P01 74	Rocker arm pin	Diameter, fit h7	TCD 2012		2V	$21^{+0}_{-0{,}021}$	mm
Drive system							
Main bearing pin							
P02 03	Main bearing pin	Standard, diameter	TCD 2012		2V	$84^{+0}_{-0{,}02}$	mm
P02 04	Crankshaft main bearing pin	two underdimension stages per	TCD 2012		2V	0,25	mm
P02 07	Crankshaft main bearing pin and lifting journal, hardness	Standard HRC	TCD 2012		2V	55^{+6}	HRC
Fit bearing pin							
P02 10	Fit bearing pin	two underdimension stages per	TCD 2012		2V	0,25	mm
P02 11	Width of fit bearing pin		TCD 2012		2V	$32{,}2^{+0{,}04}$	mm
P02 12	Width of fit bearing pin, overdimension	one overdimension stage	TCD 2012		2V	0,4	mm

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ID no.	Designation	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A06 030	Charge air line on cylinder head			TCD 2012		2V	13 Nm	
A06 042	Heating flange on charge air manifold			TCD 2012		2V	30 Nm	
A06 046	Charge air manifold on charge air pipe	M8x30-10.9 M8x95-10.9		TCD 2012		2V	30 Nm	
A06 047	Hose nozzle on charge air manifold	M8x30-10.9		TCD 2012		2V	30 Nm	
A07 001	Clamping shoe injector on cylinder head		Observe assembly sequence Install injector tension-free	TCD 2012		2V	16^{+5} Nm	
A07 003	Injection lines on rail and injector, High-pressure line on high-pressure pump		Assembly specification	TCD 2012		2V	25 Nm	
A07 024	Fuel supply pump on holder			TCD 2012		2V	22^{+2}_{-2} Nm	
A07 025	Holder fuel supply pump on holder			TCD 2012		2V	30 Nm	
A07 026	V-belt pulley on fuel supply pump		Use new screws every time they are loosened.	TCD 2012		2V	27^{+2}_{-2} Nm	
A07 031	High-pressure pump on crankcase	M10x30		TCD 2012		2V	10 Nm	50 Nm
A07 032	Control block on crankcase			TCD 2012		2V	30 Nm	
A07 034	Fuel pipe on high-pressure pump			TCD 2012		2V	29 Nm	
A07 035	Fuel pipe on control block			TCD 2012		2V	39 Nm	
A07 038	Rail on cylinder head		All injection lines 27.5 Nm	TCD 2012		2V	30 Nm	
A07 039	Pressure limiting valve on rail		insert with assembly grease	TCD 2012		2V	100 Nm	
A07 040	Rail pressure sensor on rail		insert with assembly grease	TCD 2012		2V	70 Nm	
A07 044	Pipe clips, fuel line fastening			TCD 2012		2V	30 Nm	
A07 045	Fuel line (supply) on control block Fuel line (supply) on fuel filter console Fuel line (return) on rail	Hollow screw		TCD 2012		2V	39 Nm	

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

Commercial available tools:
– Rotation angle disc 8190
– Open wrench size 13 8196
– Screwdriver insert for slotted screws. 8191
– Screwdriver insert for hexagon socket head screws (4 mm) 8194

Special tools:
– Turning gear 100 320
– Socket wrench insert size 15 . . . . . .103 050

– W 06-09-01

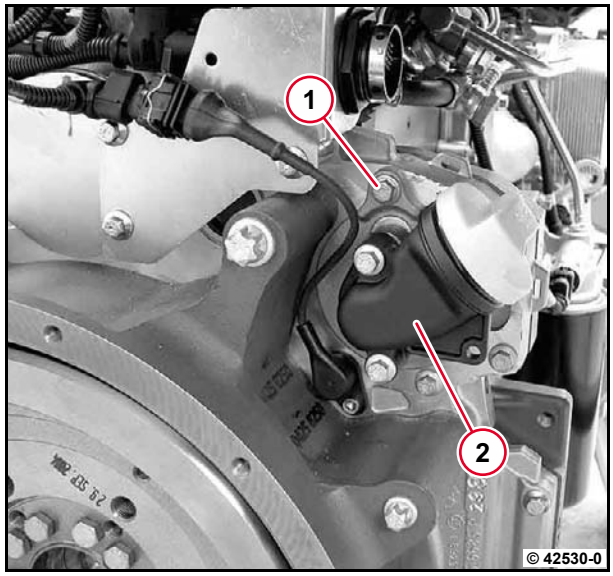
Allow the engine to cool down for at least 30 minutes before setting the valve clearance.
Engine oil temperature < 80 °C.

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

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

Disassembly

- Unscrew screw (1), remove cover (2) with oil filling nozzles.



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1 Foreword

2 General

3 User notes
- 3.1 General
- 3.2 Specifications
- 3.2.1 Safety regulations and rules for the prevention of accidents
- 3.2.2 Disposal regulations
- 3.3 Operating manual and workshop manual
- 3.4 Job cards
- 3.5 Explanation of symbols

4 Technical data
- 4.1 Testing and setting data
- 4.2 Tightening specifications

5 Job card overview
- 5.1 Sorted alphabetically
- 5.2 Sorted numerically
- 5.3 Job card references

6 Job cards

7 Commercial tools

8 Special tools

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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 operating 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 operating manual. The job cards contain technical documentation of 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.
  - 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 pipes and high pressure pipes must not be deformed.
  - Damaged injection pipes and high-pressure pipes must be renewed.

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1 Foreword

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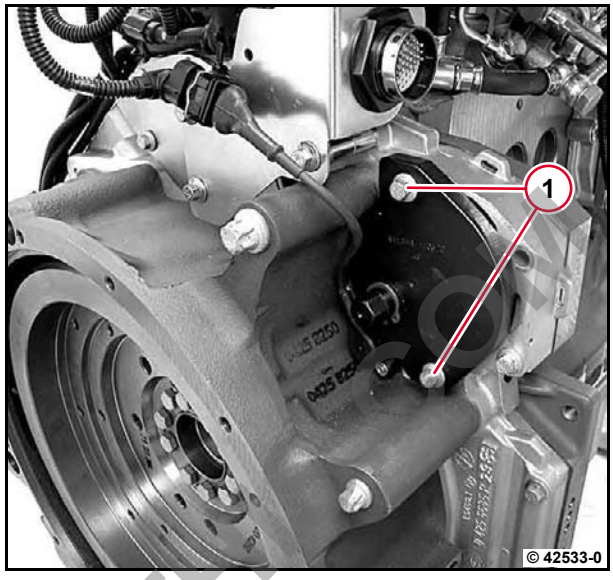
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6

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- Unscrew screws (1) and remove turning gear.

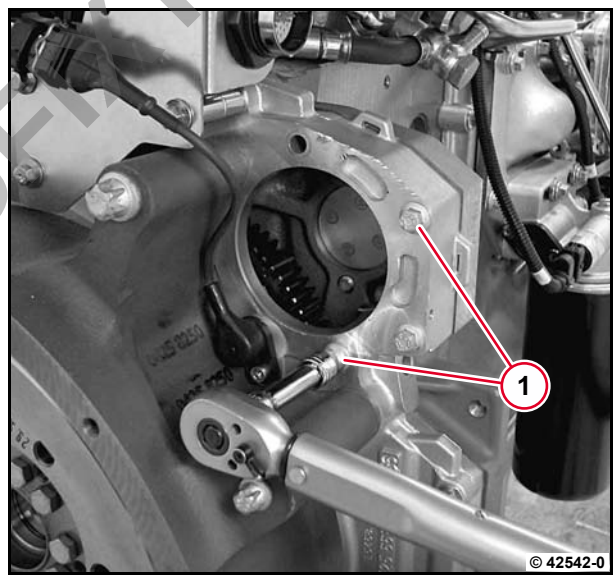


6

- Tighten screws (1).

A03 092

Use M8 x 45 mm screw.



- Clean the sealing surface on cover and gearcase.
- Pull new O-ring (arrow) onto cover.
- Lightly oil O-ring.



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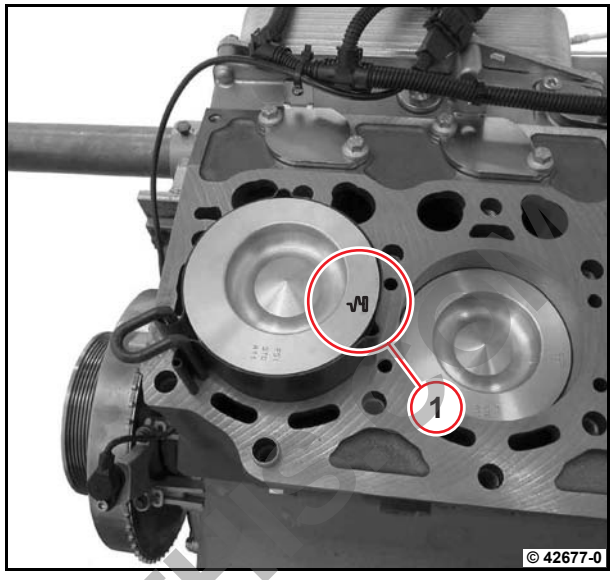
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- Set lifting journal at bottom dead centre (BDC).
- Push piston with con rod into the cylinder.

Note the cylinder assignment of the piston.

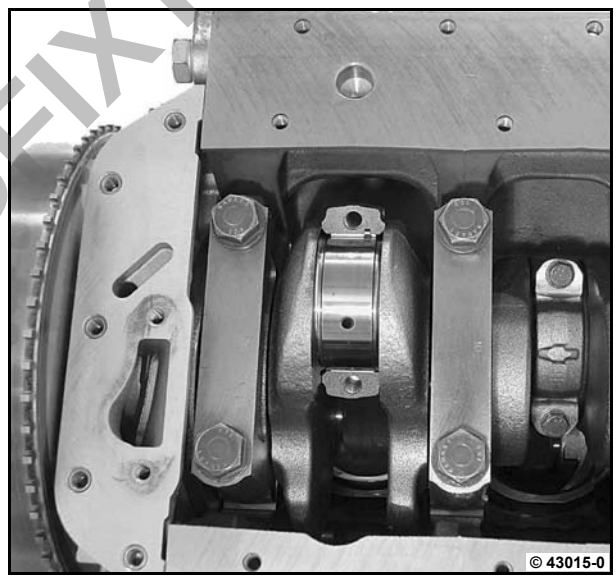
Note the label indicating the installation position on the piston base. The symbol flywheel/crankshaft (1) must face the flywheel.

The piston ring compressor must lie flat on the crankcase.



- Press the con rod carefully against the lifting journal.

Attention!
Do not jam the con rod with the crankshaft.

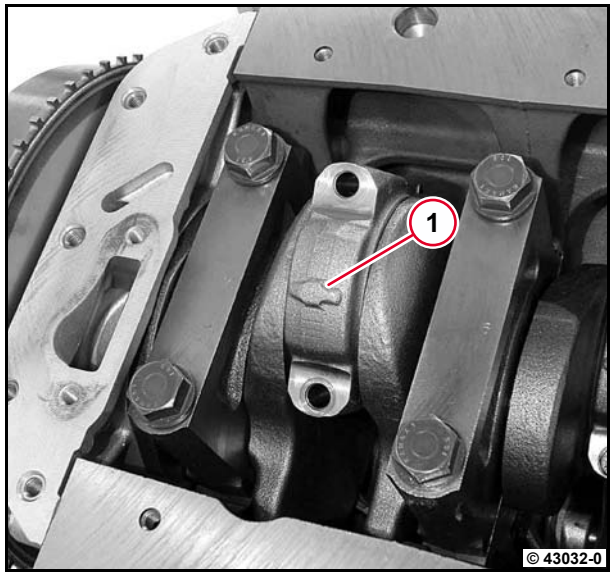


Installing the con rod bearing cover.

- Mount con rod bearing cover.

Attention!
The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!
Do not damage the break areas of the con rod and the con rod bearing cover!

The arrow (1) on the con rod bearing cover must face the front cover.



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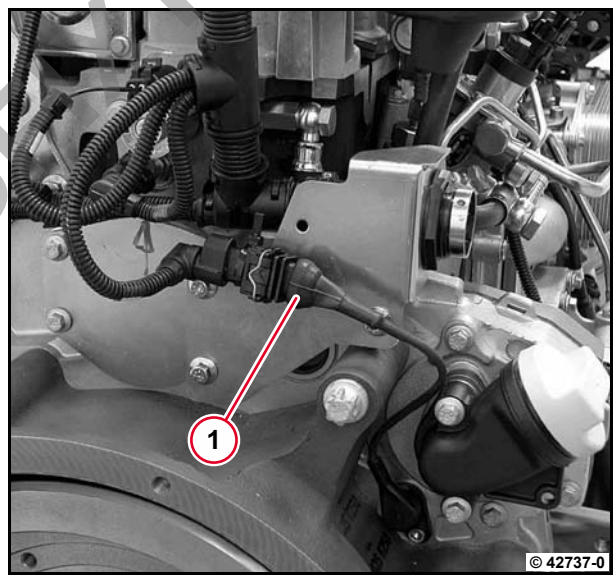
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Remove and install speed governor (camshaft)

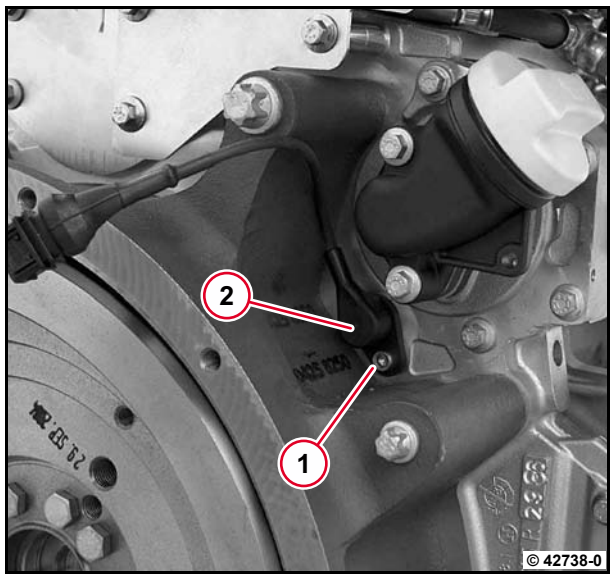
Commercial available tools

Removing impulse transmitter

- Unlock cable plug (1) and disconnect.



- Unscrew screw (1) and remove impulse transmitter (2).
- Visually inspect the components.



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Remove and install injector

Commercial available tools:
– Assembly pliers. 8024
– Torx tool set 8189

Special tools:
– Special wrench 110 500
– Assembly case with assembly sleeves, guides and disassembly tool 110 900
– Stoppers/caps. 170 160

– User notes

Danger!

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

Attention!

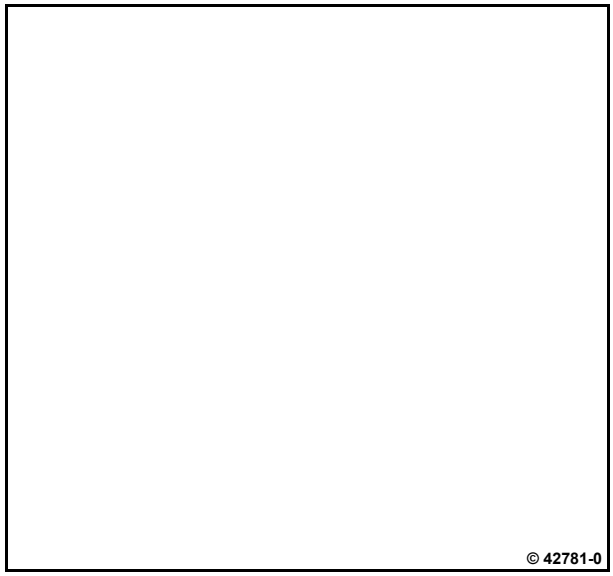
Ensure utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean stoppers/caps.
Do not remove stoppers/caps until immediately before assembling.
Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

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.



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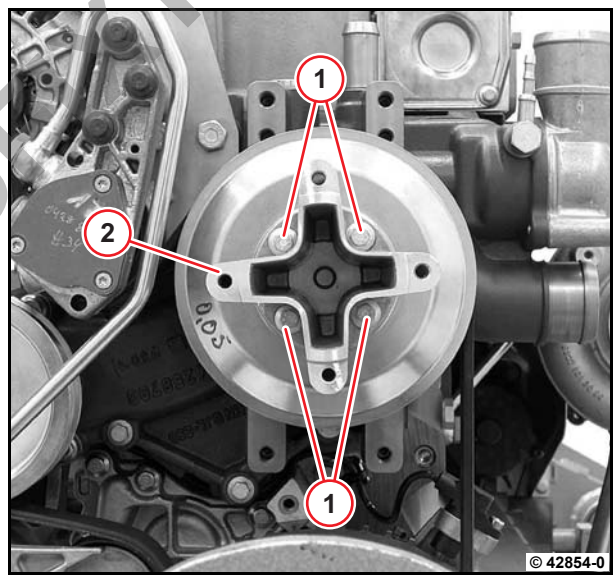
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Removing and installing the fan drive

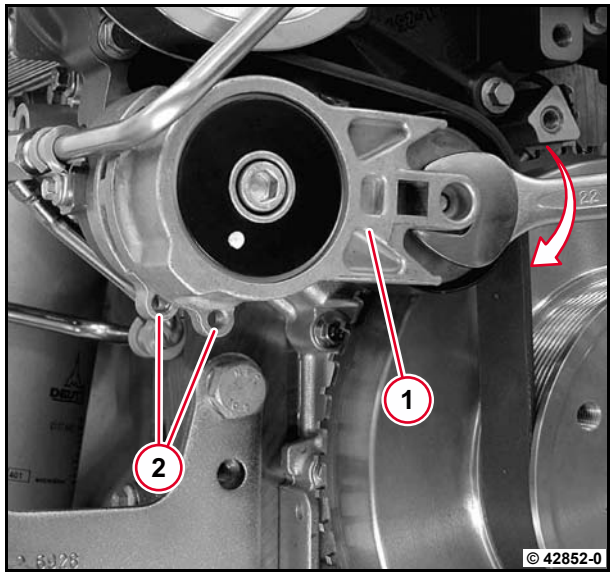
Commercial available tools:
– Mandrel 6 mm Ø

Removing the fan drive

- Unscrew screws (1) and remove adapter (2).



- Tighten belt tensioner (1) in direction of arrow until the holes (2) are in line.



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