Workshop Manual

competence level 2

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DEUTZ®

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DEUTZ® The engine company.

Notes

1 Foreword

Notes

- Read and observe the information in this documentation. You will avoid accidents, retain the manufacturer's warranty and have a fully functional, ready to use engine at your disposal.

- This engine is built exclusively for the 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 will bear the sole risk in this case.

- 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 it and instructed in the dangers.

- 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 can lead to malfunctions and engine damage as well as injury to persons for which the manufacturer will accept no liability.

- Prerequisite for the proper maintenance and repair is the availability of all necessary equipment, commercial tools and special tools as well as their perfect working order.

- Engine parts such as springs, clamps, elastic retaining rings etc. constitute an increased risk of injury when not used properly.

- The pertinent rules for the prevention of accidents and other generally recognized safety and industrial medicine rules must be observed.

- Maximum cost effectiveness, reliability and long life is only guaranteed when DEUTZ original parts are used.

- Repair of the engine must comply with use for the intended purpose. Only parts released by the manufacturer for the respective purpose may be used for conversion work. Unauthorized modification to the engine exclude manufacturer liability for resulting damages. Failure to observe this will lead to voiding of 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, i.e. not all the parts and components described in this documentation are installed in your engine.

- We have done our best to clearly identify 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

Notes

DEUTZ engines

are the product of years of research and development. The profound know-how gained in connection with high quality requirements is the guarantee for manufacturing of engines with a long life, high reliability and low fuel consumption. Naturally the high requirements for protection of the environment are also met.

Maintenance and care

are decisive for whether the engine satisfactorily meets the set demands. Compliance with the prescribed maintenance times and the careful execution of maintenance and care are therefore essential. Difficult operating conditions deviation from normal operation must be observed especially.

DEUTZ AG

Please consult one of our service representatives responsible for operating faults and spare parts questions. Our trained specialist personnel ensures fast, professional repairs using original parts in the event of damage. Original parts of the DEUTZ AG are always produced according to the latest state of the art.
Information about our service can be found at the end of this documentation.

Take care when the engine is running

Only perform maintenance work or repairs when the engine is at a standstill. Replace any removed protective devices upon completion of the work. When working on the running engine, work clothing must be close fitting.

Safety

This symbol accompanies all safety notes. Observe these carefully.
Also pass on the safety instructions to your operating personnel. The ”General safety regulations and rules for the prevention of accidents” of the legislator must be observed additionally.

Note

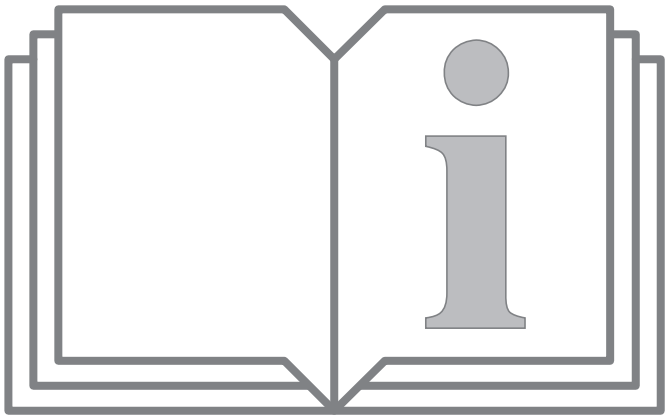
This symbol accompanies information of a general kind.
Observe these carefully.

Asbestos

Gaskets used in this engine are asbestos-free. Please use the appropriate spare parts for maintenance and repair work.

Notes

3 User notes



Notes

3.1 General

The maintenance work prescribed in the operating manual and in the workshop manual must be performed on schedule and completely.

The maintenance personnel must possess 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.

Also observe the special safety regulations for the different maintenance groups which are listed in detail as job cards in the Job cards chapter (cf. also section 1.2).

See the maintenance schedules for the maintenance intervals. These also inform you of the work to be performed.

The job cards provide technical instructions for performing the work.

3.2 Specifications

3.2.1 Safety regulations and rules for the prevention of accidents

For various maintenance groups, detailed safety notes in the form of job cards have been compiled, these precede the job cards of the respective maintenance groups.

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

Special protection measures depending on the respective work are specified and identified in the job description.

It generally applies among other things:

- for the personnel
  - Only instructed personnel may operate or maintain the engine. Unauthorized persons may not enter the engine room.
  - Wear close fitting clothing and ear protectors in the engine room when the engine is running.
  - Only appoint qualified personnel to do repairs and maintenance.
- for the engine room:
  - Ensure adequate ventilation (do not cover air shafts)
  - Install first aid kit and suitable fire extinguishers. Check the filling and readiness for operation regularly.
  - Only store inflammable materials in the engine room if these are necessary for operating the system.
  - Smoking and naked lights are prohibited in the engine room.
- For operation and maintenance of the engine:
  - Only start the engine when all protection devices are installed. Make sure that no-one is standing in the danger area.
  - Only perform cleaning, maintenance and repair work when the engine has been shut down and secured against starting.

3.2.2 Disposal regulations

The work described in the operating manual and workshop manual necessitates renewal of parts and operating materials. The renewed parts / operating materials must be stored, transported and disposed of properly. The owner himself is responsible for this.

Disposal includes recycling and the scrapping of parts / operating materials whereby 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 Operating manual and workshop manual

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

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

It contains the following chapters:

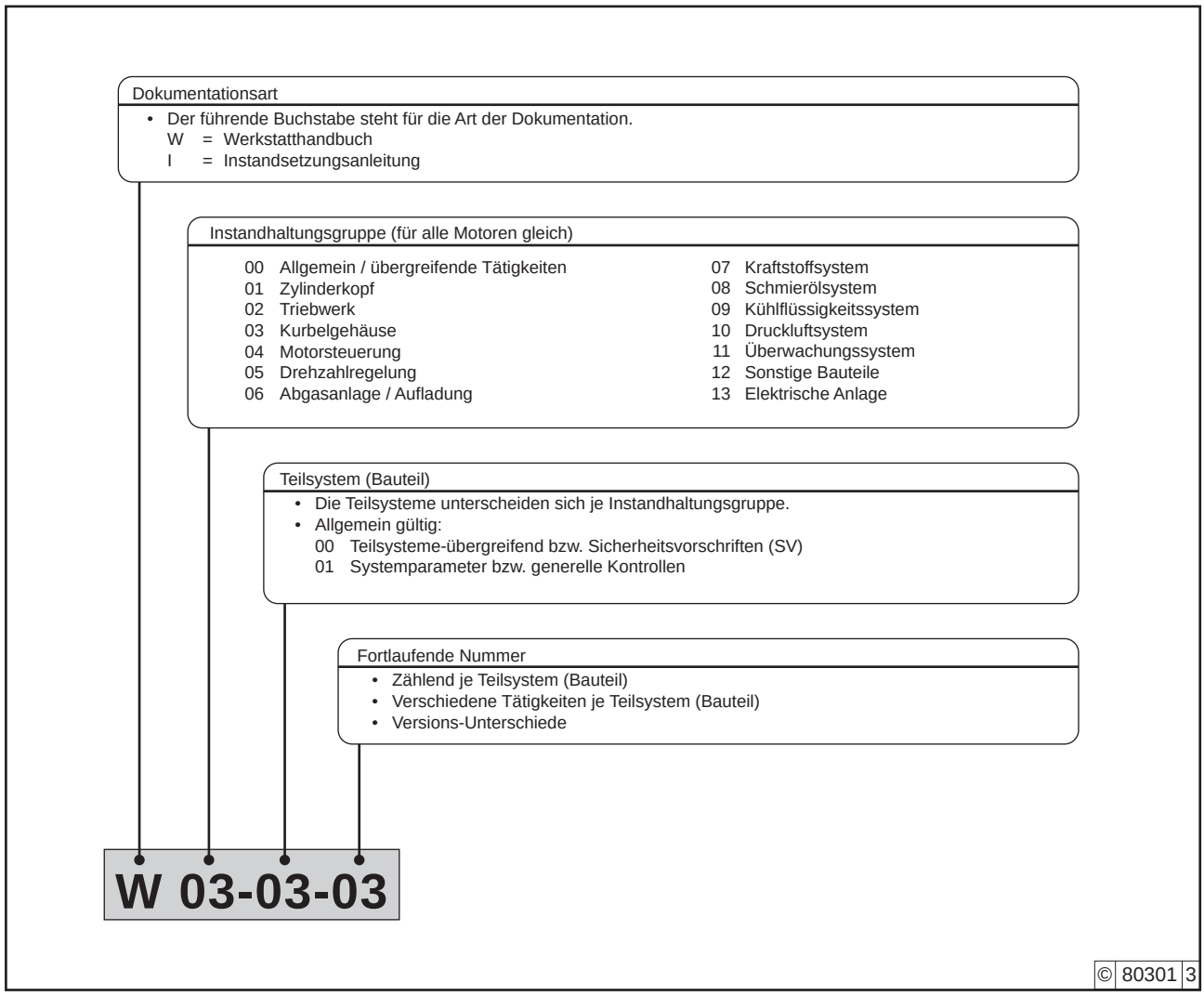
1. General, Contents
2. Engine description
3. Operation
4. Operating materials
5. Maintenance
6. Care and maintenance work
7. Faults, causes and remedies
8. Engine corrosion protection
9. Technical data
10. Service

The **workshop manual** assumes knowledge of the contents of the operating manual, this applies especially for the safety regulations. Minor repairs and emergency measures on components are described the execution of which requires more effort and appropriately qualified personnel.

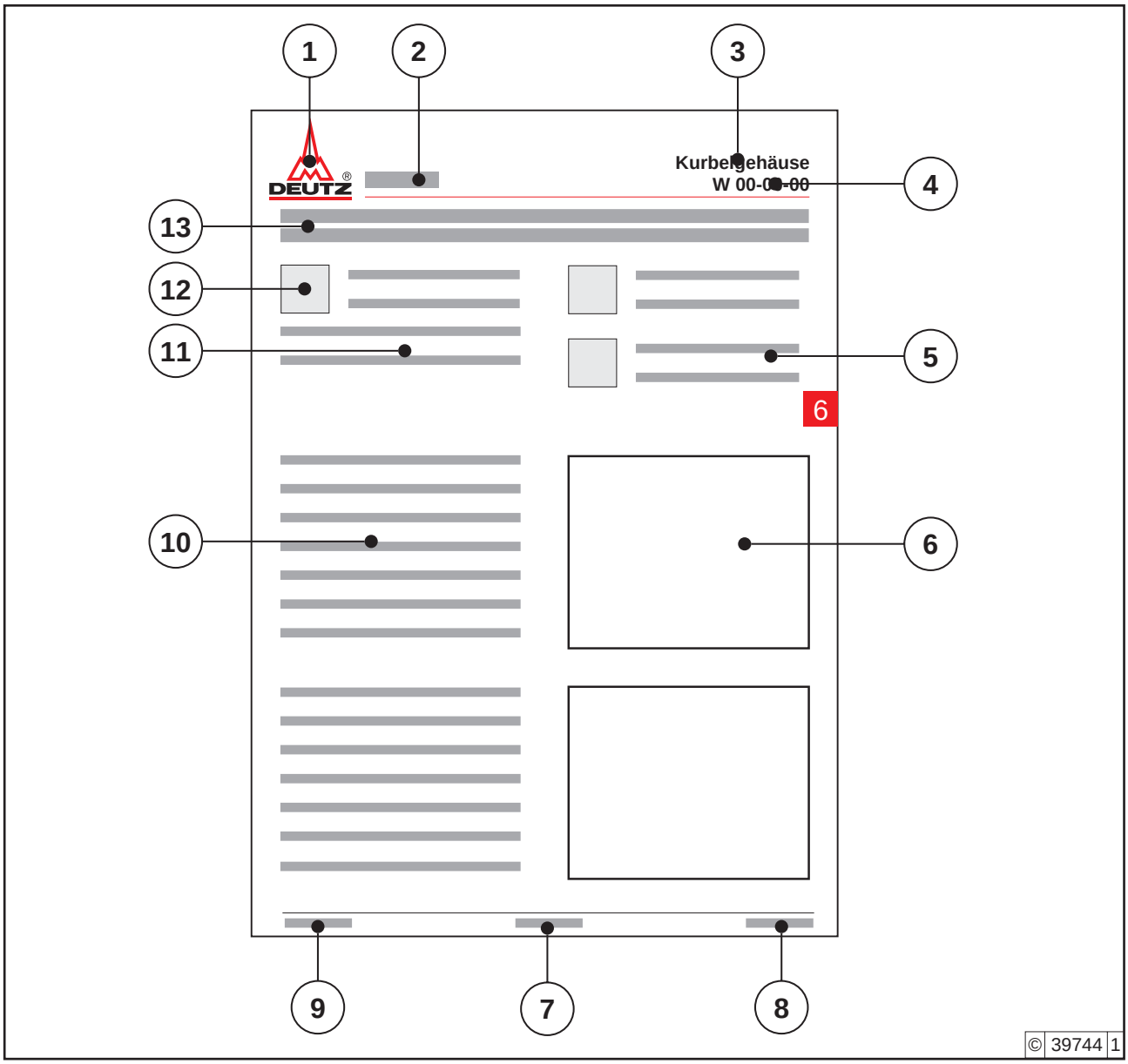
3.4 Job cards

The **job cards** are divided into job cards of the **workshop manual** e. g. **W 04-05-01** and the **maintenance manual I 04-05-01**.

Numbering of job cards



Structure of a job card



1. DEUTZ, publisher of the service documentation
2. Engine type (e. g. 914)
3. Maintenance group
4. Job card number
5. Reference to other job cards, Specifications and similar
6. Explanatory graphics
7. Page number
8. DEUTZ-internal part number of job card and technical order number
9. Date of issue of the job card
10. Work sequence
11. Safety and general notes
12. Necessary tools, auxiliary materials and spare parts
13. Title of the job card

Note

For inquiries about the job card please always state the engine type (2), the job card number (4), the page number (7), the date of issue (9) or alternatively the DEUTZ-internal part number (8).

3.5 Explanation of symbols

Caution!

Auxiliary material
For example: Lifting gear, adhesive

Tools
for example:100 400 - meter

Note
For example: Cylinder head is dismantled.

Always renew when assembling
For example: Gaskets

References
For example: Job card no. W xx-yy-zz

See technical data (test and setting data)
Line note, for example: ”01 61 – Valve clearance (inlet)”

See technical data (tightening specifications)
Line note, for example: ”01001 – Cylinder head on crankcase”

Notes

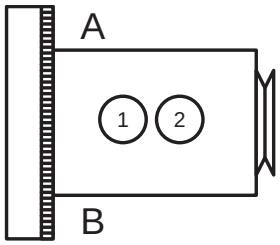
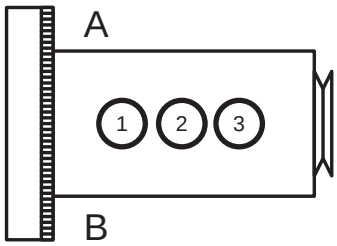
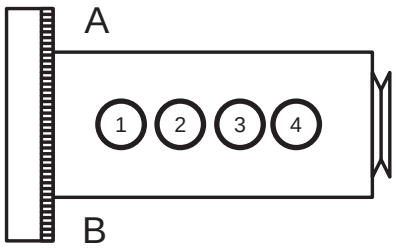
4 Technical data

4.1 Test and adjustment data

Notes

00 00 Engine general

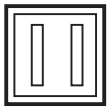
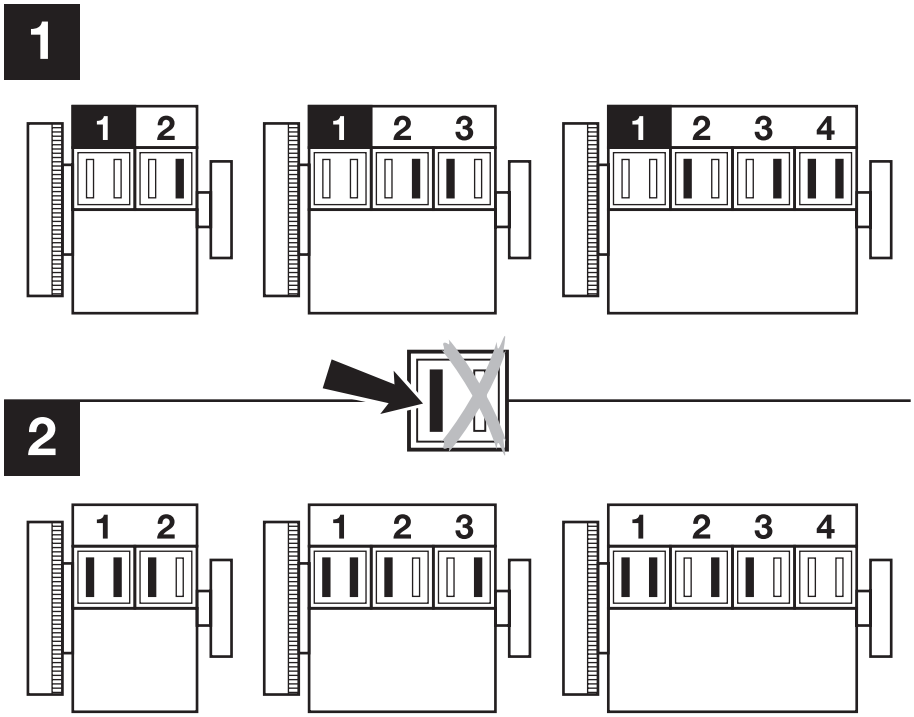
ID No.	Name	Remark	Value	Unit
00 04	Engine weight according to DIN 70020-A	F2L engine	175	kg
		F3L engine	217	
		F4L engine	256	
		F2M engine	169	
		F3M engine	210	
		F4M engine	248	
		BF3L engine	222	
		BF4L engine	257	
		BF3M engine	215	
		BF4M engine	250	
00 10	Working principle		four-stroke diesel	
00 20	Combustion process		Direct injection	
00 31	Bore	Diameter	94	mm
00 32	Stroke		112	mm
00 40	Compression ratio	FL/M engines	19:1	
		BFL/M engines	17.5:1	
00 50	Direction of rotation	looking onto the flywheel	left	
00 51	Compression pressure	FL/M engines	25 to 30	bar
		BFL/M engines	22 to 27	bar
00 70	Ignition distance	2 and 4 cylinder	180	°
		3-cylinder	120	°

ID No.	Name	Remark	Value	Unit
00 71	Ignition sequence	2-cylinder	1 - 2	
		3-cylinder	1 - 2 - 3	
		4-cylinder	1 - 3 - 4 - 2	
00 81	Cylinder arrangement 2-cylinder A = Manifold side B = Operating side	 © 39617 0		
	Cylinder arrangement 3-cylinder A = Manifold side B = Operating side	 © 39618 0		
	Cylinder arrangement 4-cylinder A = Manifold side B = Operating side	 © 39619 0		

01 00 Cylinder head

ID No.	Name	Additional information	Value	Unit
01 60	**Valve clearance**			

ID No.	Name	Additional information	Value	Unit
01 61	Valve clearance (inlet)	• after a cooling time of at least 0.5 h (oil temperature < 80 °C)	0.3 ±0.05	mm
		• Test and setting values in inspections from a running time of 50 operating hours of the engine or life of the cylinder head gasket (see maintenance schedule) • Setting values when changing the cylinder head gasket	(0.4 ±0.05)	
01 62	Valve clearance (outlet)	• after a cooling time of at least 0.5 h (oil temperature < 80 °C)	0.5 ±0.05	mm
		• Test and setting values in inspections from a running time of 50 operating hours of the engine or life of the cylinder head gasket (see maintenance schedule) • Setting values when changing the cylinder head gasket	(0.6 ±0.05)	

ID No.	Name	Additional information	Value	Unit
01 63	Valve clearance setting scheme			
	• Turn over engine up until reaching the valve overlap cyl. no. 1. **Note** According to the order below (see table) the valve clearance setting is possible with 2 crankshaft revolutions á 360°.			
	Crankshaft setting 1		Cyl. no. 1 = overlap	
			white = not adjustable black = adjustable	
	Crankshaft setting 2 • Turn the crankshaft one rev on (360°).		white = not adjustable black = adjustable	
				

ID No.	Name	Additional information	Value	Unit
01 70	**toggle lever / toggle lever block**			
01 72	toggle lever bore for toggle lever axle (outlet)		18 ±0.27	mm
01 73	toggle lever bore for toggle lever axle (inlet)		18 ±0.27	mm
01 74	diameter of the toggle lever axle		17.97 ±0.01	mm
01 98	Length of the cylinder head screw	Standard	150.000 + 0.8 - 0.8	mm

02 00 Drive system

ID No.	Name	Additional information	Value	Unit
02 70	**Piston**			
02 75	Piston overlap for cylinder head gasket	1 Notch	0.514 - 0.69	mm
02 76	Piston overlap for cylinder head gasket	2 Notches	0.691 - 0.76	mm
02 77	Piston overlap for cylinder head gasket	3 Notches	0.761 - 0.83	mm

08 00 Lube oil system

ID No.	Name	Additional information	Value	Unit
08 74	Length of the compression spring for the lube oil thermostat		116.7	mm

09 00 Cooling system

ID No.	Name	Additional information	Value	Unit
09 91	Gap dimension between running wheel and blower jacket inlet		min. = 0.2 max. = 0.8	mm

12 00 Other components

ID No.	Name	Additional information	Value	Unit
12 11	Tension of the single V-belt	First assembly	450 ±50	N
12 21	Tension of the single V-belt	Check after 15 min running under load	300 ±20	N

Notes

4 Technical data

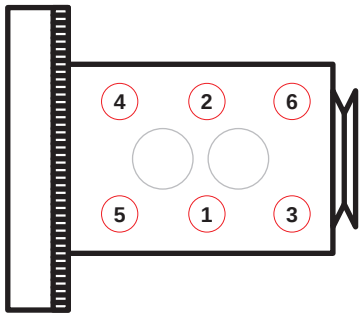
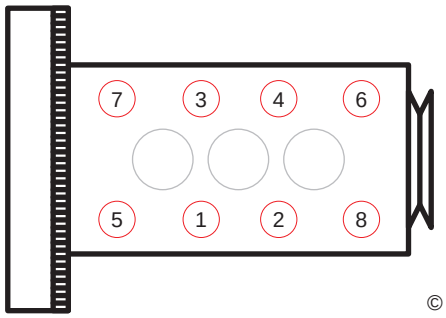
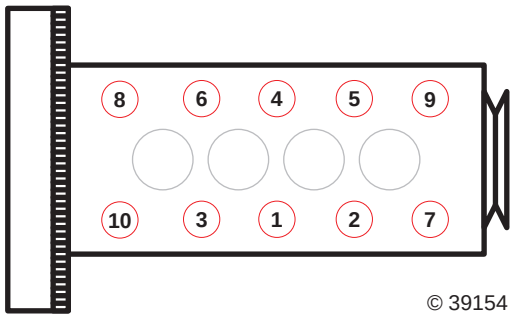
4.2 Tightening specifications

Notes

00000 Engine general

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
00001	Clamp holder on crankcase	90 Nm		
00002	Clamp holder on adapter for assembly block	90 Nm		
00003	Engine mount on crankcase elast. mounting	180 Nm	+ 30°	

01000 Cylinder head

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
01001	Cylinder head on crankcase	30 Nm	+ 80 Nm + 160 Nm + 90°	• In case of provability use max. 5 times. • oil lubricated • See tightening order
	Tightening order 2-cylinder	 © 39152 1		
	Tightening order 3-cylinder	 © 39153 1		
	Tightening order 4-cylinder	 © 39154 1		
01002	Toggle lever block on cylinder head	21 Nm		
01003	Lock nut on valve setting screw	20 ± 2 Nm		
01004	Cylinder head cover on cylinder head	8.5 Nm		

03000 Crankcase

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
03060	Crankcase bleeding on: • Front cover • Cylinder head cover • Cylinder head	8.5 Nm		

05000 Speed governing

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
05041	Lifting magnet (shutoff magnet) on front cover	8.5 Nm		
05065	Lifting magnet (start volume release) on front cover	10 Nm		

06000 Exhaust system / Charging

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
06001	Exhaust manifold on cylinder head	55 Nm		with DEUTZ S1
06020	Turbocharger on exhaust manifold	21 Nm		with DEUTZ S1
06030	Air intake pipe on cylinder head	21 Nm		
	Charge air on cylinder head	21 Nm		
06094	Solenoid valve on LDA	10 Nm		

07000 Fuel system

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
07001	Injection valve on cylinder head	21 Nm		
07002	Injection nozzles lock nut on nozzle holder (leak oil-less)	35 ± 5 Nm		Motorpal
	Injection nozzles lock nut on nozzle holder	45 ± 5 Nm		Bosch
07003	Injection line on: • Injection valve • injection pump	25 ± 2.5 Nm		Union nut
07015	Fuel supply line to injection pump	29 Nm		• Hollow screw • DIN 7643-8
07024	Fuel pump on crankcase	21 Nm		• Piston pump • Diaphragm pump

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
07061	Overcurrent line to injection pump	29 Nm		• Renew CU sealing rings • Hollow screw
07062	Overcurrent line to cylinder head bolt	8.5 Nm		
07082	Fuel filter console on crankcase	21 Nm		
07095	Charge pressure-dependent full load stop (LDA) on crankcase	22 Nm		
07096	Cap on charge pressure-dependent full load stop (LDA)	8 Nm		
07099	Fuel filter on fuel filter console	9 ± 1 Nm		hand tight

08000 Lube oil system

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
08001	Oil filter	10 -12 Nm		• Oil gasket lightly • Screw on by hand and screw tight
08003	Oil filter console on crankcase	21 Nm		Torx screw
08042	Oil pressure line on: • Turbocharger • Crankcase	29 Nm		• Renew CU sealing rings • Hollow screw • Before assembling the line ATL via pressure oil connection bore, pre-oil with approx. 1 cm^3 engine oil!
08044	Oil return pipe on turbocharger	40 Nm		Screwed socket
	Oil return pipe on turbocharger	8.5 Nm		Flange socket
08046	Holder for stopper on crankcase	8.5 Nm		FL/M engine
	Oil return pipe (ATL) holding plate on crankcase	8.5 Nm		BFL/M engines
08048	Oil line to (control line): • oil filter console • Crankcase	18 Nm		• Injection adjustment • Renew CU sealing rings • Hollow screw
08051	Oil cooler fastening screws	21 Nm		Torx screw M8

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
08072	Locking screw oil cooler thermostat on crankcase	50 Nm		Hexagon socket
08091	Oil pressure switch (locking screw) on crankcase	13 ± 1.5 Nm		Oil pressure switch M10 x 1mm
08093	Oil pressure sensor on crankcase	20 +2 Nm		
08095	Oil temperature sensor on crankcase	25 ± 2.5 Nm		

09000 Cooling system

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
09065	Cooling blower jacket on generator	4 Nm		
09066	Blower jacket on cylinder head	22 Nm		
	Cooling blower on: • air duct • Cylinder head	21 Nm		
09067	Blower jacket inlet on generator	22 Nm		
09070	Stand plate on: • crankcase • Oil cooler	21 Nm		Torx screw 8 x 20mm
09087	Air duct cowling on: • Cylinder head • Stand plate	21 Nm		
09089	Air duct on cooling blower	3 Nm	21 Nm	
09098	Air duct on cylinder head	3 Nm	+21 Nm	

12000 Other components

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
12001	Flywheel on crankcase	30 Nm	+ 60° + 30°	Renew screws after every disassembly
12041	V-belt tensioning roller (holder) on front cover	45 Nm		
12051	Hydraulic pump on hydraulic pump console	57 Nm		Hexagon bolts

13000 Electrical components

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
13001	Starter on crankcase	43,5 Nm		
13006	Starter console on crankcase	75 ± 7 Nm		without connection housing
13009	Heat shield for starter	8.5 Nm		Bolts M6
13010	Generator console on: crankcase Cylinder head	34 Nm		• with built up fan drive • Unit design
	Generator console on crankcase	30 Nm	49°	• with built up fan drive • Unit design
13012	Generator on console	34 Nm		• with built up fan drive • Unit design
		34 Nm		• with built up fan drive • Building machine design
13015	Generator on clamping bracket	22 Nm		• with built up fan drive • Unit design
		21 Nm		• with built up fan drive • Building machine design
13016	Clamping bracket on console Generator	22 Nm		• with built up fan drive • Unit design
		21 Nm		• with built up fan drive • Building machine design
13017	V-belt clamping bracket on front cover	45 Nm		
13018	Generator console on cylinder head	34 Nm		with in-built fan drive
13021	Pulley on generator	50 Nm		
	Running wheel on generator	50 Nm		
13022	Fan drive on generator console	30 Nm	120°	• M10 x 110mm • with built up fan drive • Unit design
13031	Helical heater plug in: charge air line Suction pipe	60 Nm		
13071	Charging current cable on starter	max. 15 Nm		

ID no.	Name	Pre-tightening value	Re-tightening value	Remark
13081	Charging current cable on generator B+	5.5 -7 Nm		
13082	Cable G1.D+ on generator	4.5 ± 0.8 Nm		
13083	Cable G1.W on generator	4 Nm		
13092	Cable harness holder on crankcase	14 Nm		Torx screw M8 x 16mm
	Cable harness holder on: Starter crankcase	8.5 Nm		M6

5 Job card overview

5.1 Sorted alphabetically

Notes

Activity	Job card	Maintenance group
Assemble and disassemble engine on assembly stand	W 00-05-01	Engine general
Check and set valve clearance	W 01-01-01	Cylinder head
Check compression	W 00-02-06	Engine general
Check V-belt, renew (in FL and BFL engines)	W 12-02-01	Other components
Check V-belt, renew (in FM and BFM engines)	W 12-02-01	Other components
Disassemble and complete, check toggle lever and toggle lever block	W 01-02-06	Cylinder head
Remove and install air intake pipe	W 06-07-03	Exhaust system / Charging
Remove and install cable harness	W 13-01-02	Electrical components
Remove and install charge pressure-depedent full load stop (LDA)	W 07-08-02	Fuel system
Remove and install cooling blower	W 09-11-01	Cooling system
Remove and install crankcase bleeding	W 03-01-11	crankcase
Remove and install cylinder head	W 01-04-04	Cylinder head
Remove and install exhaust manifold	W 06-01-05	Exhaust system / Charging
Remove and install flywheel	W 12-06-01	Other components
Remove and install fuel filter console	W 07-10-08	Fuel system
Remove and install fuel lines (with Bosch injection pumps)	W 07-10-06	Fuel system
Remove and install fuel lines (with leak fuel line)	W 07-10-06	Fuel system
Remove and install fuel pump	W 07-11-01	Fuel system
Remove and install generator (in FL and BFL engines)	W 13-02-03	Electrical components
Remove and install generator and holder (in FM and BFM engines)	W 13-02-03	Electrical components
Remove and install helical heater plugs	W 13-06-01	Electrical components
Remove and install hydraulic pump	W 12-08-02	Other components
Remove and install injection valves	W 07-07-01	Fuel system
Remove and install lifting magnet (shutoff magnet)	W 11-00-03	Monitoring system

Activity	Job card	Maintenance group
Remove and install lifting magnet for start volume release	W 07-02-07	Fuel system
Remove and install oil cooler	W 08-08-02	Lube oil system
Remove and install oil filter cartridge	W 08-10-06	Lube oil system
Remove and install oil filter console	W 08-11-07	Lube oil system
Remove and install oil pressure sensor	W 08-11-09	Lube oil system
Remove and install oil pressure line (turbocharger)	W 08-15-01	Lube oil system
Remove and install oil pressure switch	W 08-11-08	Lube oil system
Remove and install oil line for injection adjuster supply	W 08-16-01	Lube oil system
Remove and install oil return line (turbocharger)	W 08-15-02	Lube oil system
Remove and install oil temperature sensor	W 08-11-11	Lube oil system
Remove and install oil thermostat (oil cooler)	W 08-11-12	Lube oil system
Remove and install solenoid valve (LDA)	W 07-08-01	Fuel system
Remove and install starter	W 13-03-02	Electrical components
Remove and install toggle lever and toggle lever block	W 01-02-02	Cylinder head
Remove and install turbocharger	W 06-06-04	Exhaust system / Charging
Remove and install V-belt clamping roller	W 12-02-06	Other components
Renew injection lines	W 07-03-01	Fuel system

5 Job card overview

5.2 Sorted numerically

Notes

Job card	Activity	Maintenance group
W 00-02-06	Check compression	Engine general
W 00-05-01	Assemble and disassemble engine on engine block	Engine general
W 01-01-01	Check and set valve clearance	Cylinder head
W 01-02-02	Remove and install toggle lever and toggle lever block	Cylinder head
W 01-02-06	Disassemble and complete, check toggle lever and toggle lever block	Cylinder head
W 01-04-04	Remove and install cylinder head	Cylinder head
W 03-01-11	Remove and install crankcase bleeding	Crankcase
W 06-01-05	Remove and install exhaust manifold	Exhaust system / Charging
W 06-06-04	Remove and install turbocharger	Exhaust system / Charging
W 06-07-03	Remove and install air intake pipe	Exhaust system / Charging
W 07-02-07	Remove and install lifting magnet for start volume release	Fuel system
W 07-03-01	Renew injection lines	Fuel system
W 07-07-01	Remove and install injection valves	Fuel system
W 07-08-01	Remove and install solenoid valve (LDA)	Fuel system
W 07-08-02	Remove and install charge pressure-depedent full load stop (LDA)	Fuel system
W 07-10-06	Remove and install fuel lines (with Bosch injection pumps)	Fuel system
W 07-10-06	Remove and install fuel lines (with leak fuel line)	Fuel system
W 07-10-08	Remove and install fuel filter console	Fuel system
W 07-11-01	Remove and install fuel pump	Fuel system
W 08-08-02	Remove and install oil cooler	Lube oil system
W 08-10-06	Remove and install oil filter cartridge	Lube oil system
W 08-11-07	Remove and install oil filter console	Lube oil system
W 08-11-08	Remove and install oil pressure switch	Lube oil system
W 08-11-09	Remove and install oil pressure sensor	Lube oil system

Job card	Activity	Maintenance group
W 08-11-11	Remove and install oil temperature sensor	Lube oil system
W 08-11-12	Remove and install oil thermostat (oil cooler)	Lube oil system
W 08-15-01	Remove and install oil pressure line (turbocharger)	Lube oil system
W 08-15-02	Remove and install oil return line (turbocharger)	Lube oil system
W 08-16-01	Remove and install oil line for injection adjuster supply	Lube oil system
W 09-11-01	Remove and install cooling blower	Cooling system
W 11-00-03	Remove and install lifting magnet (shutoff magnet)	Monitoring system
W 12-02-01	Check V-belt, renew (in FL and BFL engines)	Other components
W 12-02-01	Check V-belt, renew (in FM and BFM engines)	Other components
W 12-02-06	Remove and install V-belt clamping roller	Other components
W 12-06-01	Remove and install flywheel	Other components
W 12-08-02	Remove and install hydraulic pump	Other components
W 13-01-02	Remove and install cable harness	Electrical components
W 13-02-03	Remove and install generator (in FL and BFL engines)	Electrical components
W 13-02-03	Remove and install generator and holder (in FM and BFM engines)	Electrical components
W 13-03-02	Remove and install starter	Electrical components
W 13-06-01	Remove and install helical heater plugs	Electrical components

5 Job card overview

5.3 Job card references

Explanation of job card reference:

Owing to the job card structure, individual parts of the work processes may overlap or repeat. Illustrations of the same working environment may also deviate slightly.

00 Engine general

Job card	Activity	Other job cards necessary for performing the activity				
W 00-02-06	Check compression	W 01-01-01	W 07-07-01	W 08-08-02		
W 00-05-01	Assemble and disassemble engine on engine block	W 13-03-02				

01 Cylinder head

Job card	Activity	Other job cards necessary for performing the activity				
W 01-01-01	Check and set valve clearance					
W 01-02-02	Remove and install toggle lever and toggle lever block	W 01-01-01				
W 01-02-06	Disassemble and complete, check toggle lever and toggle lever block	W 01-02-02				
W 01-04-04	Remove and install cylinder head	W 01-02-02	W 06-07-03	W 07-07-01	W 09-11-01	W 13-02-03

03 Crankcase

Job card	Activity	Other job cards necessary for performing the activity				
W 03-01-11	Remove and install crankcase bleeding					

06 Exhaust system / Charging

W 06-01-05	Remove and install exhaust manifold	W 06-06-04				
W 06-06-04	Remove and install turbocharger					
W 06-07-03	Remove and install air intake pipe	W 06-01-05				

07 Fuel system

Job card	Activity	Other job cards necessary for performing the activity				
W 07-02-07	Remove and install lifting magnet for start volume release					
W 07-03-01	Renew injection lines	W 08-08-02				
W 07-07-01	Remove and install injection valves	W 07-03-01				
W 07-08-01	Remove and install solenoid valve (LDA)					
W 07-08-02	Remove and install charge pressure-depedent full load stop (LDA)					
W 07-10-06	Remove and install fuel lines (with Bosch injection pumps)	W 08-08-02				
W 07-10-06	Remove and install fuel lines (with leak fuel line)					
W 07-10-08	Remove and install fuel filter console					
W 07-11-01	Remove and install fuel pump					

08 Lube oil system

Job card	Activity	Other job cards necessary for performing the activity				
W 08-08-02	Remove and install oil cooler					
W 08-10-06	Remove and install oil filter cartridge					
W 08-11-07	Remove and install oil filter console	W 08-10-06				
W 08-11-08	Remove and install oil pressure switch					
W 08-11-09	Remove and install oil pressure sensor					

Job card	Activity	Other job cards necessary for performing the activity				
W 08-11-11	Remove and install oil temperature sensor	W 08-08-02				
W 08-11-12	Remove and install oil thermostat (oil cooler)					
W 08-15-01	Remove and install oil pressure line (turbocharger)					
W 08-15-02	Remove and install oil return line (turbocharger)					
W 08-16-01	Remove and install oil line for injection adjuster supply					

09 Cooling system

Job card	Activity	Other job cards necessary for performing the activity				
W 09-11-01	Remove and install cooling blower	W 12-02-01 (FL, BFL engines)				

11 Monitoring system

Job card	Activity	Other job cards necessary for performing the activity				
W 11-00-03	Remove and install lifting magnet (shutoff magnet)	W 12-02-06	W 13-02-03 (FM, BFM engines)			

12 Other components

Job card	Activity	Other job cards necessary for performing the activity				
W 12-02-01	Check V-belt, renew (in FL and BFL engines)					
W 12-02-01	Check V-belt, renew (in FM and BFM engines)					

Job card	Activity	Other job cards necessary for performing the activity				
W 12-02-06	Remove and install V-belt clamping roller	W 12-02-01 (FL, BFL engines)	W 12-02-01 (FM, BFM engines)			
W 12-06-01	Remove and install flywheel					
W 12-08-02	Remove and install hydraulic pump					

13 Electrical components

Job card	Activity	Other job cards necessary for performing the activity				
W 13-01-02	Remove and install cable harness					
W 13-02-03	Remove and install generator (in FL and BFL engines)	W 12-02-01				
W 13-02-03	Remove and install generator and holder (in FM and BFM engines)	W 12-02-01				
W 13-03-02	Remove and install starter					
W 13-06-01	Remove and install helical heater plugs					

6 Job cards

Notes

Check compression

Tools

- Commercial tools

8005 - Compression tester
8189 - Torx tool kit

- Special tools

100 120 - Connecting piece

References

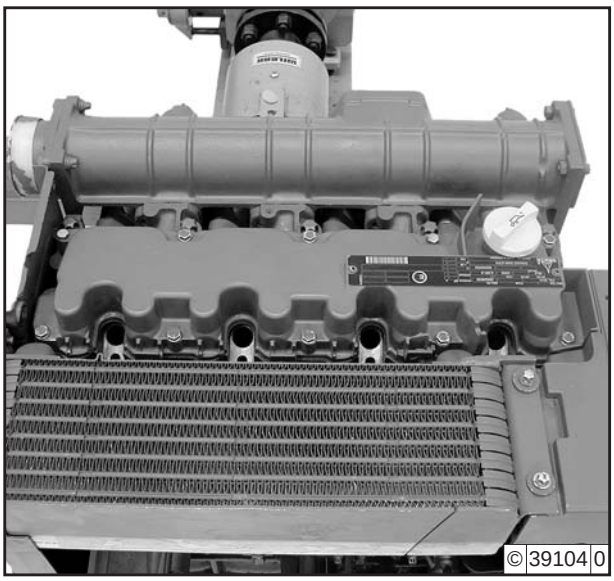
- W 01-01-01
- W 07-07-01
- W 08-08-02

Check compression

- Check and set valve clearance
  ➔ Job card **W 01-01-01**.
- Remove injection valves
  ➔ Job card **W 07-07-01**.

In FL, BFL engines

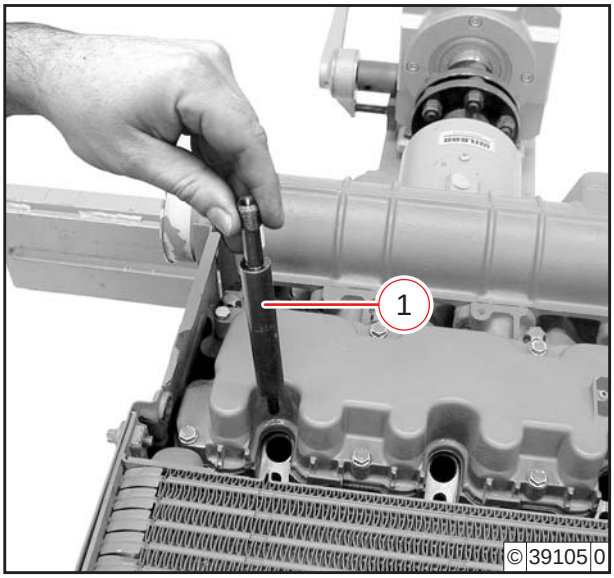
- Install oil cooler
  ➔ Job card **W 08-08-02**.



- Insert adapter (1) with sealing ring.

Note

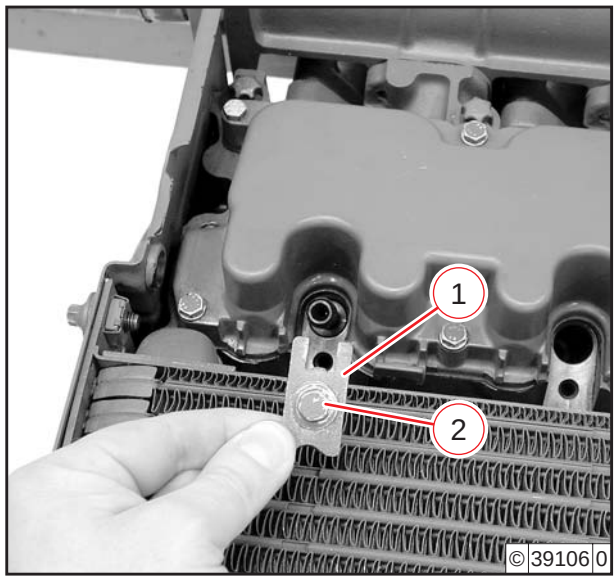
Use sealing ring from injection valve.



- Fit clamping claw (1) and tighten screws (2)
.

Note
Note installation position.

07001



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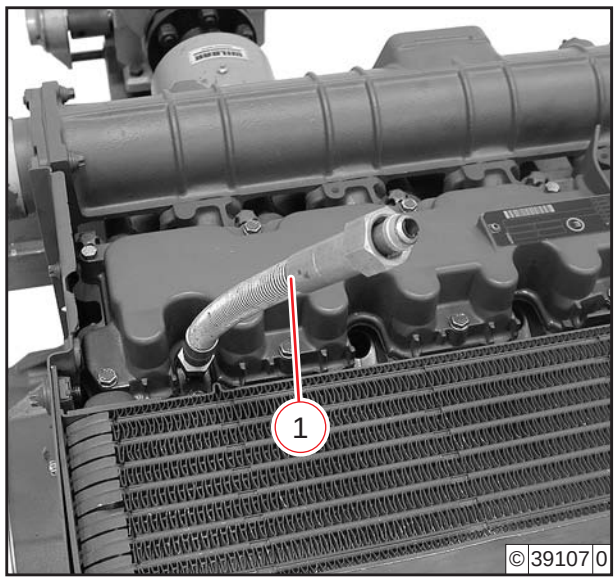
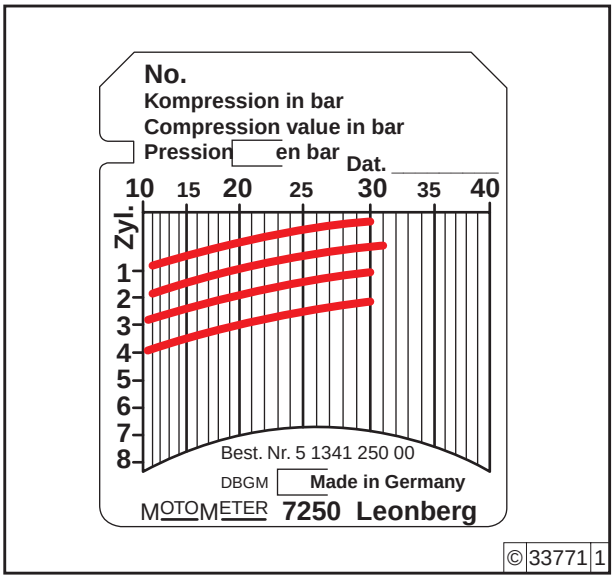
- If necessary, mount adapter (1) on connection piece.



- Connect compression tester to connection piece or adapter.
- Turn over engine with starter.

00 51

- The measured compression pressure depends on the starting speed during the measuring process and the altitude of the engine installation site.
  Limit values can therefore not be determined exactly. The compression 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.

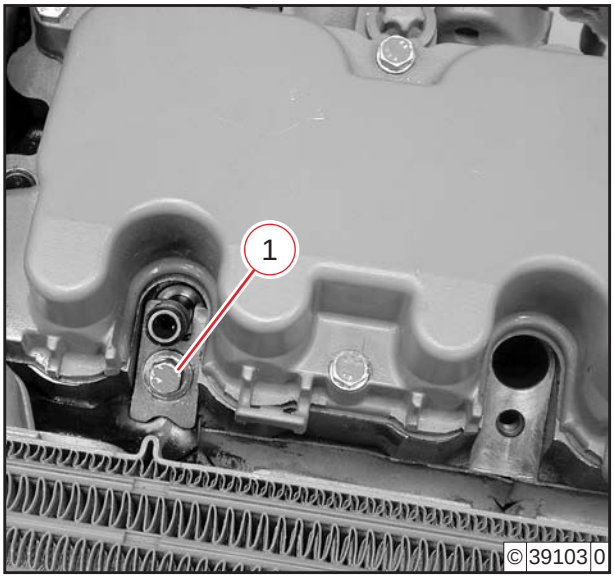


- Remove the compression tester and adapter.

- Unscrew screw (1).
- Remove connection piece with sealing ring.

In FL, BFL engines

- Remove oil cooler
  ➔ Job card **W 08-08-02**.
- Install injection valves
  ➔ Job card **W 07-07-01**.



Notes

Mount engine on assembly stand and disassemble

Tools

- Commercial tools

- Special tools

6067 - Engine assembly block
6067/115 - Clamping holder
6067/114 - Support arm

Auxiliary material

- Lifting gear
- Support ropes
- Eyebolts

References

- W 13-03-02

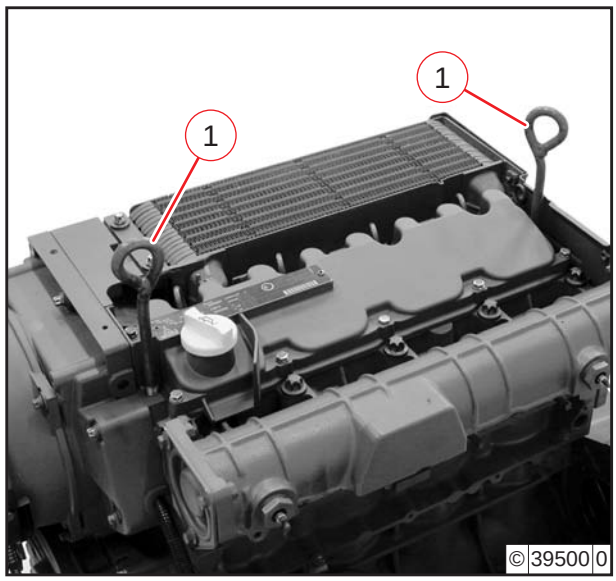
Note

In the repair procedure shown here different customer scopes are not taken into consideration, i.e. add-on parts deviating from standard are not shown.

6

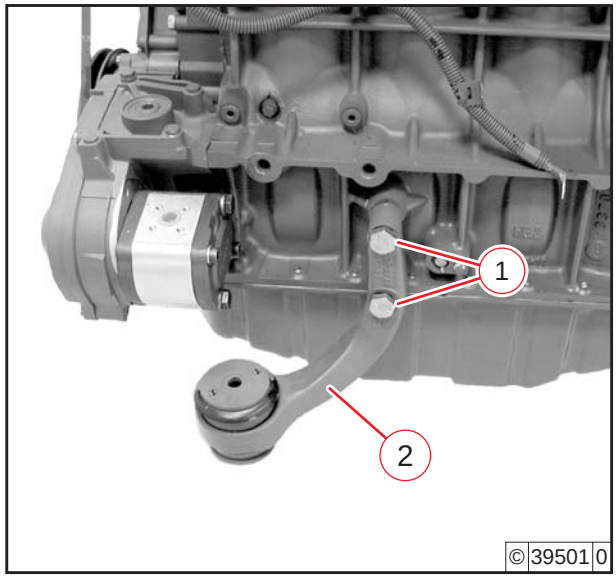
Assemble engine on engine block

- Remove starter
  ➔ Job card **W 13-03-02**.
- Screw in eyebolt (1).
- Hang engine on suitable workshop crane.



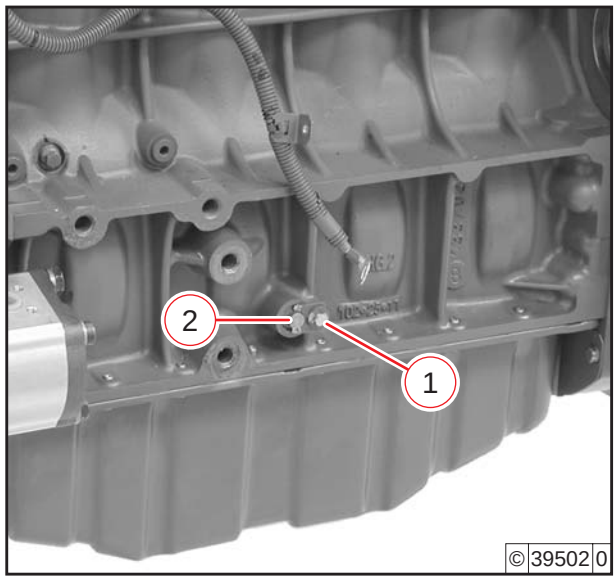
- Unscrew screws (1) and remove engine bearing (2) of the Manifold side.

00 81



In FL, FM engines

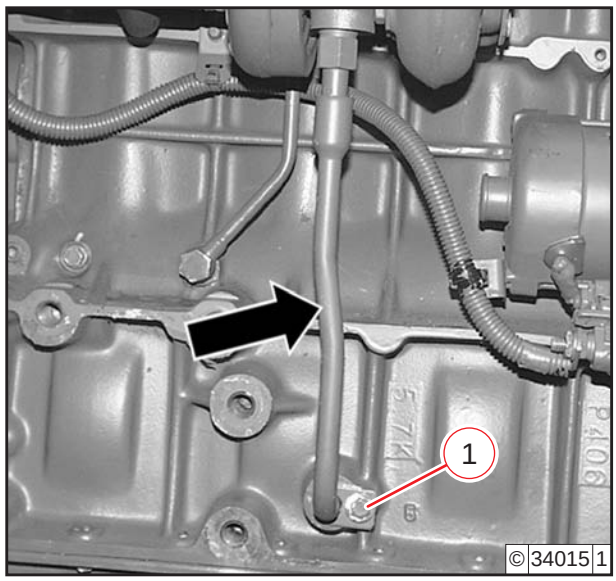
- Unscrew screw (1) and remove holder.
- Pull out stopper (2).



6

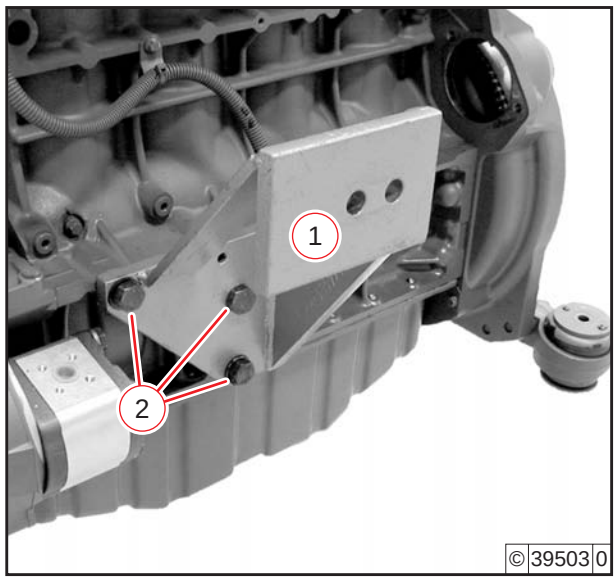
In BFL, BFM engines

- Unscrew screw (1) and remove holder.
- Remove oil return pipe (arrow).



- Mount clamping holder (1) on the Manifold side and tighten screws (2).

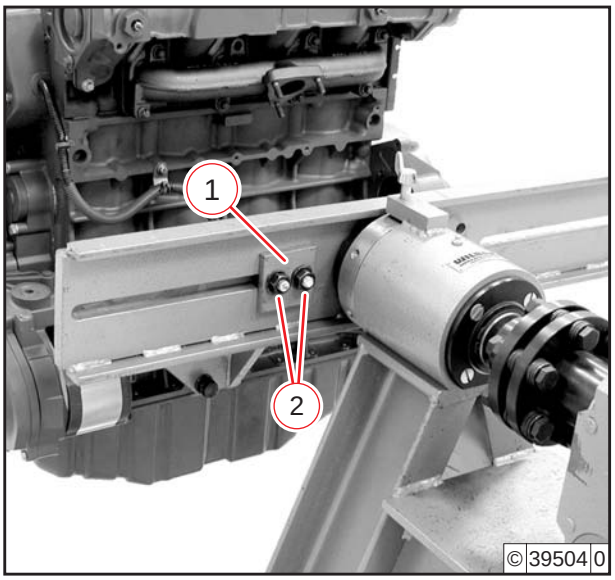
00001



- Mount clamping holder on engine assembly block.
- Fit counter plate (1).
- Insert screws and nuts (2).

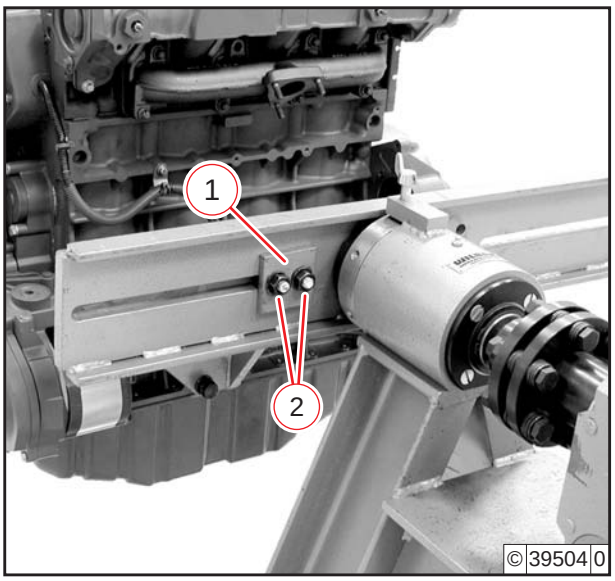
00002

- Unhook engine from workshop crane and unscrew eyebolt.

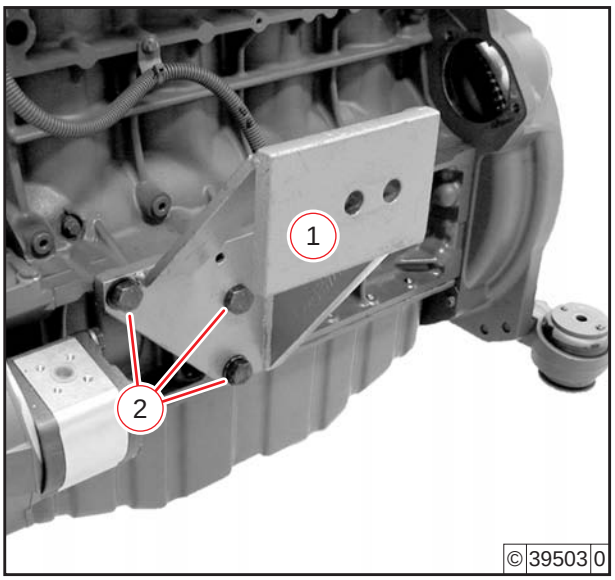


Remove engine from assembly block.

- Screw in eyebolt.
- Hang engine on suitable workshop crane.
- Unscrew nuts (2), remove counter plate (1) and bolts.



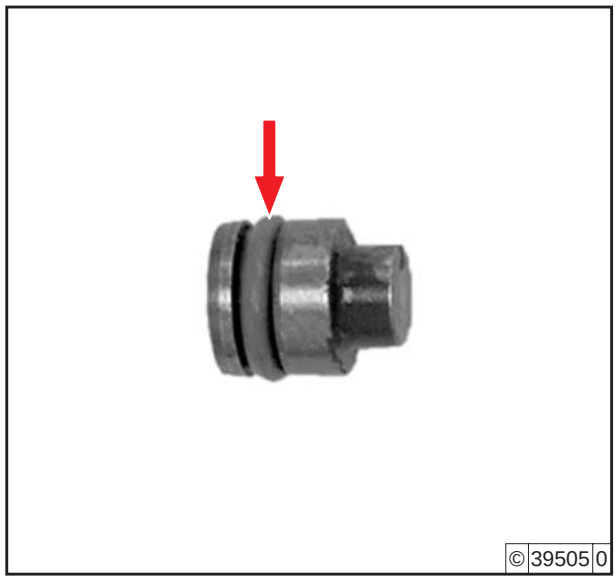
- Unscrew screws (2) and remove clamping holder (1).



6

In FL, FM engines

- Pull new round sealing ring (arrow) onto stopper.



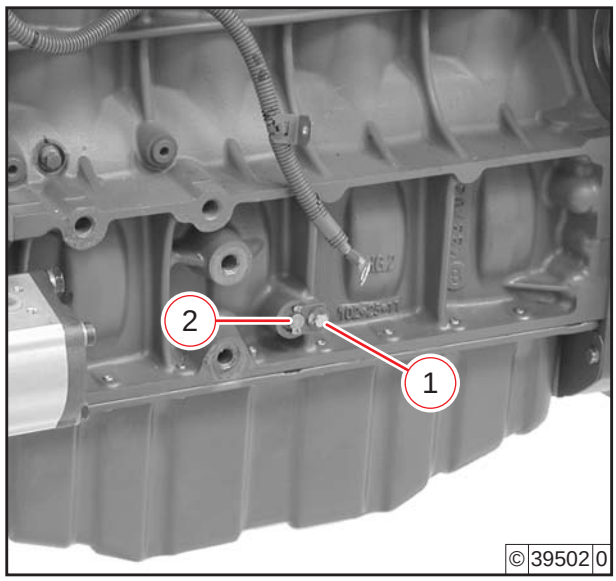
6

- Insert stopper (2).

Note
Oil round sealing ring lightly

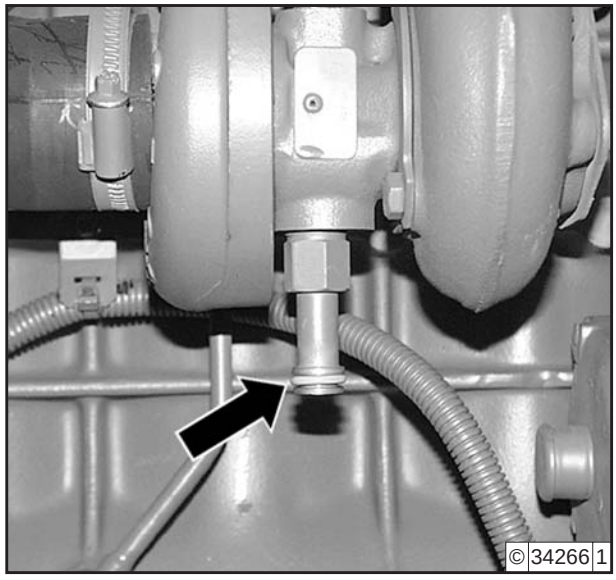
- Mount holder and tighten screw (1).

08046



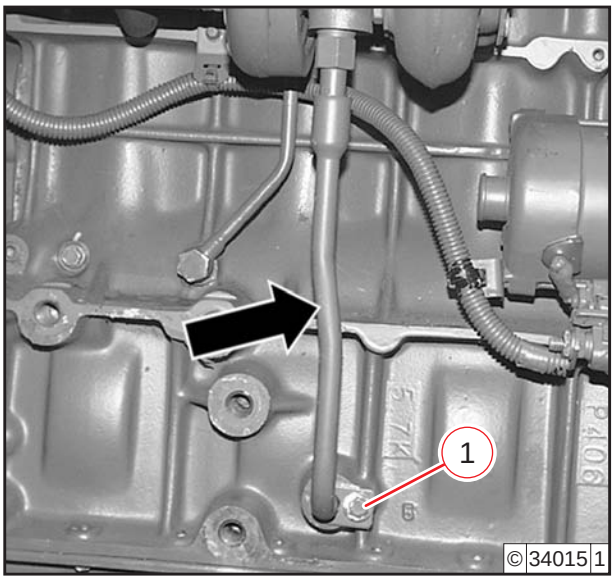
In BFL, BFM engines

- Pull new round sealing rings onto screwed socket (arrow) and oil return pipe.



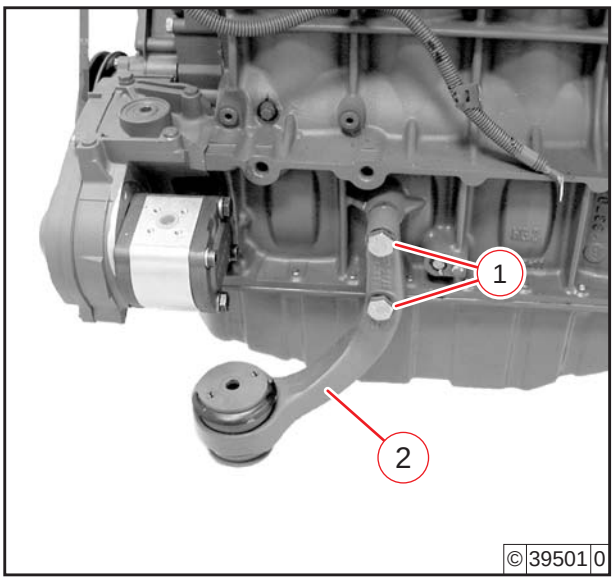
- Insert oil return pipe (arrow).
- Mount holder and tighten screw (1).

08044



- Mount engine bearing (2) and tighten screws (1).

00003



- Unhook engine from workshop crane and unscrew eyebolt.
- Install starter
  ➔ Job card **W 13-03-02**

6

Notes

Check and set valve clearance

Tools

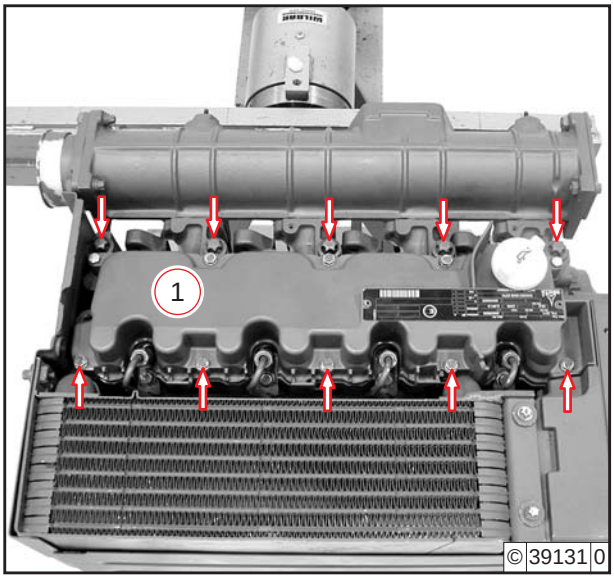
- Commercial tools
Feeler gauges

Note

The standard valve clearance setting is possible:
- On cold or warm engine after a cooling time of at least 0.5 h.
- Oil temperature < 80 °C.

Removal

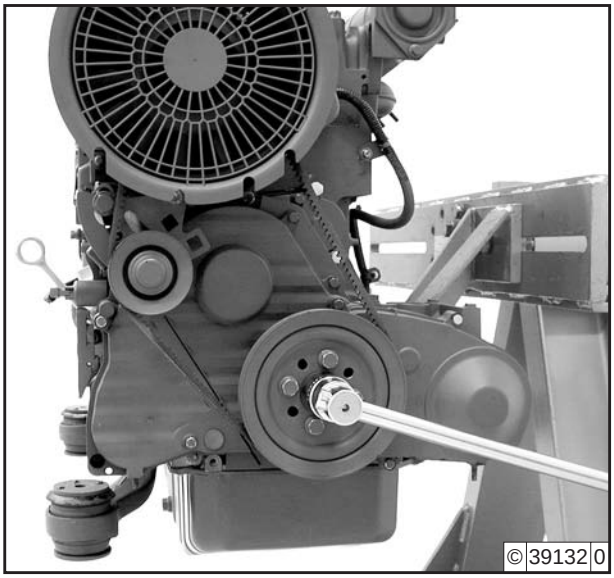
- Unscrew screws (arrows), remove starter cylinder head cover (1) and gasket.



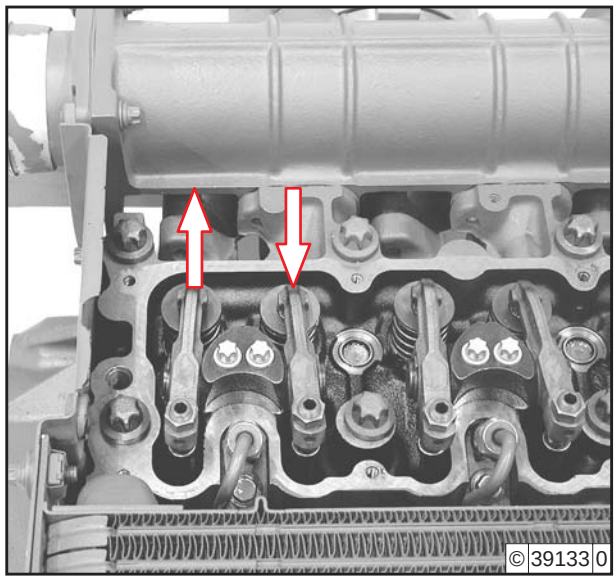
Set engine to valve overlap

- Turn crankshaft until reaching valve overlap on cylinder no. 1.

01 63



Note
Valve overlap means:
- Outlet valve not yet closed.
- The inlet valve starts opening.



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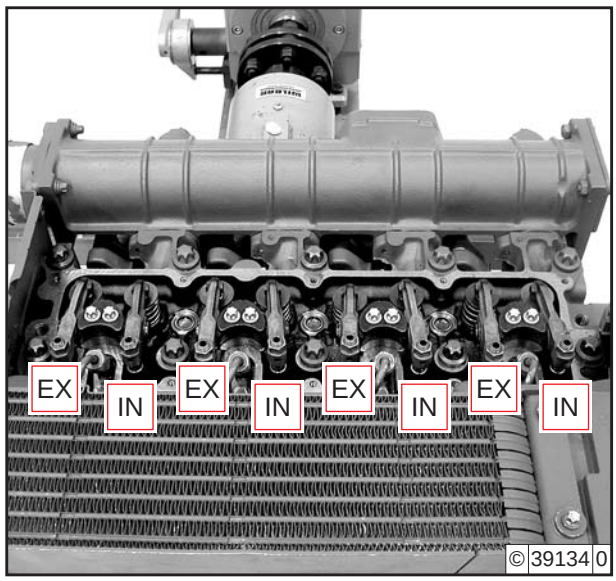
Check valve clearance

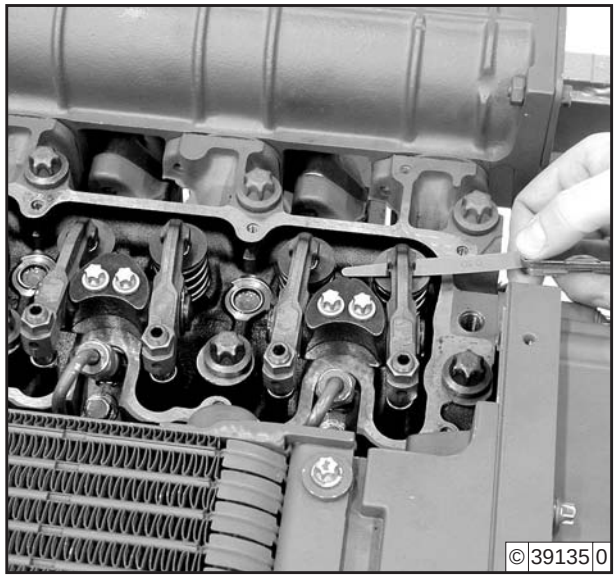
- Arrangement of inlet and outlet valves.
  - IN = inlet valve
  - EX = outlet valve



- Check valve clearance setting with feeler gauge blade on the appropriate cylinder.

01 63 01 61 01 62

Note
The feeler gauge blade must go between the toggle lever sliding surface and the valve with little resistance.

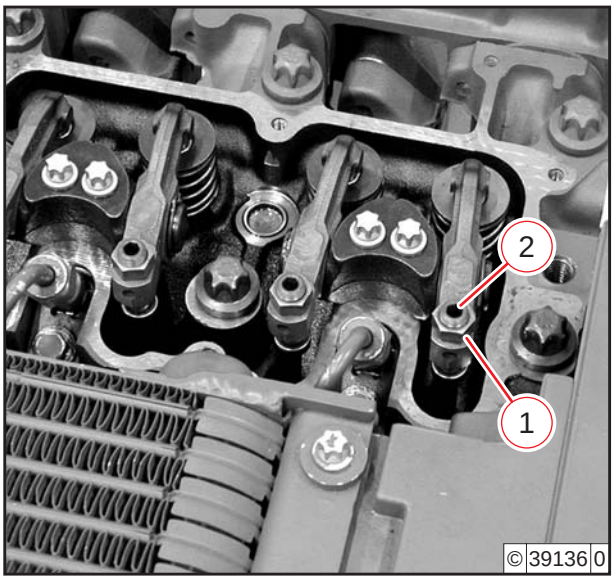


Setting valve clearance

- Loosen lock nut (1).
- Correct valve clearance by turning the setting screw (2).

Note
- If valve clearance is too small, unscrew the setting screw.
- If valve clearance is too great, screw in the setting screw.

01 61 01 62

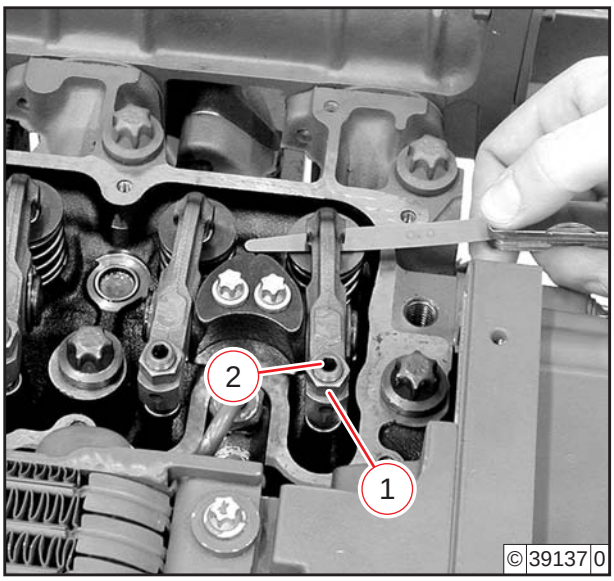


- Tighten lock nut (1).

Note
Do not turn the setting screw (2) when tightening the lock nut.

01003

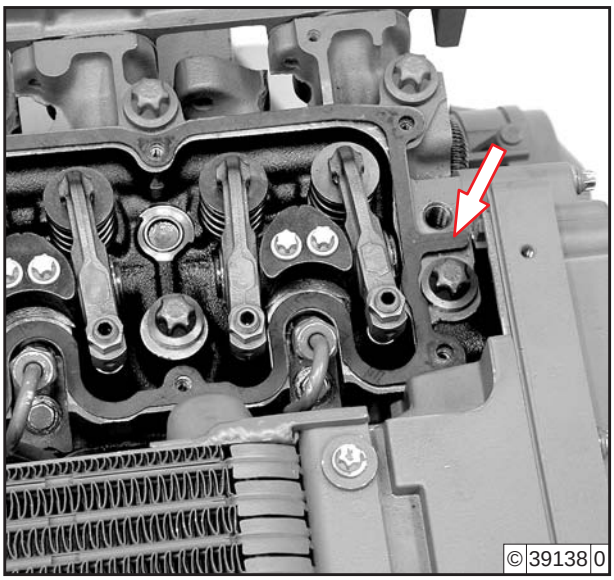
- Check the valve clearance again with a feeler gauge blade.



Assembly

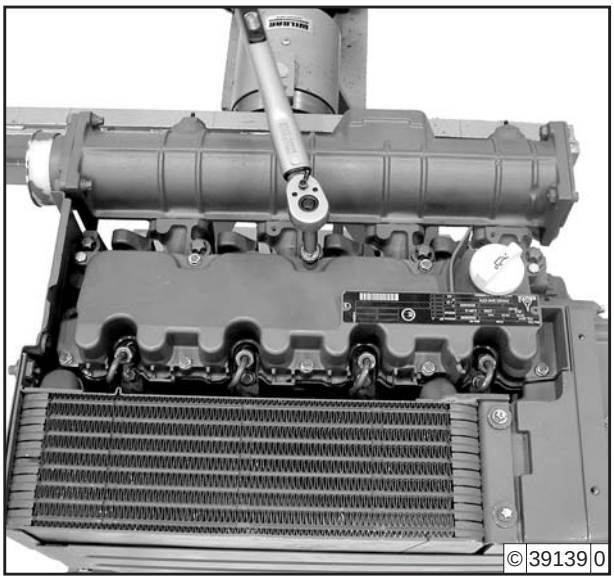
- Clean the sealing surface on the cylinder head cover and cylinder head.
- Fit gasket.

Note
Note installation position, the gate (arrow) must face the front cover.



- Mount cylinder head cover and tighten screws alternately.

01004



6

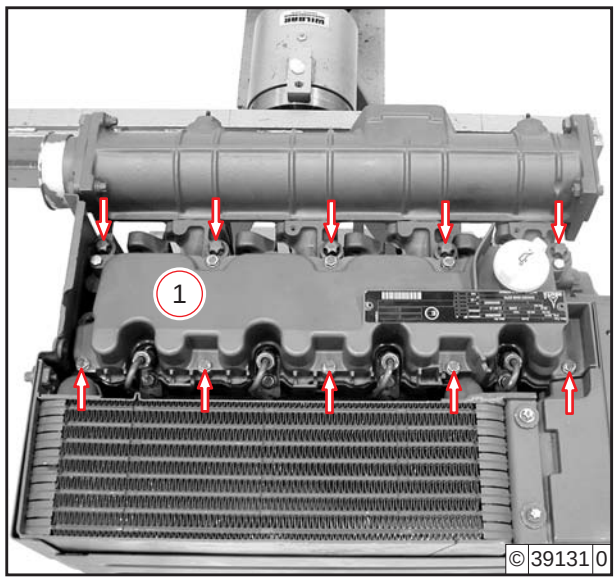
Remove and install toggle lever and toggle lever block

Tools
- Commercial tools

References
- W 01-01-01

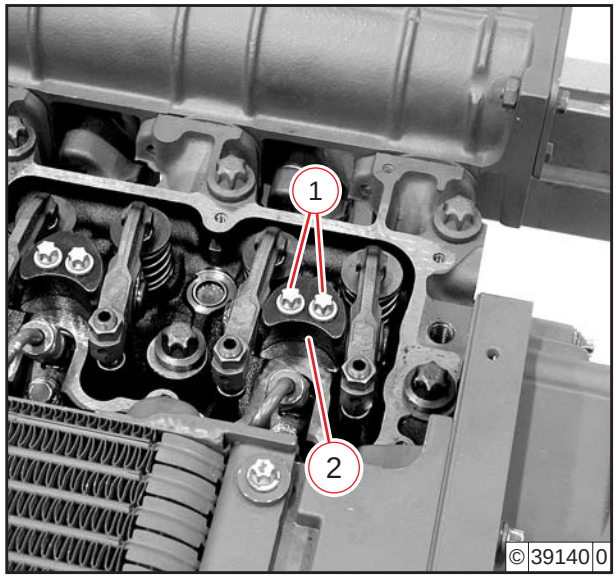
Remove toggle lever and toggle lever block

- Unscrew screws (arrows).
  Remove cylinder head cover (1) and gasket.



- Unscrew screws (1) and remove toggle lever with toggle lever block (2).

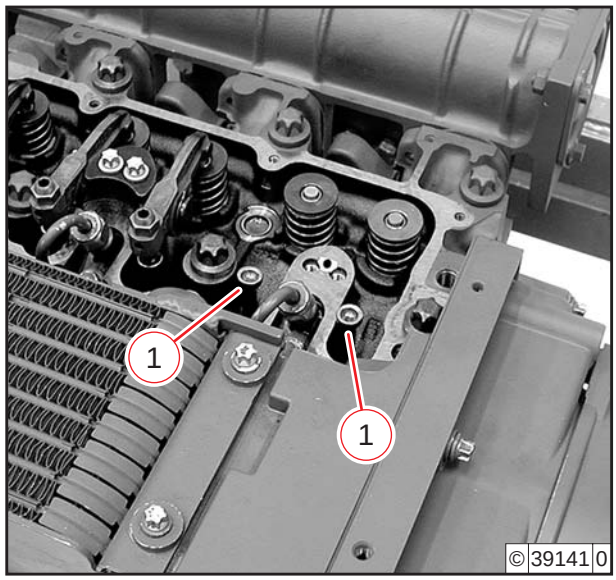
Note
- Loosen screws evenly to avoid jamming the toggle lever blocks.
- Set down the components in the order of installation.



- Remove stop rods (1).

Note
Set down the components in the order of installation.

- Check stop rods for visible signs of damage.



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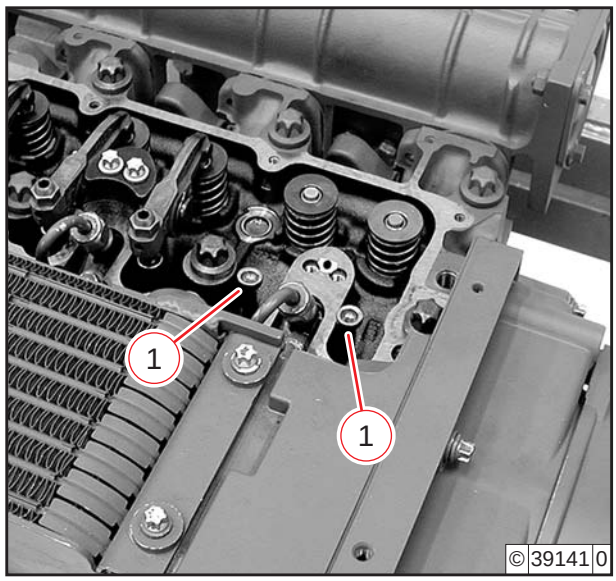
- Insert stop rods (1).

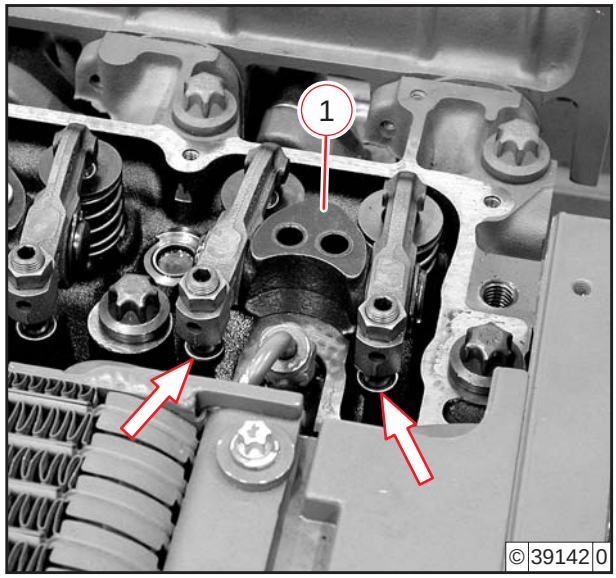
Note
- Note the assignment of the stop rods.
- The stop rod must be seated in the socket of the ram with the ball head.



Install toggle lever and toggle lever block

- Loosen the lock nuts of the setting screws and turn back the setting screws.
- Mount toggle lever block (1).

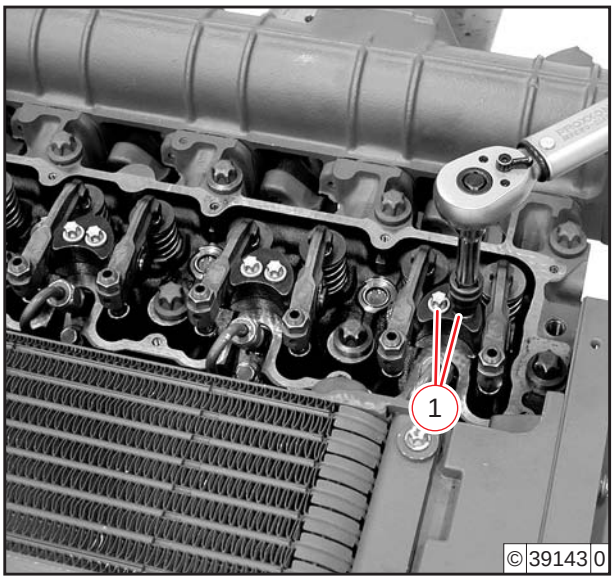
Note
The ball heads must be seated in the sockets of the stop rods (arrows).



- Tighten (1) screws alternately.

Note
- Make sure that the stop rods are not under stress due to valve overlap when tightening the bolts.
- Align toggle lever to the stop rods/valves.

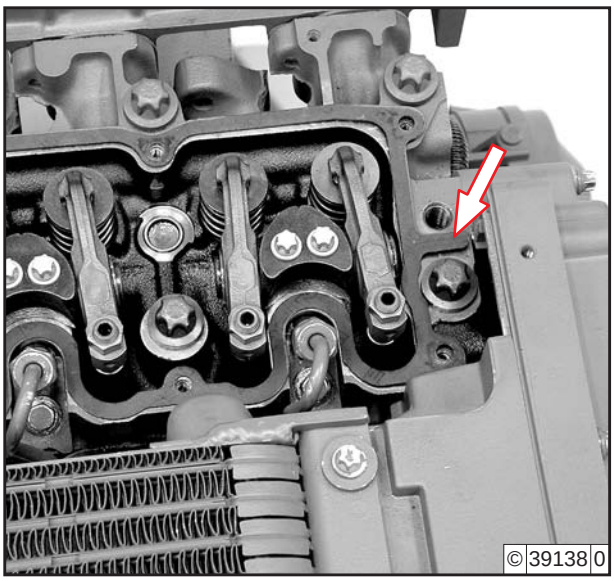
01002



- Check and set valve clearance
  ➔ Job card **W 01-01-01**.

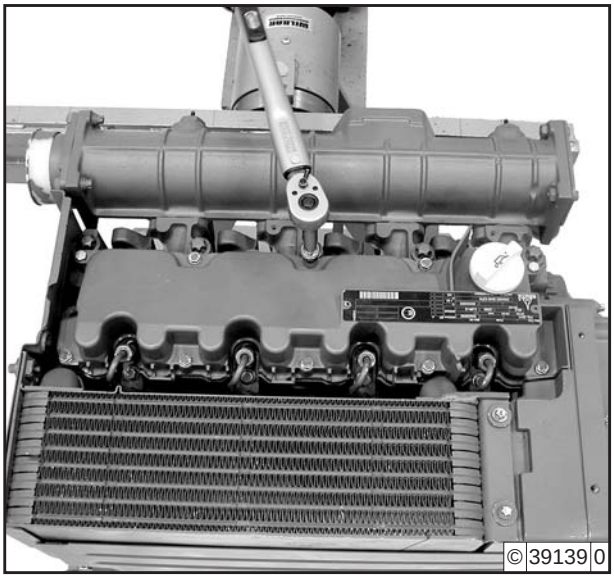
- Clean the sealing surface on the cylinder head cover and cylinder head.
- Fit gasket.

Note
Note installation position, the gate (arrow) must face the front cover.



- Mount cylinder head cover and tighten screws alternately.

01004



6

Notes

Disassemble and complete, check toggle lever and toggle lever block

Tools

- Commercial tools

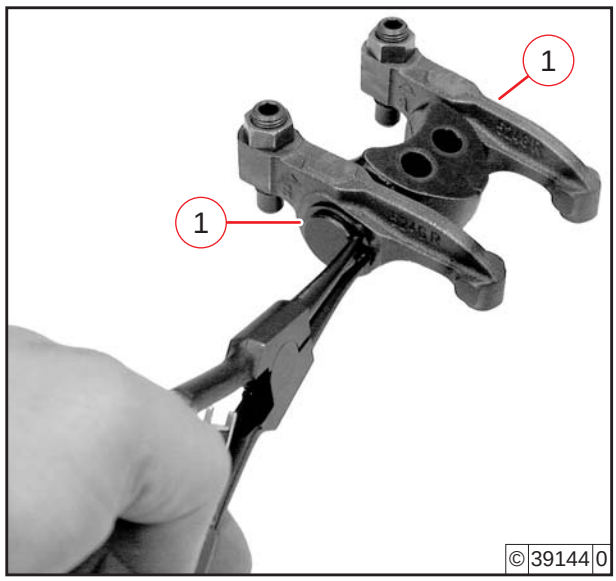
Internal measuring device
Micrometer gauge

References

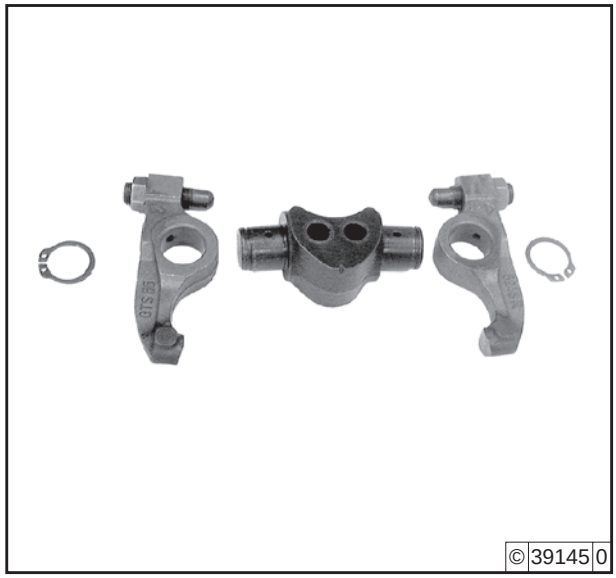
- W 01-02-02

Dismantle toggle lever block

- Remove toggle lever and toggle lever block
  ➔ Job card **W 01-02-02**.
- Remove locking rings (1).



- Remove toggle lever.

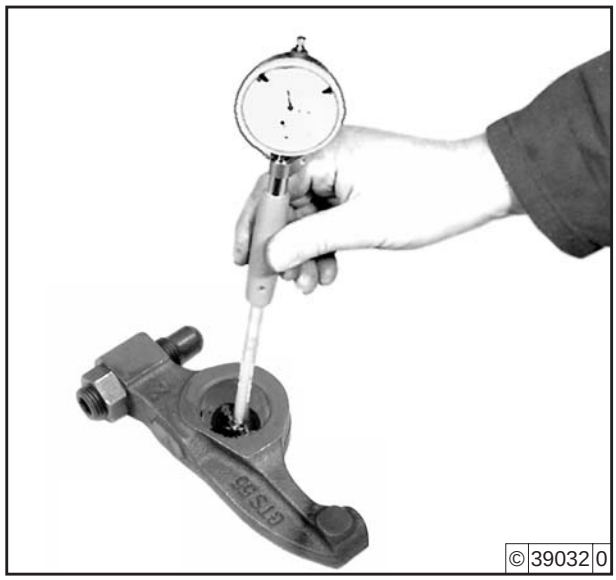


Check toggle lever

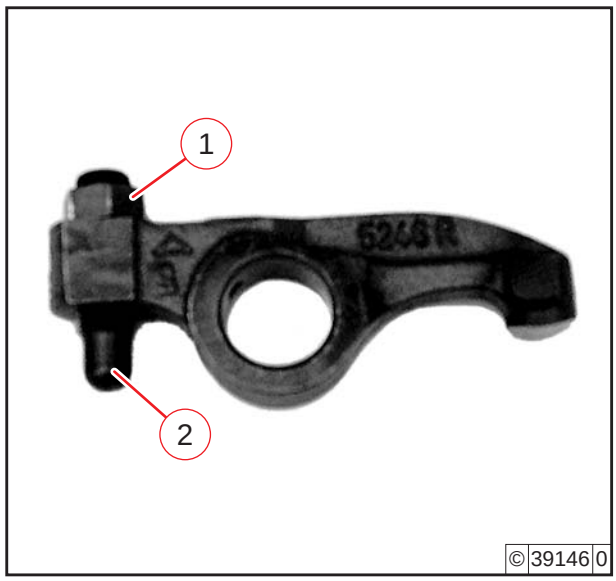
- Measure toggle lever bore with internal measuring device.

01 72 01 73

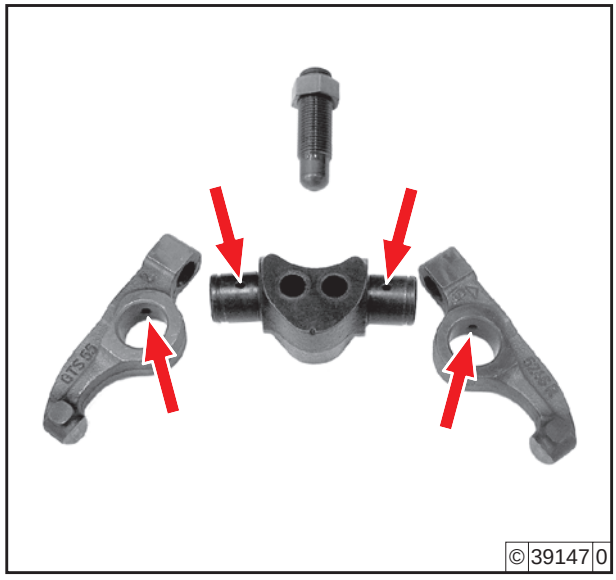
Note
If the wear limit is reached, change the toggle lever.



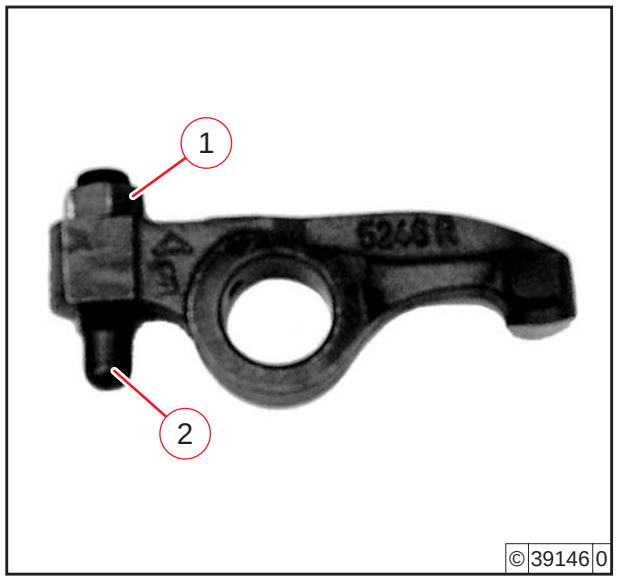
- Unscrew lock nut (1) and turn out setting screw (1).



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



- Turn setting screw (2) into the toggle lever and tighten the lock nut (1).

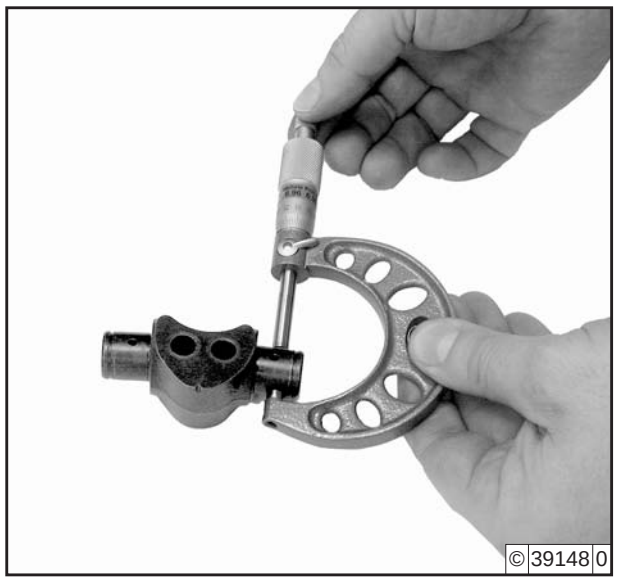


Check the toggle lever axis

- Measure toggle lever diameter with micrometer gauge.

01 74

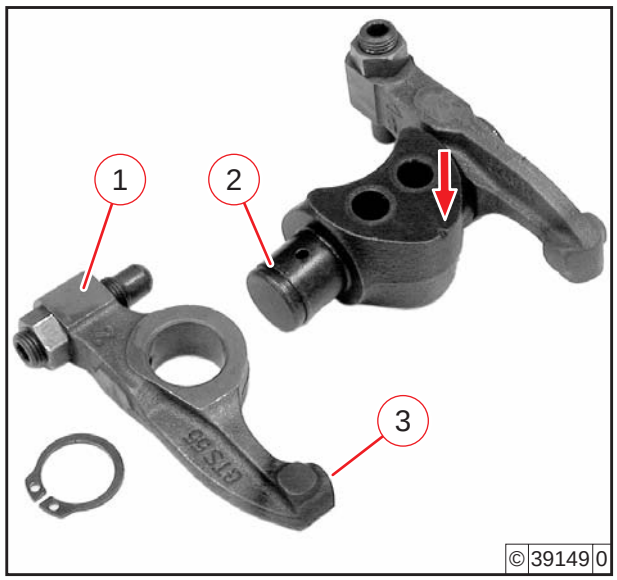
Note
If the wear limit is reached, the toggle lever block has to be changed.



Complete the toggle lever block

- Push toggle lever (1) onto the toggle lever axle (2).

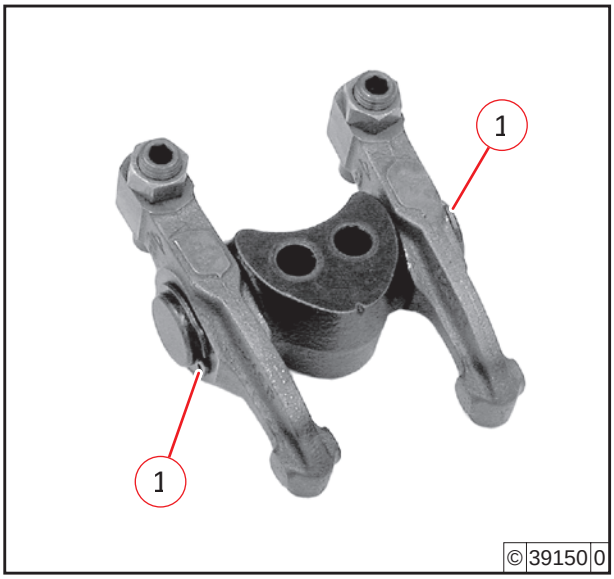
Note
- Oil the toggle lever axle (2) lightly.
- The toggle lever sliding surface (3) must face the side with the notch (arrow).



- Install locking rings (1).

Note
Pay attention to correct fit of the locking ring in the groove.

- Install toggle lever and toggle lever block
  ➔ Job card **W 01-02-02**.



6

Remove and install cylinder head

Tools

- Commercial tools

8189 - Torx tool kit

- Special tools

100 400 - Meter

100 750 - Measuring device

References

- W 01-02-02
- W 06-07-03
- W 07-07-01
- W 09-11-01
- W 13-02-03

Remove cylinder head

- Remove air intake pipe
  ➔ Job card **W 06-07-03**.
- Remove injection valve
  ➔ Job card **W 07-07-01**.
- Remove toggle lever and toggle lever block
  ➔ Job card **W 01-02-02**.

In FM, BFM engines

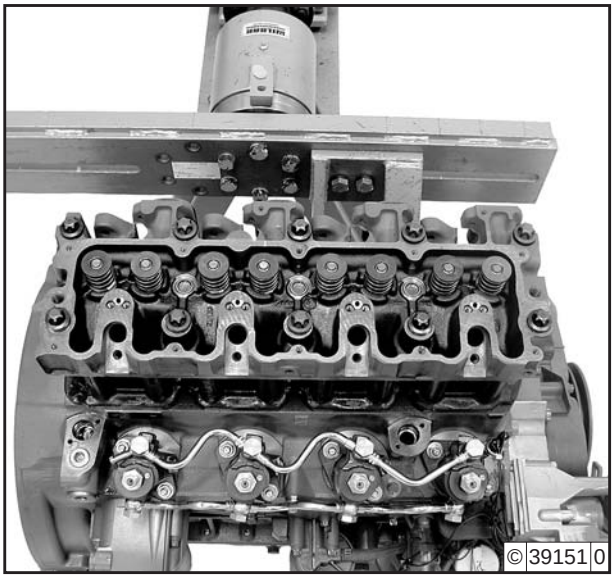
- Remove generator
  ➔ Job card **W 13-02-03**.

In FL, BFL engines

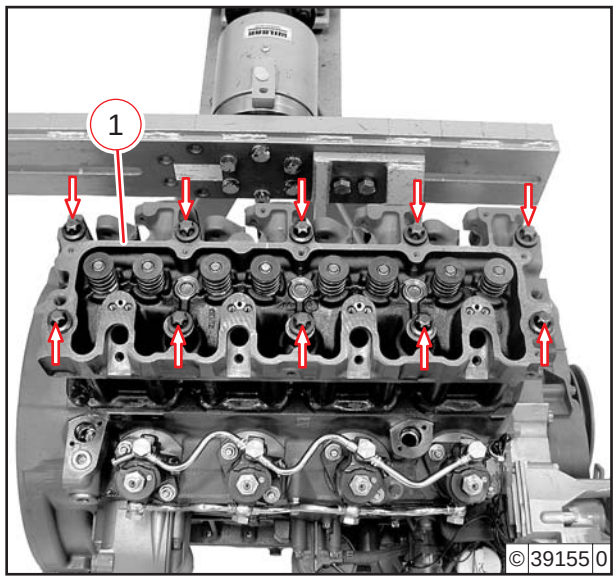
- Remove cooling blower
  ➔ Job card **W 09-11-01**.

Note

Put down the components in the order of installation, note order of cylinders.



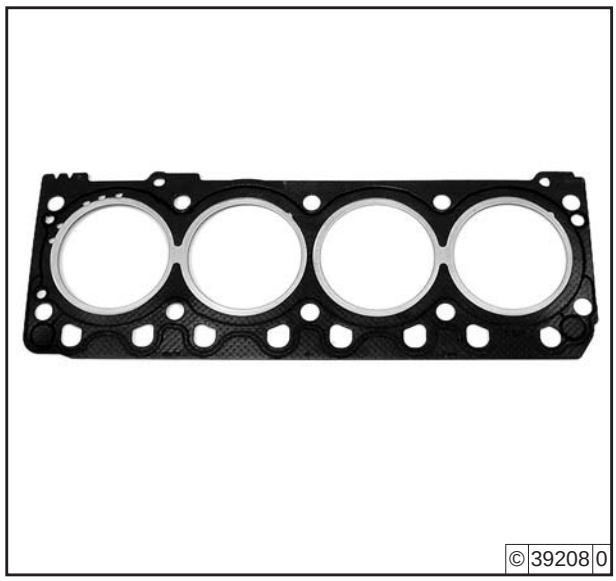
- Unscrew screws (arrows), remove cylinder head (1) and gasket.
- Clean sealing surfaces on cylinder head and crankcase.



6

Determine cylinder head gasket

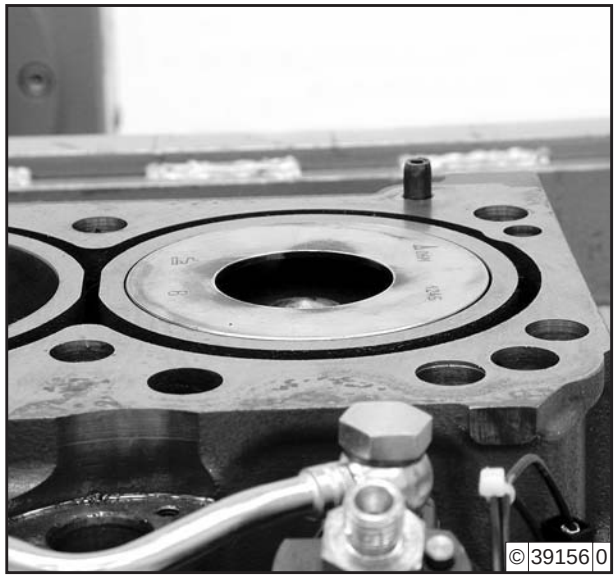
Note
- The piston overlap must be measured on all pistons to determine the cylinder head gasket.
- The cylinder head gasket must be selected according to the greatest measured piston overlap.



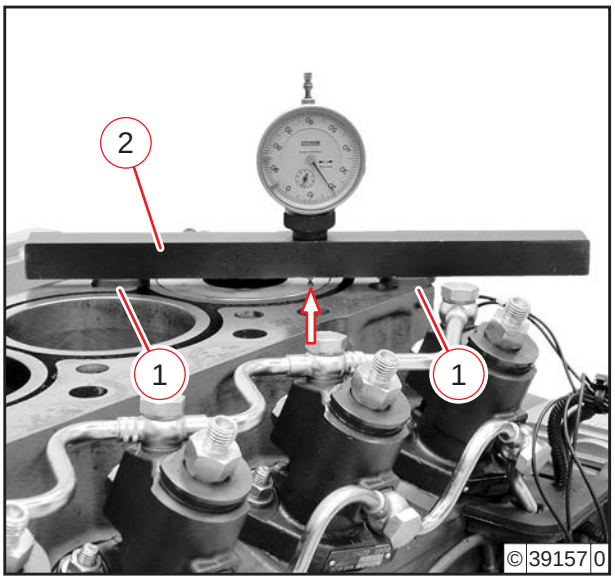
Determine piston UT

- Turn crankshaft until the piston closes flush with the crankcase.

Note
Turn crankshaft in direction of rotation of engine.

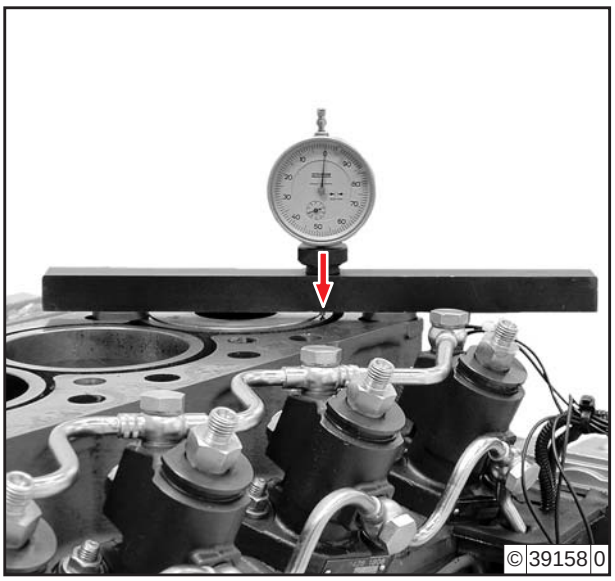


- Mount shim (1) and measuring bridge (2) on crankcase.
- Insert meter in measuring bridge and position the stylus with pre-tension on the piston base (arrow).
- Turn the crankshaft on evenly until the reversal point of the pointer on the meter is reached.
  The piston is now in UT.



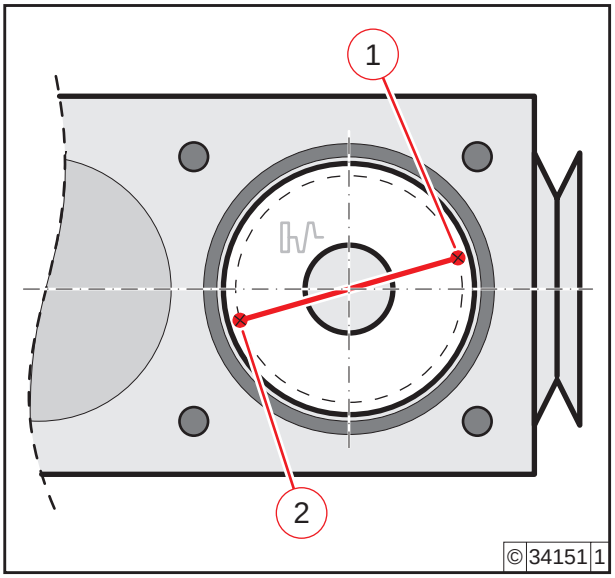
Determine piston overlap

- Move measuring bridge and shim.
- Place the stylus of the meter under pre-tension on the sealing surface of the crankcase (arrow).
- Adjust meter to "0".



- Read measuring points.

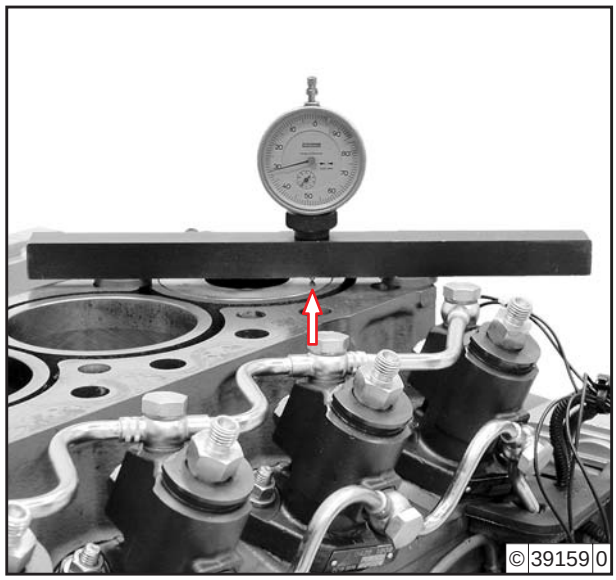
Note
Schematic representation for measuring the piston overlap at the points "1" and "2".



- Move the measuring bridge on the shims so that the stylus is applied to the specified measuring points.

Note
- Measuring points, see schematic diagram.
- The stylus may not be positioned on the labeling of the piston.

- Note the greatest measured value.

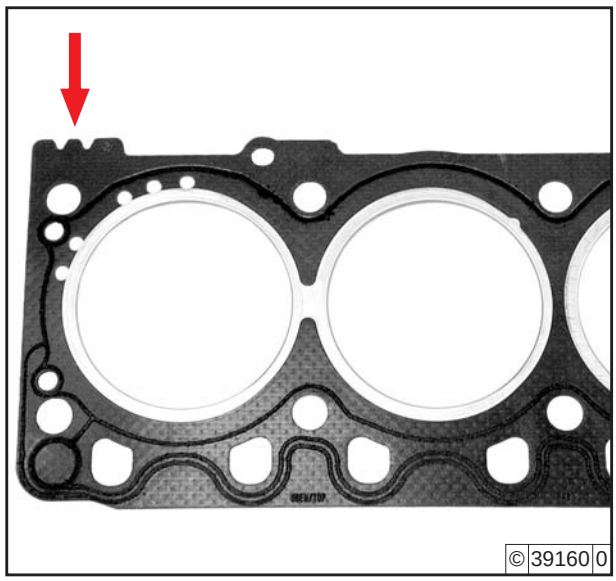


6

- Select the cylinder head gasket according to the greatest measured piston overlap.

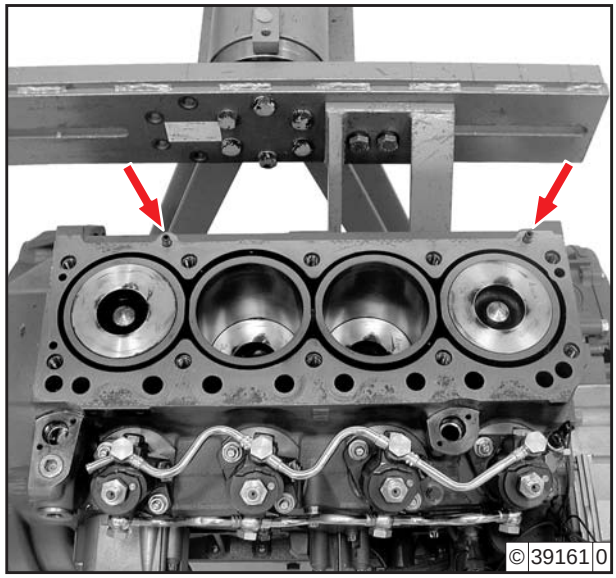
02 75 02 76 02 77

- Example: **Piston overlap = 0.73 mm**, corresponds to cylinder head gasket with **2 notches** (arrow).



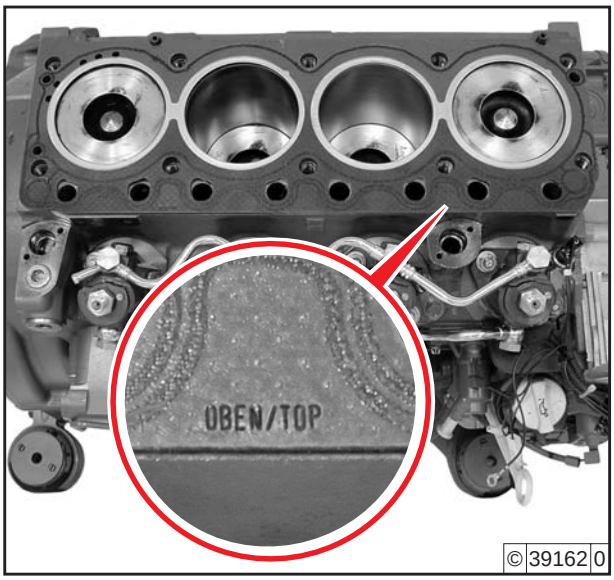
Install cylinder head

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



- Mount new cylinder head gasket.

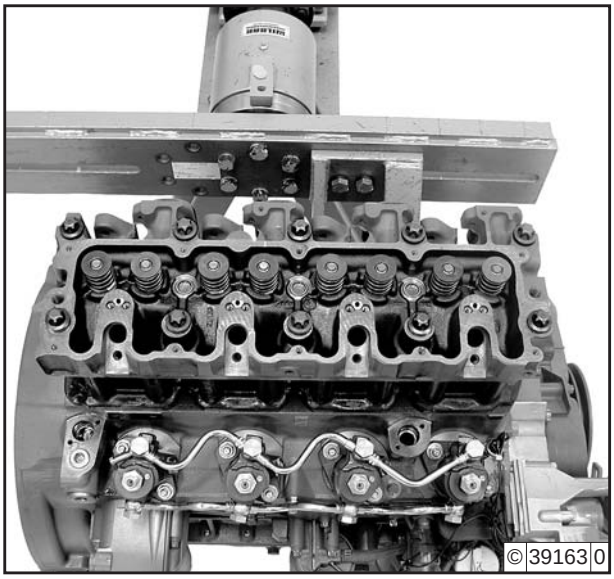
Note
- Sealing surfaces for the cylinder head gasket must be clean and free of oil.
- Identification ”OBEN / TOP” must face up.



- Mount cylinder head, oil cylinder head bolts lightly and tighten.

Note
Cylinder head bolts can be used a maximum 5 times in case of provability.

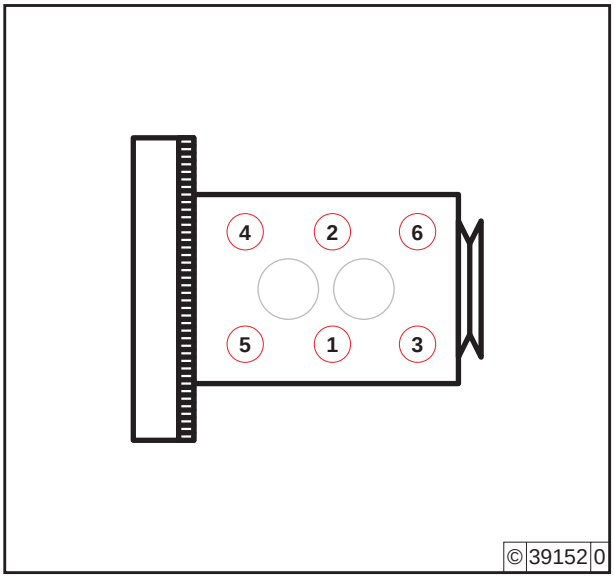
01 98



Tightening order 2-cylinder

- Tighten all bolts in the right order.

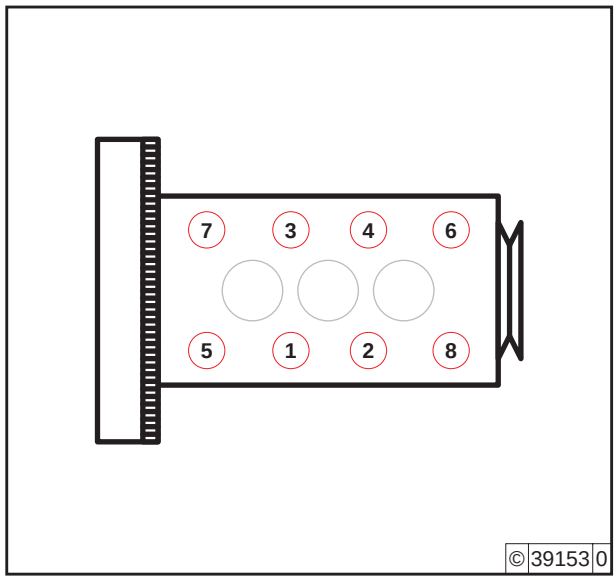
01001



Tightening order 3-cylinder

- Tighten all bolts in the right order.

01001



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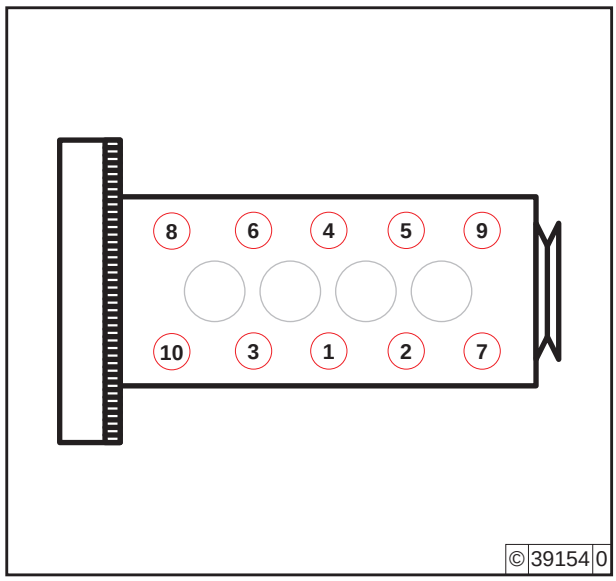
Tightening order 4-cylinder

- Tighten all bolts in the right order.

01001

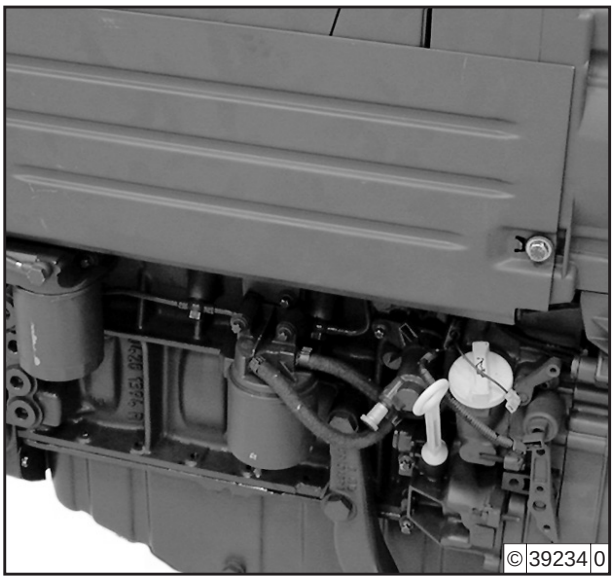


In FM, BFM engines

- Install generator
  ➔ Job card **W 13-02-03**.

In FL, BFL engines

- Install cooling blower
  ➔ Job card **W 09-11-01**.
- Install toggle lever and toggle lever block
  ➔ Job card **W 01-02-02.**
- Install injection valve
  ➔ Job card **W 07-07-01.**
- Install air intake pipe
  ➔ Job card **W 06-07-03.**



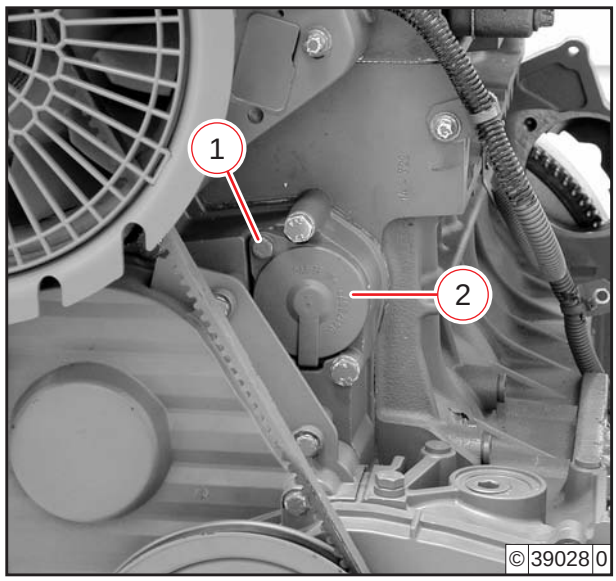
Notes

Remove and install crankcase bleeding

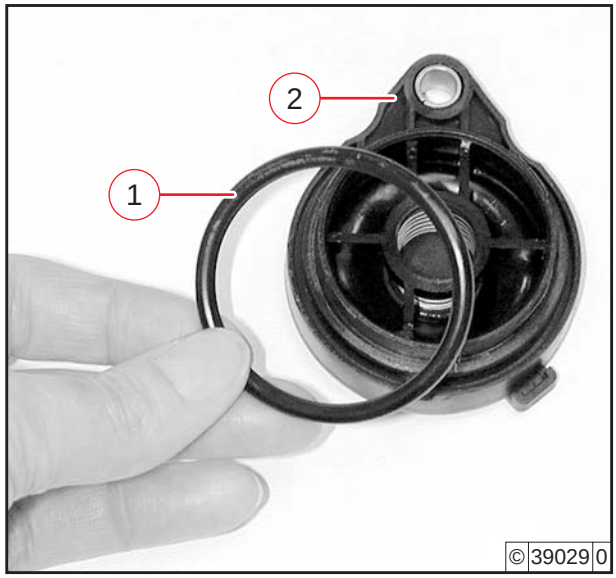
Tools
- Commercial tools

Remove bleed valve

- Unscrew screw (1) and remove bleed valve (2).
- Clean components and check for visible signs of wear.



- Pull new round sealing ring (1) onto bleed valve (2).



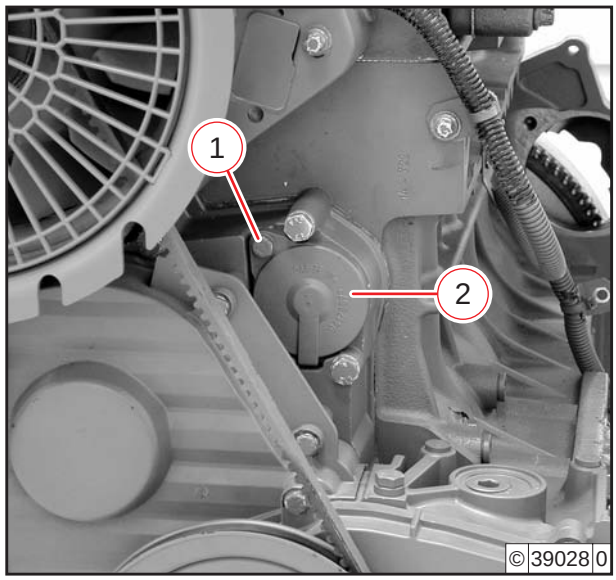
Install bleed valve

- Mount bleed valve (2) and press in.

Note
The bleed valve must contact the front cover evenly.

- Tighten screw (1).

03060



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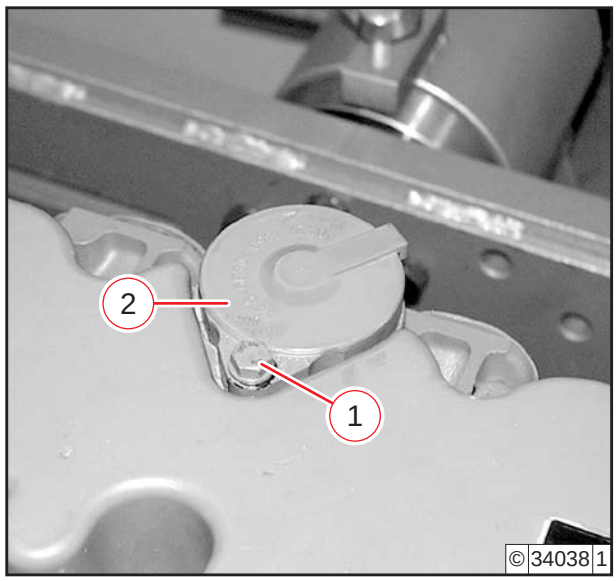
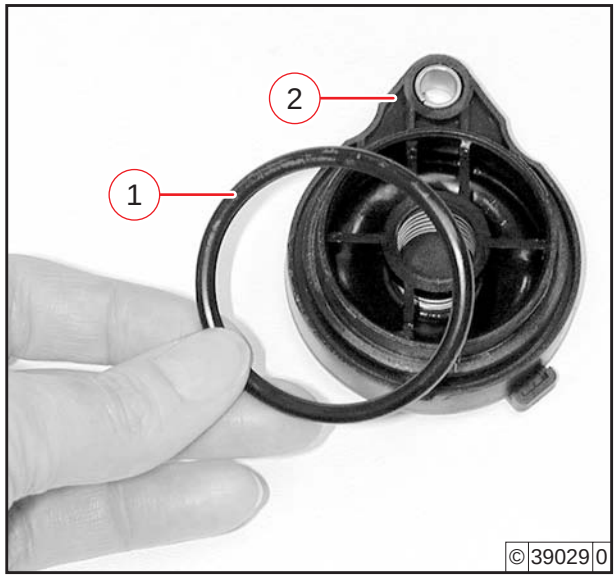
In BFL, BFM engines

Remove bleed valve

- Unscrew screw (1) and remove bleed valve (2).
- Clean components and check for visible signs of wear.



- Pull new round sealing ring (1) onto bleed valve (2).



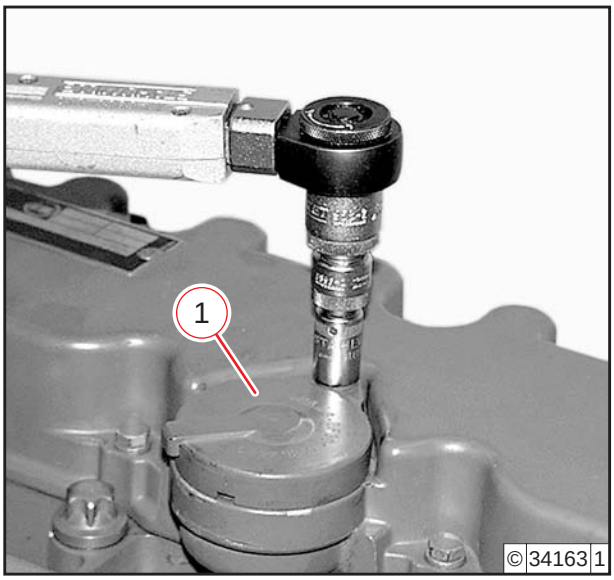
Install bleed valve

- Mount bleed valve (1) and press in.

Note
The bleed valve must touch the cylinder head cover evenly.

- Tighten screw.

03060



6

Notes

Remove and install exhaust manifold

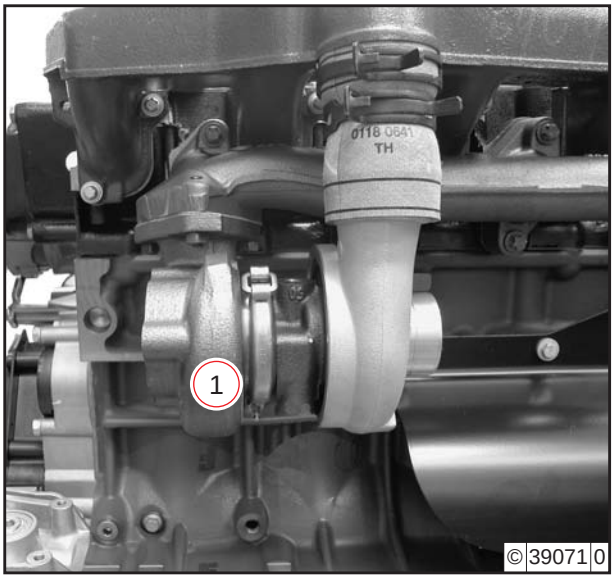
Tools
- Commercial tools
8189 - Torx tool kit

Auxiliary material
- DEUTZ S1

References
- W 06-06-04

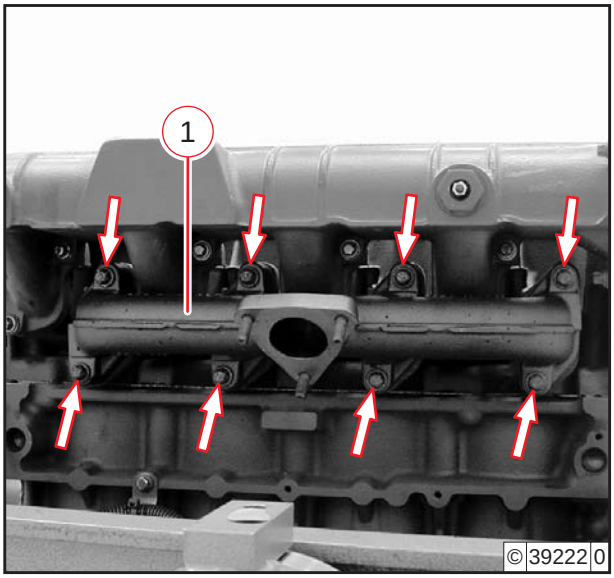
In BF engines

- Remove turbocharger (1).
  ➔ Job card **W 06-06-04**.



Remove exhaust manifold

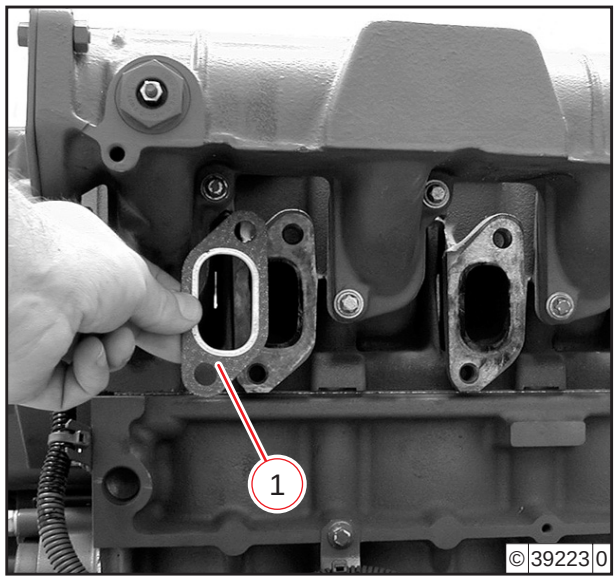
- Unscrew screws (arrows), remove exhaust manifold (1) and gaskets.
- Check components for visible signs of damage.



Install exhaust manifold

- Clean the sealing surface on the exhaust manifold and cylinder head.

Note
Note installation position of the gaskets (1).



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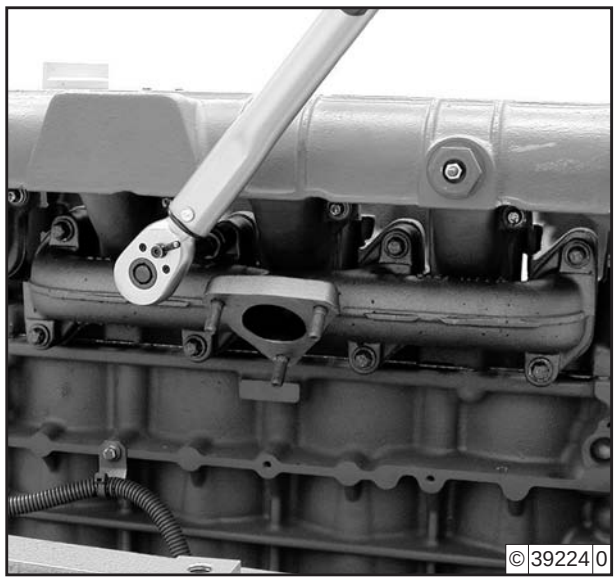
- Mount exhaust manifold with new gaskets and tighten screws.

Note
Coat screws with assembly aid **DEUTZ S1**.

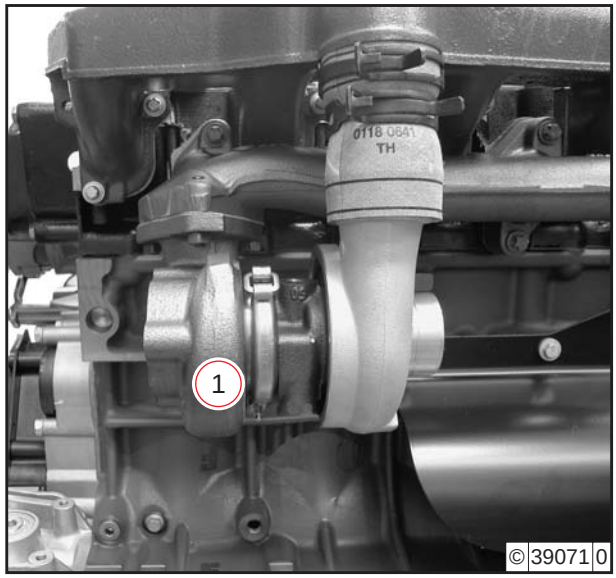
- Tighten screws alternately from the center outwards.

06001



In BF engines

- Install turbocharger (1).
  ➔ Job card **W 06-06-04**.



Remove and install turbocharger

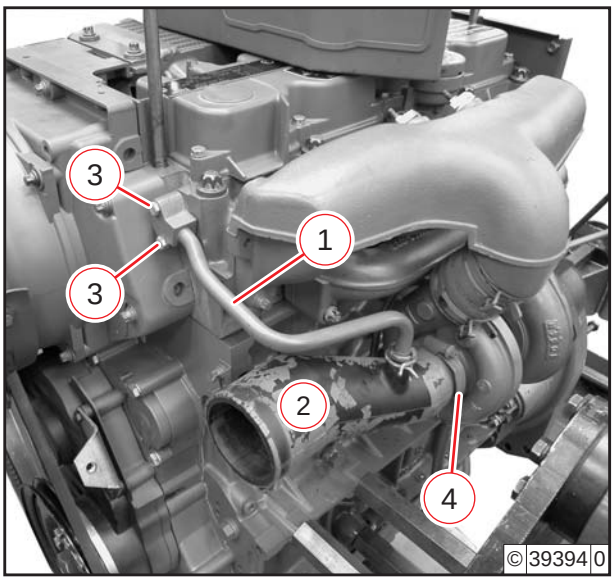
Tools
- Commercial tools
9090 - Clamping pliers

Auxiliary material
- DEUTZ S1

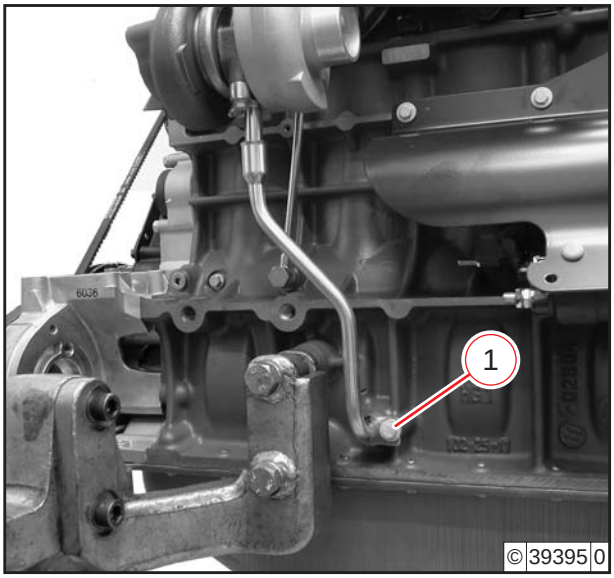
Note
Collect drained operating materials in suitable vessels and dispose of according to regulations.

Remove turbocharger

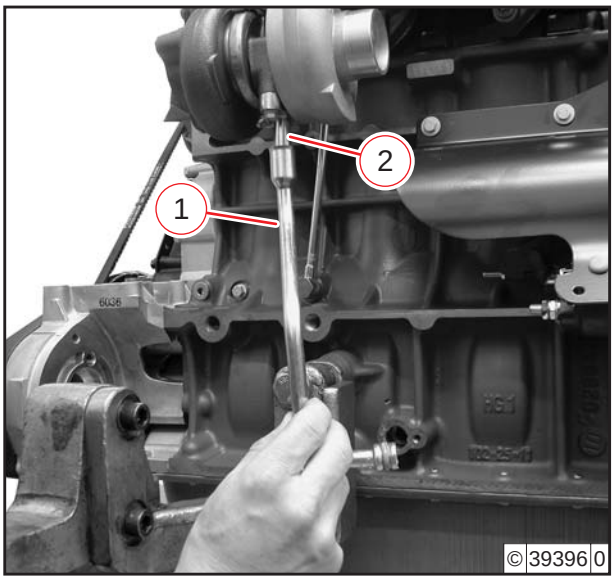
- If available, remove the bleed pipe (1) and reducer (2).
  Unscrew screws (3).
- Loosen pipe clip (4), remove reducer with bleed pipe.



- Unscrew screw (1) and remove holder.



- Pull oil return line (1) out of the crankcase and pull off from oil return pipe flange support (2).



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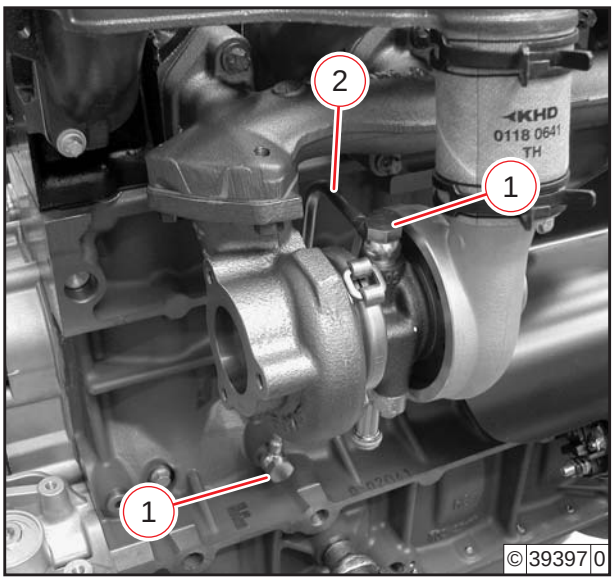
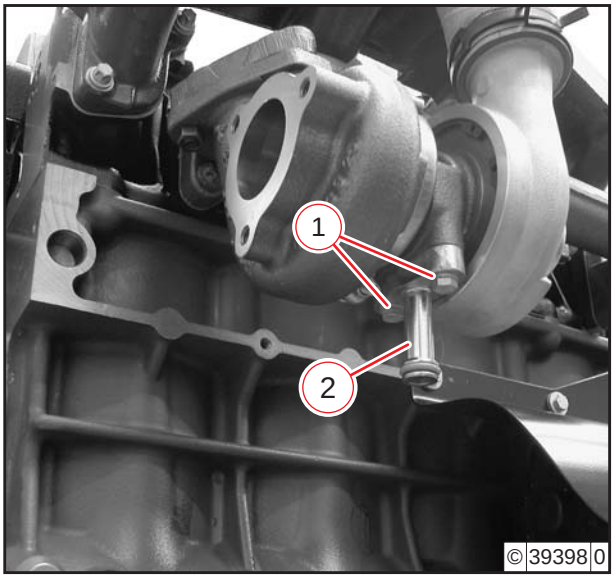
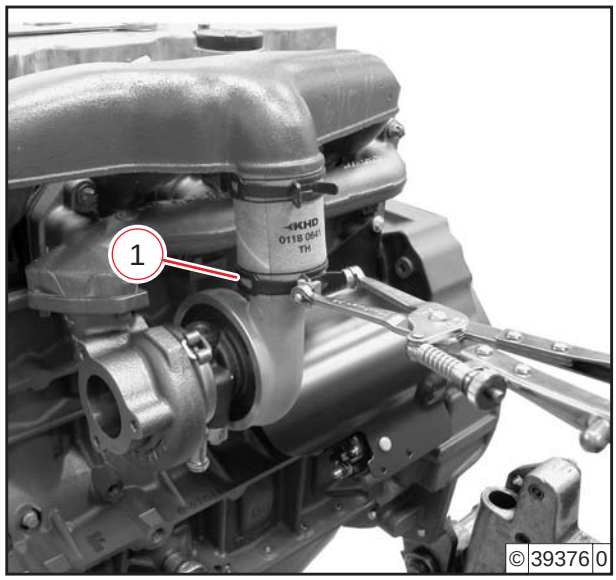
- Unscrew hollow screws (1), remove oil pressure line (2) and sealing rings.



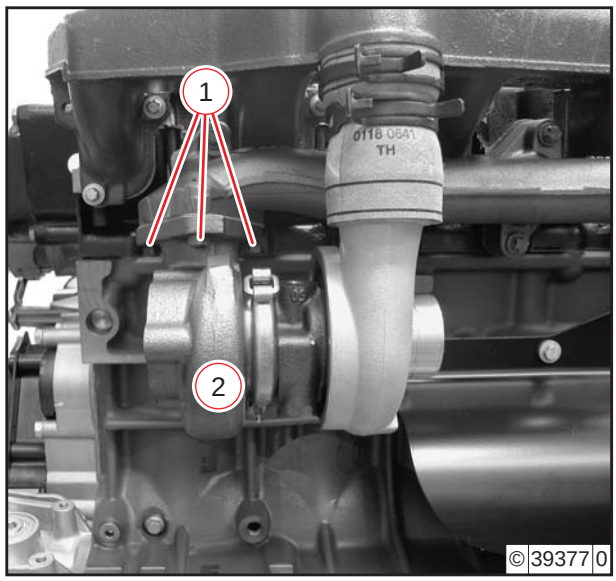
- Unscrew screws (1), remove oil return pipe flange support (2) and gasket.



- Loosen pipe clip (1) with clamping pliers.



- Unscrew nuts (1), remove turbocharger (2) and gasket.
- Check components for visible signs of damage.

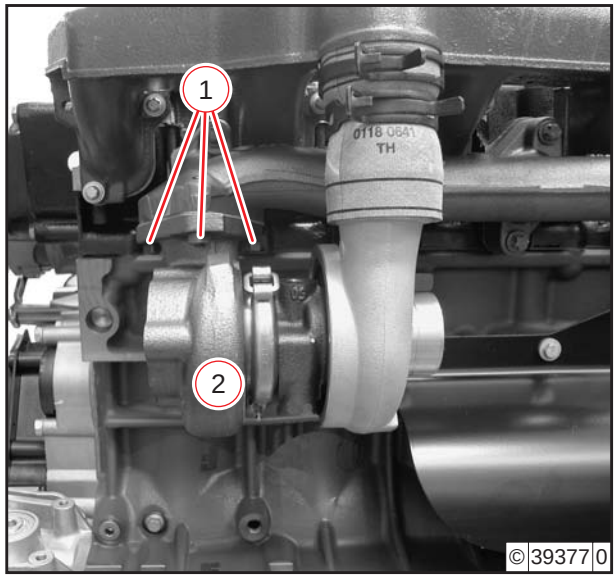


Install turbocharger

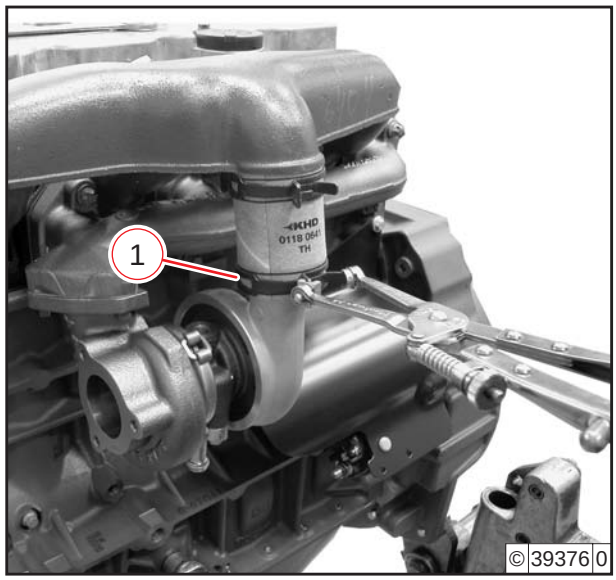
- Clean the sealing surface of the turbocharger and exhaust manifold.
- Mount turbocharger (2) with new gasket and tighten nuts (1).

Note
Coat pin bolts with assembly aid **DEUTZ S1**.

06020



- Position pipe clip (1) with clamping pliers.



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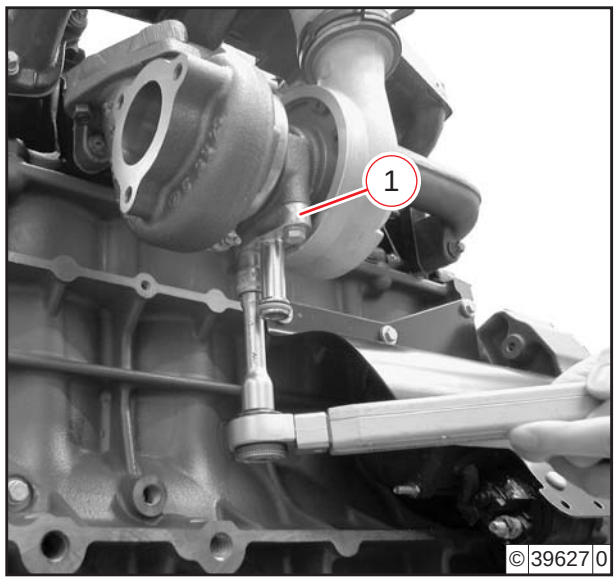
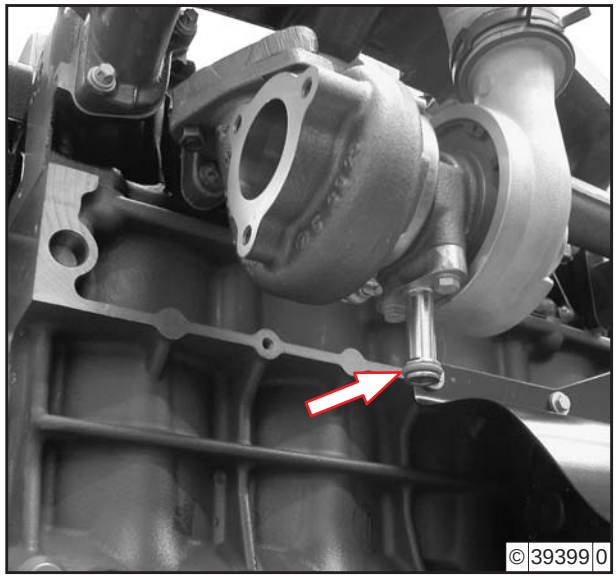
- Clean the sealing surface of the turbocharger and oil return pipe flange support.
- Mount oil return pipe flange support (1) with new gasket and tighten screws (2).

08044

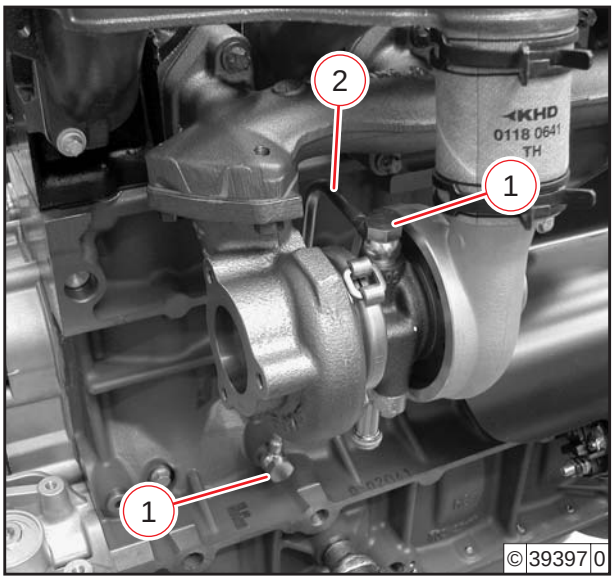


- Pull new round sealing ring (arrow) onto oil return pipe flange support.

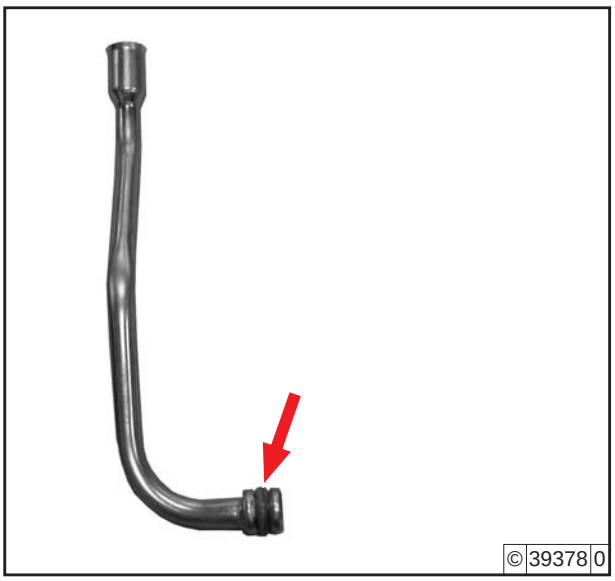


- Mount oil pressure line (2), tighten hollow screws (1) with new CU sealing rings.

08042

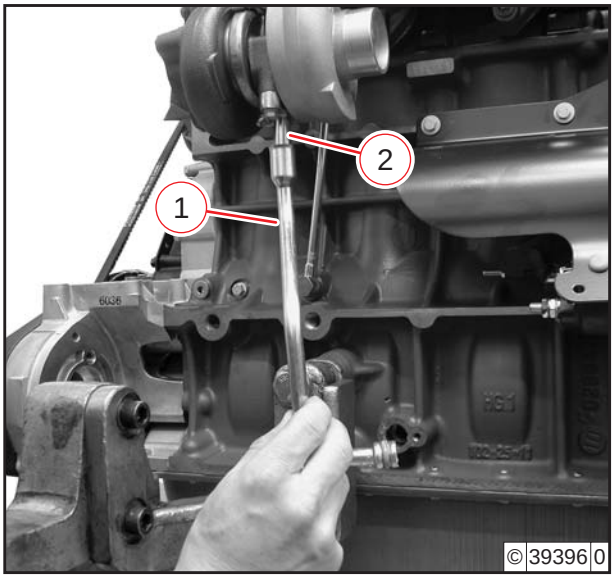


- Fit new round sealing ring (arrow) onto oil return pipe.



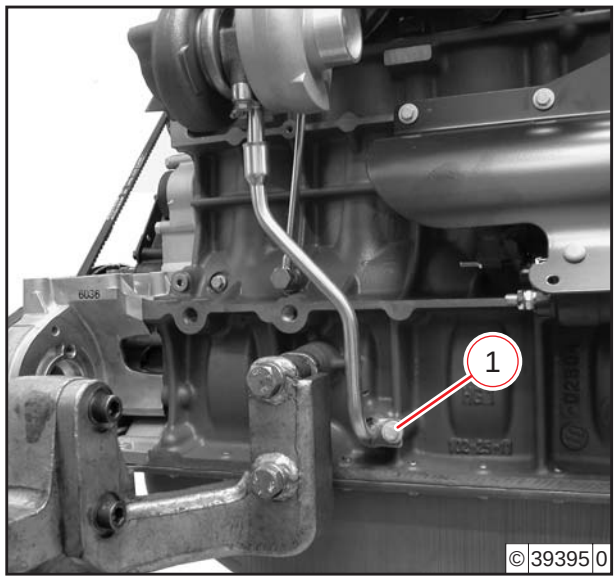
- Push oil return pipe (1) onto oil return pipe flange support (2) and insert in crankcase.

Note
Oil round sealing rings lightly.



- Mount holder and tighten screw (1).

08044



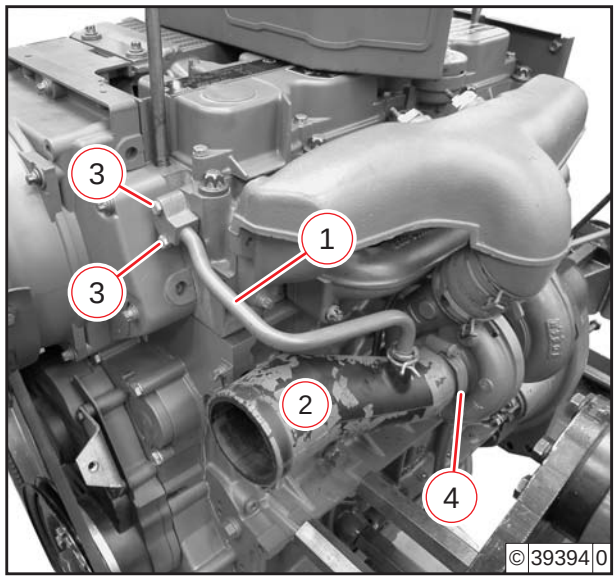
6

- Clean sealing surface on bleed pipe and cylinder head.
- If available, install the bleed pipe (1) and reducer (2).
- Mount reducer with bleed pipe and new gasket, tighten screws (3).

03060

- Fix pipe clip (1).

03060



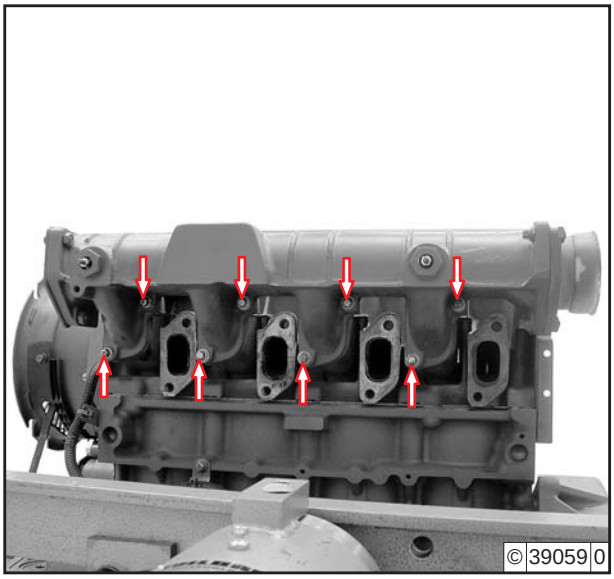
Remove and install air intake pipe

Tools
- Commercial tools
8189 - Torx tool kit

References
- W 06-01-05

Remove air intake pipe

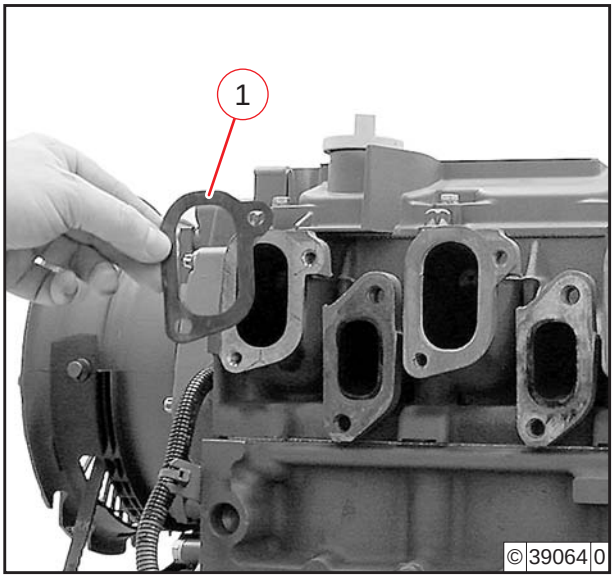
- Remove exhaust manifold
  ➔ Job card **W 06-01-05**.
- Unscrew screws (arrows), remove air intake pipe and gaskets.



Install air intake pipe

- Clean sealing surfaces on air intake pipe and cylinder head.

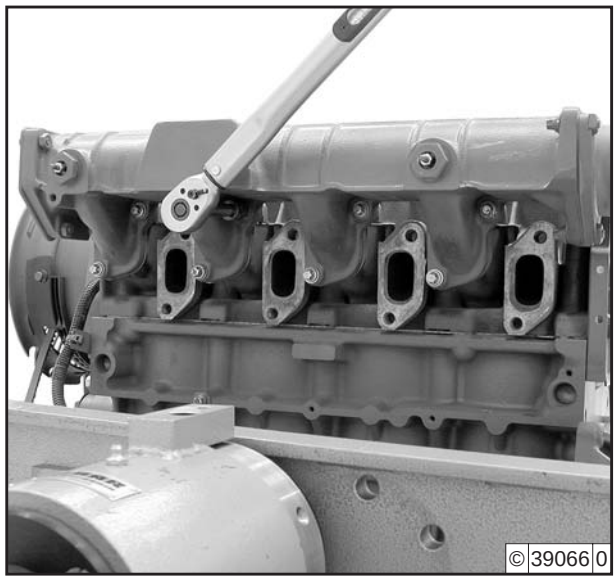
Note
Note installation position of the gaskets (1).



- Mount air intake pipe with new gaskets and tighten screws.
- Tighten screws from the center outwards.

06030

- Install exhaust manifold
  ➔ Job card **W 06-01-05**.



6

Remove and install lifting magnet for start volume release

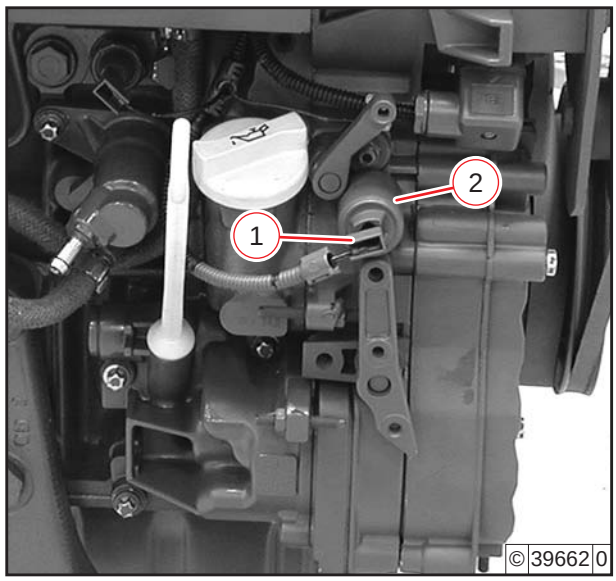
Tools

- Commercial tools

8027 - Pliers insert

Remove lifting magnet for start volume release

- Pull cable plug (1) out of lifting magnet (2).

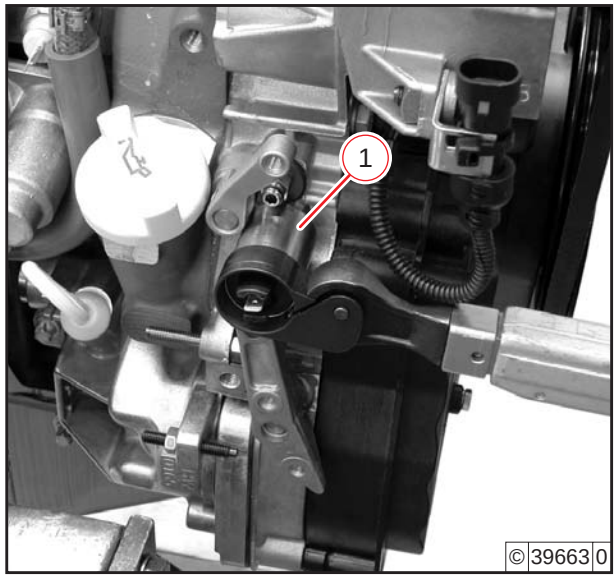


- Unscrew lifting magnet (1) with pliers insert and remove sealing ring.

Note

Note clamping direction of the pliers insert.

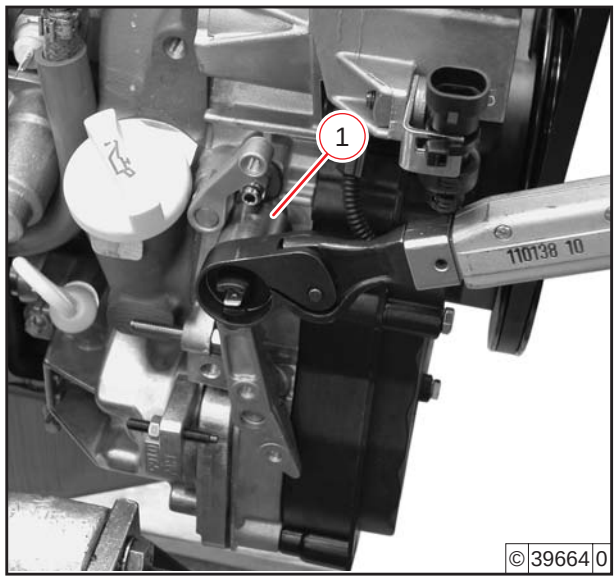
- Check components for visible signs of damage.



Install lifting magnet for start volume release

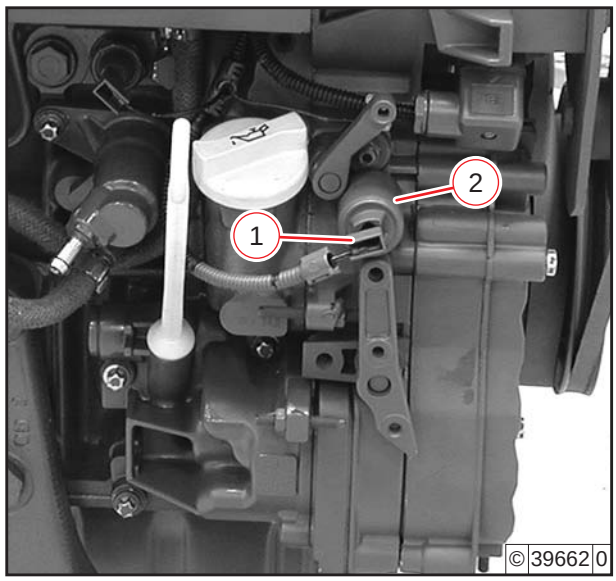
- Mount lifting magnet (1) with new CU sealing ring and tighten with pliers insert.

05065



6

- Pull cable plug (1) out of lifting magnet (2).



Renew injection lines

Tools

- Commercial tools

8018 - Claw wrench

8189 - Torx tool kit

References

- W 08-08-02

Caution!

Observe the safety regulations and and national specifications for handling fuels.

Note

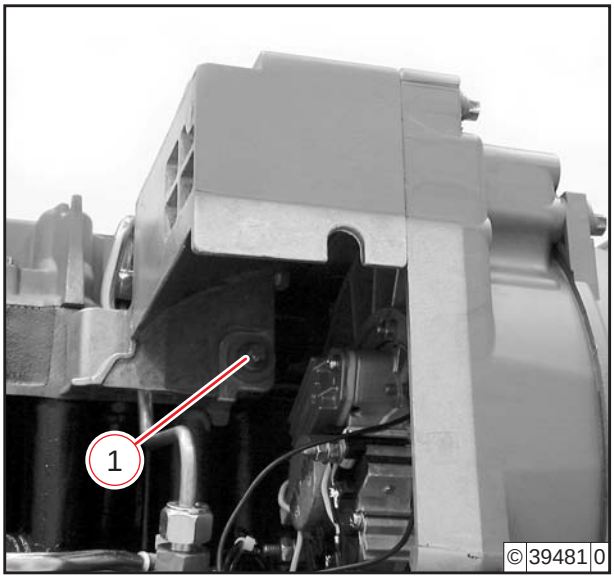
- Cleanliness is extremely important when working on the injection equipment.
- Bending the injection lines is not permissible.
  Small tears may occur which lead to a reduction in the fatigue strength.
- Collect drained operating materials in suitable vessels and dispose of according to regulations.

6

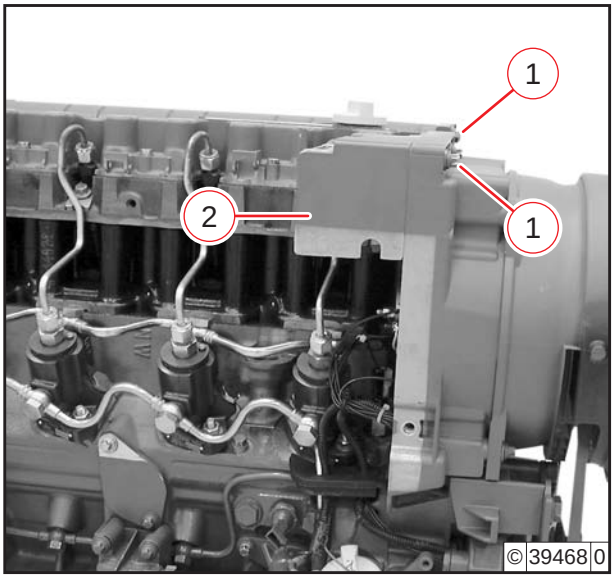
Remove injection lines

In FL, BFL engines

- Remove oil cooler
  ➔ Job card **W 08-08-02**.
- Unscrew screw (1).

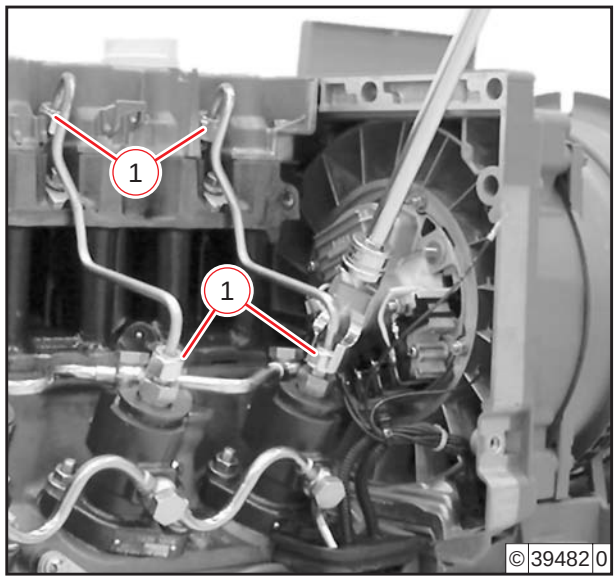


- Unscrew screws (1) and remove air feed (2).



- Unscrew union nuts (1) from injection valve and injection pump with claw wrench.
- Remove injection line.

Note
- Put down the components in the order of installation, note order of cylinders.
- Seal openings on the injection valve and the injection pump.



6

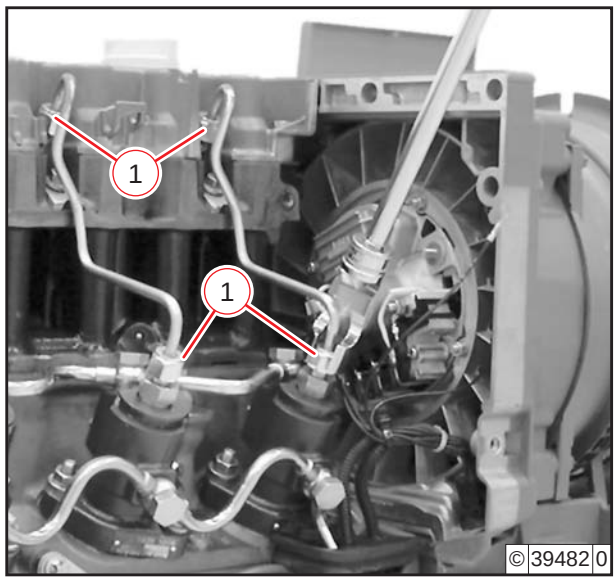
Install injection lines

- Mount injection line on injection pump and injection valves and tighten union nuts (1).

Note
Mount the injection lines without tension.

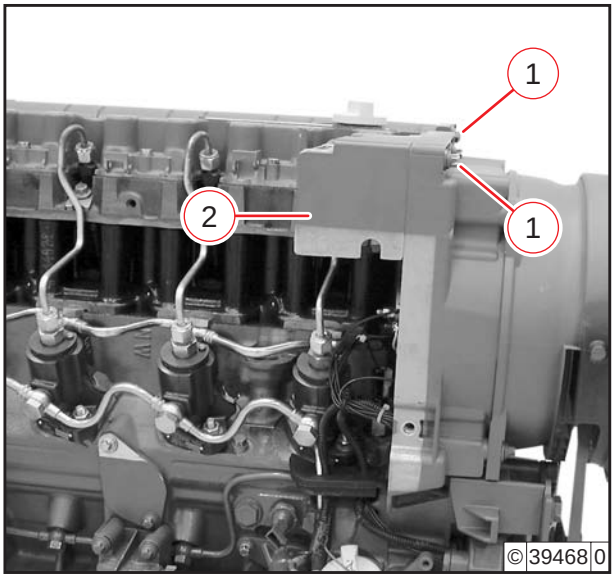
- Tighten the union nuts of the injection line on the injection pump and injection valve.

07003

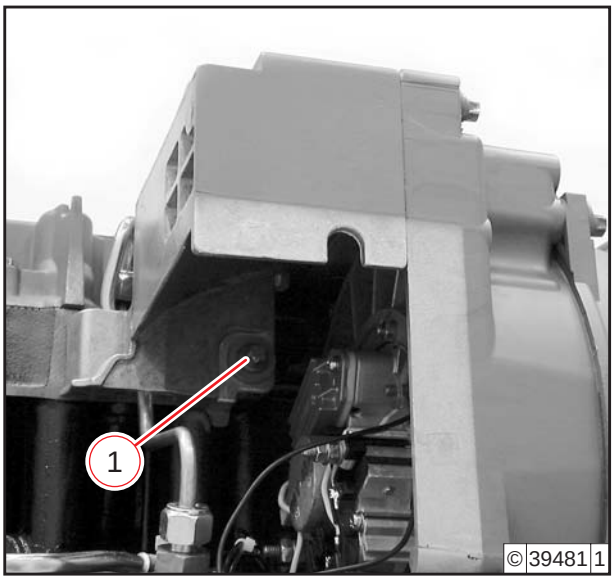


In FL, BFL engines

- Mount air feed (2) and tighten screws (1).



- Tighten screw (1).



- Pre-tighten screw (1) on cylinder head.

09098

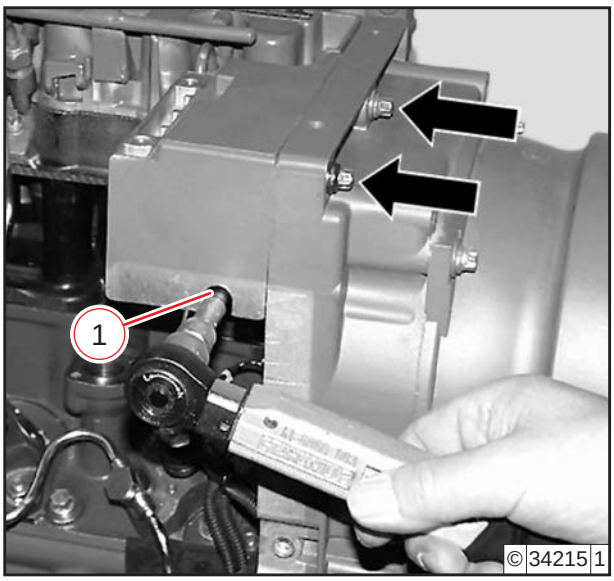
- Tighten screws (arrows).

09089

- Tighten screw (1) on cylinder head.

09098

- Install oil cooler
  ➔ Job card **W 08-08-02**.



6

Notes

Remove and install injection valves (in engines with leak fuel line)

Tools

- Commercial tools

8011 - Clamping pliers

- Special tools

110 030 - Extractor

150 800 - Extraction tool

References

- W 07-03-01

Note

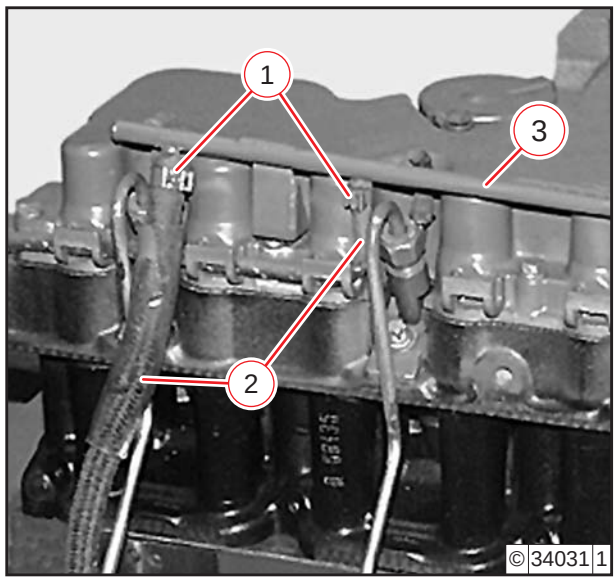
- Cleanliness is extremely important when working on the injection equipment.
- Collect drained operating materials in suitable vessels and dispose of according to regulations.

Remove injection valve

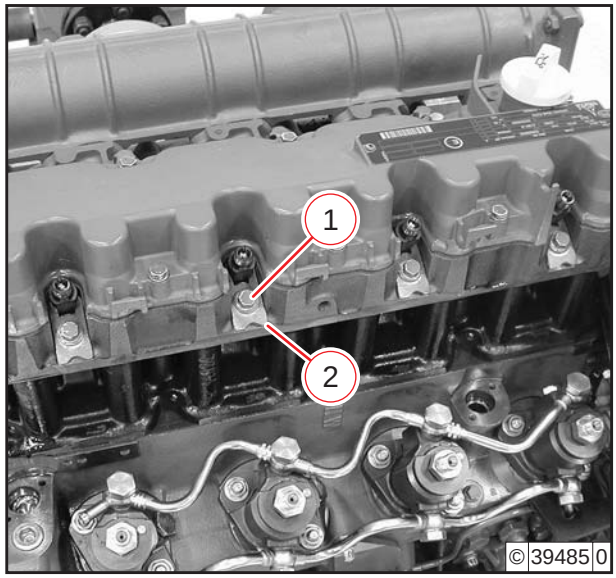
- Remove injection lines
  ➔ Job card **W 07-03-01**.

In engines with leak fuel line

- Loosen pipe clips (1) and pull off return pipes (2).
- Unscrew screws and remove overflow pipe (3).

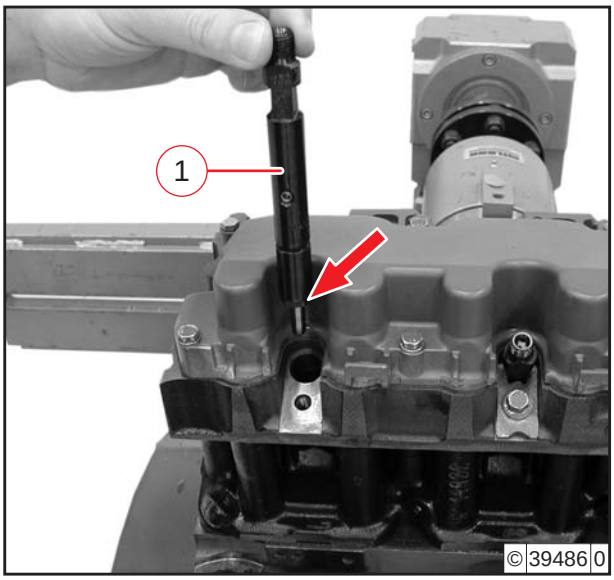


- Unscrew screw (1) and remove clamping claw (2).



- Pull out injection valve (1) and sealing ring (arrow).

Note
- Put down the components in the order of installation, note order of cylinders.
- Pull off gaskets burned tight to the cylinder head with extractor and extraction device.



6

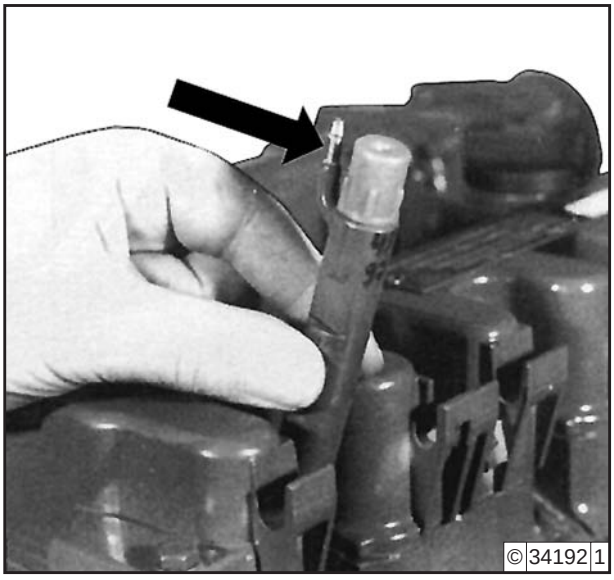
Install injection valve

- Mount new sealing ring (arrow) on injection valve.

- Insert injection valve.

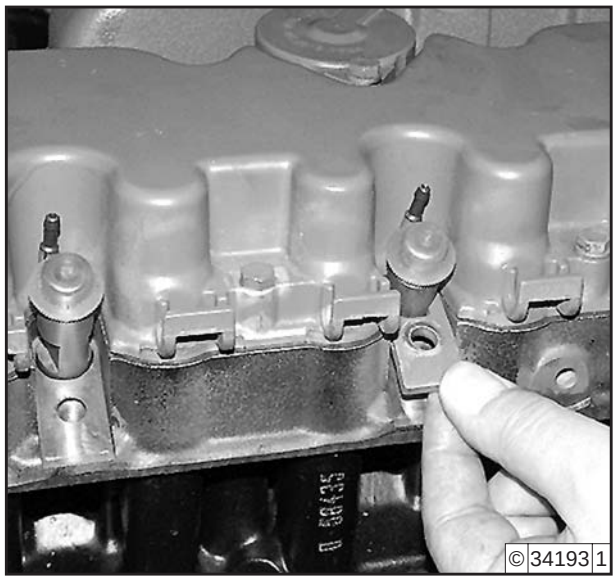
Note
The leak fuel connection (arrow) must face the Manifold side.

00 81



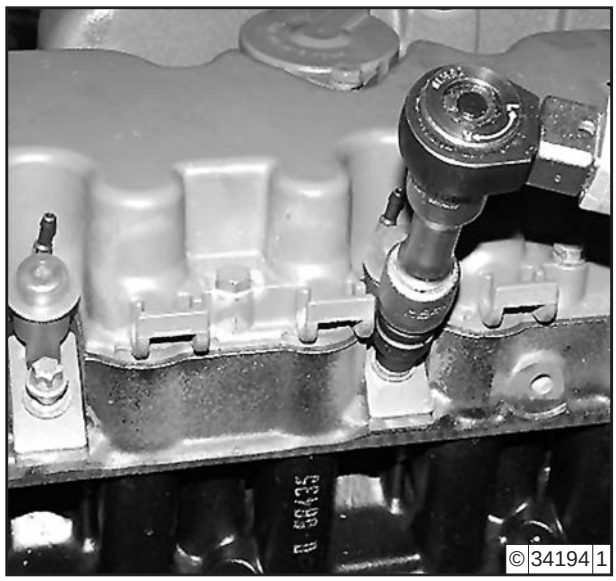
- Mount the clamping claw and tighten the screw.

Note
Note installation position of the clamping claw.



- Tighten screw.

07001

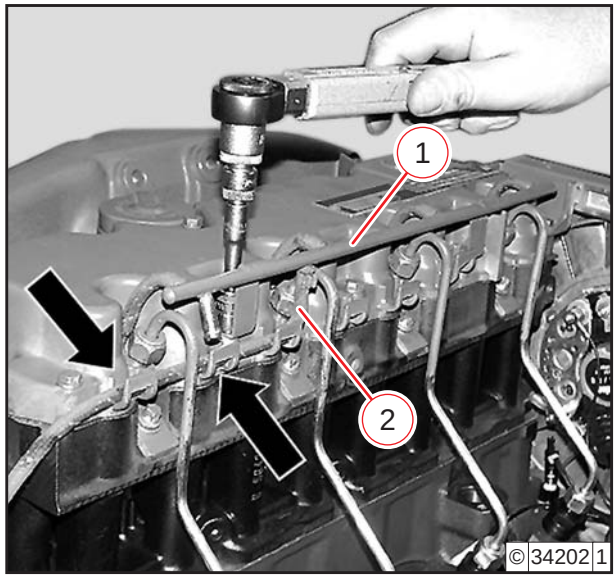


- Mount overflow pipe (1), attach hoses and tighten screws.

07062

- Attach return hose (2) and fix hose clip with clamping pliers.
- Insert return hose in holder (arrows).

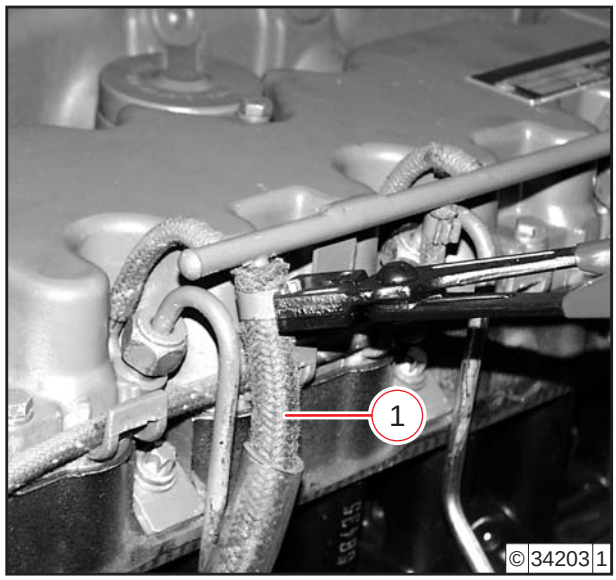
Note
The rubber hoses must always be renewed.



- Attach return hose (1) and fix hose clip with clamping pliers.

Note
Check return pipe, renew if necessary.

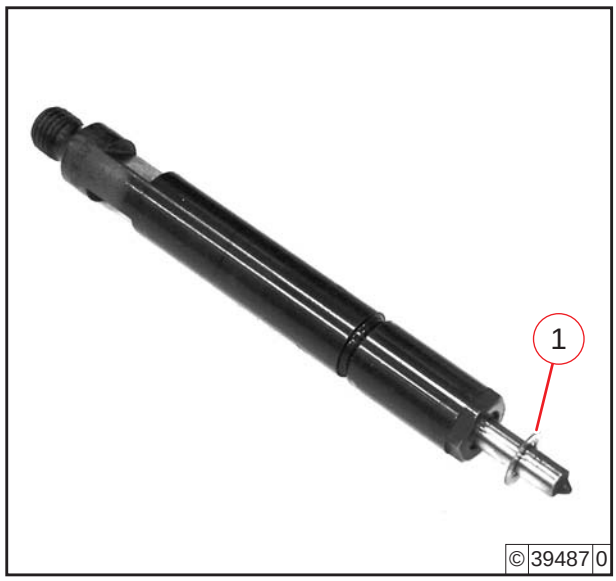
- Install injection lines
  ➔ Job card **W 07-03-01**.



6

Install injection valve (leak fuel-less)

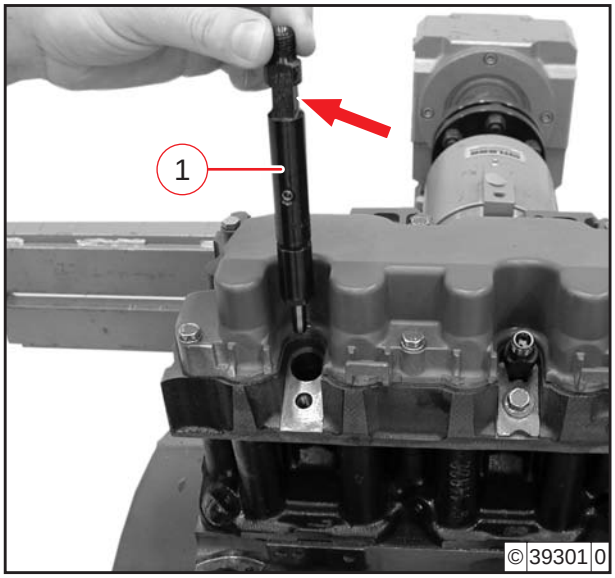
- Mount new sealing ring (1) on injection valve.



- Insert injection valve (1).

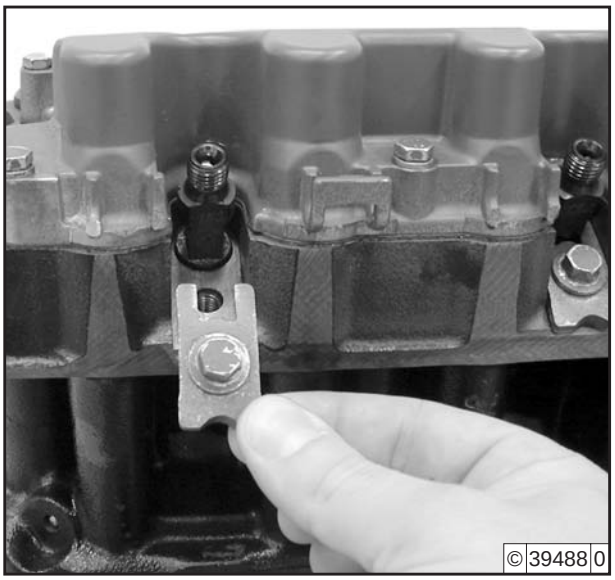
Note
The flattened side (arrow) must face the Operating side.

00 81



- Mount the clamping claw and tighten the screw.

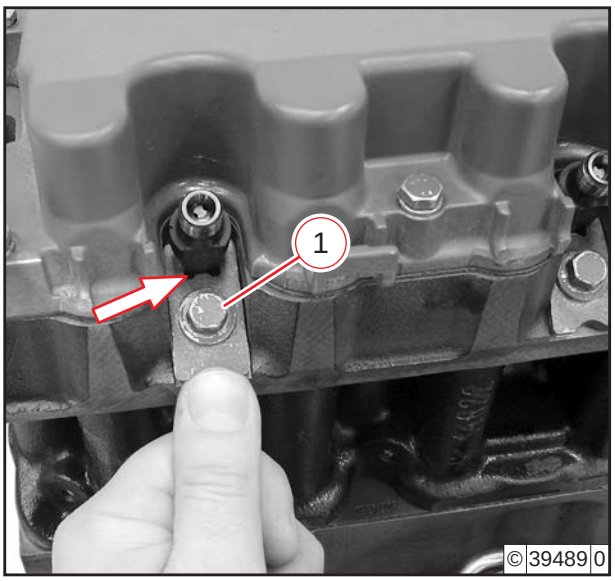
Note
Note installation position of the clamping claw.



- Press the clamping claw to touch the gate (arrow) on the injection valve (arrow) and tighten screw (1).

07001

- Install injection lines
  ➔ Job card **W 07-03-01**.



6

Notes

Remove and install solenoid valve (LDA)

Tools

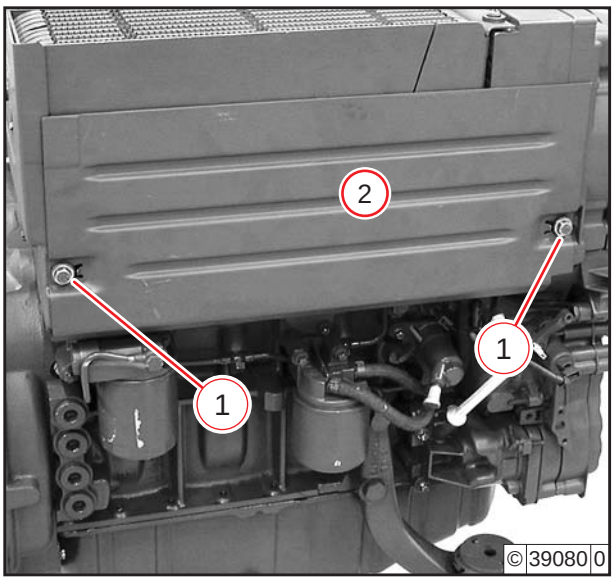
- Commercial tools

8027 - Pliers insert

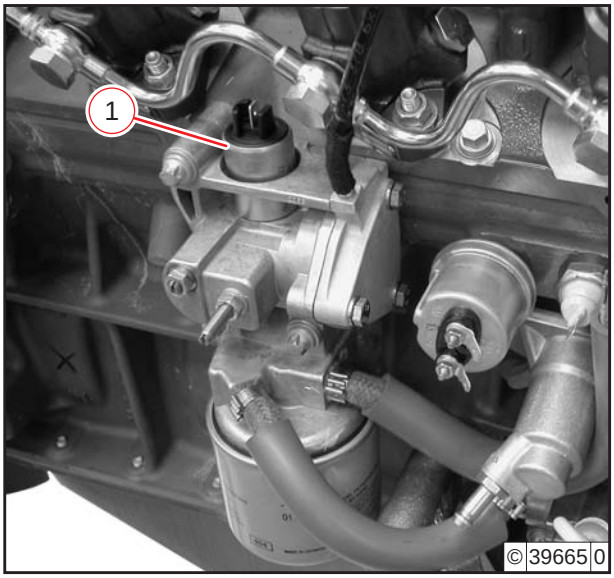
Remove solenoid valve

In BFL engines

- Unscrew screws (1) and remove air duct cover (2).



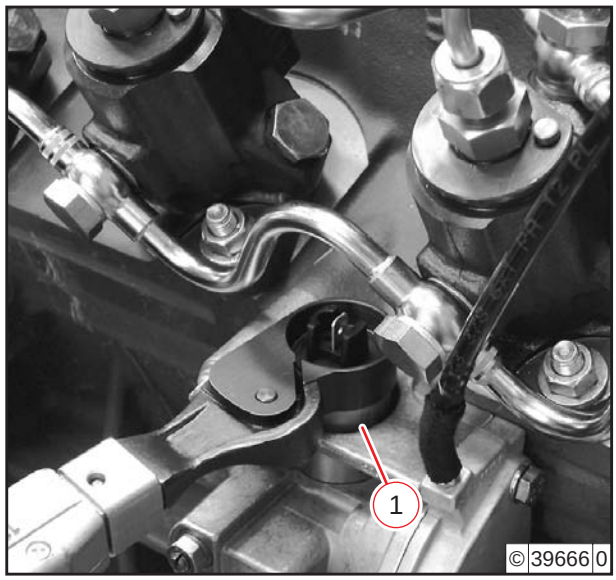
- Pull off cable plug from solenoid valve (1) if available.



- Unscrew solenoid valve (1) with pliers insert and remove sealing ring.

Note
Note clamping direction of the pliers insert.

- Check components for visible signs of damage.

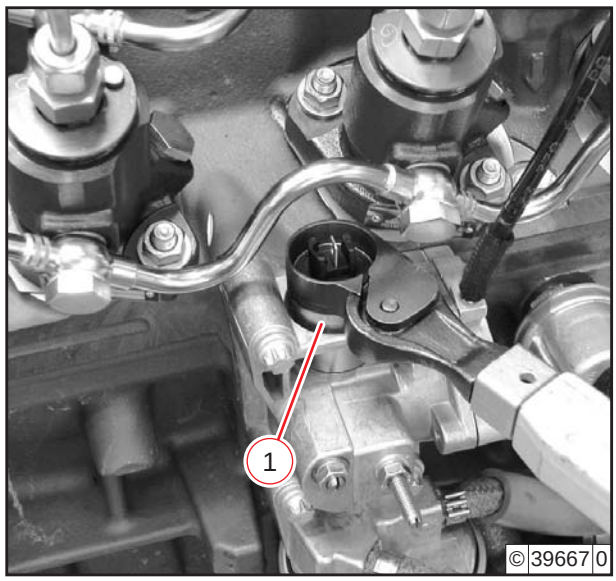


6

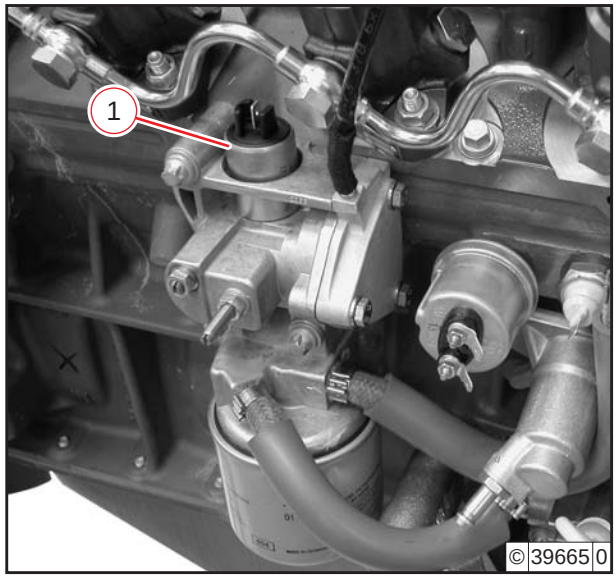
Install solenoid valve

- Mount solenoid valve (1) with new CU sealing ring and tighten with pliers insert.

06094



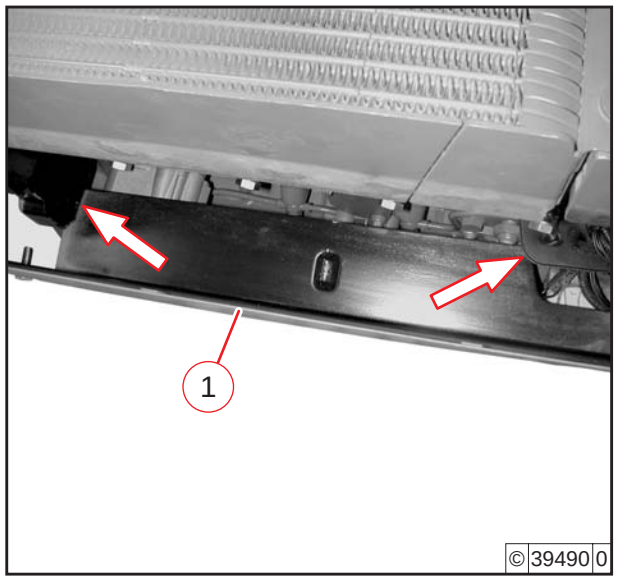
- Plug cable plug to solenoid valve (1) if available.



In BFL engines

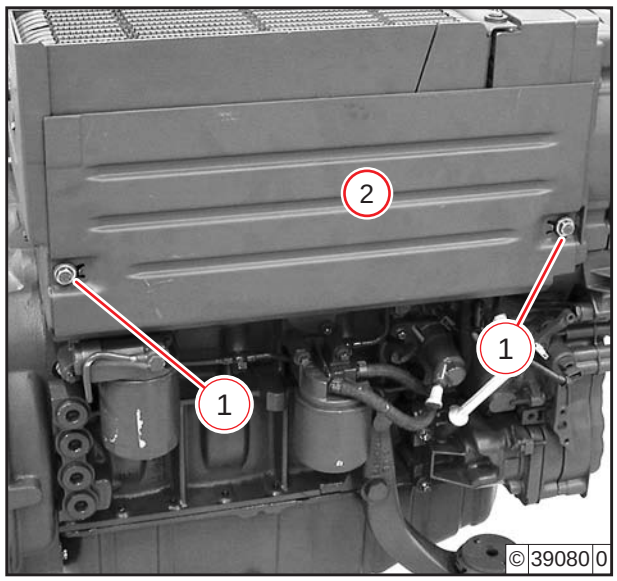
- Mount air duct cover (1).

Note
The air duct cover must be under the stand plate and the profile rubber (arrows).



- Fix air duct cover (2).
  Tighten screws (1).

09087



6

Notes

Remove and install charge pressure full load stop (LDA)

Tools

- Commercial tools

8011 - Clamping pliers
8027 - Pliers insert

- Special tools

170 050 - Special wrench

Caution!

Observe the safety regulations and national specifications for handling fuels!

Note

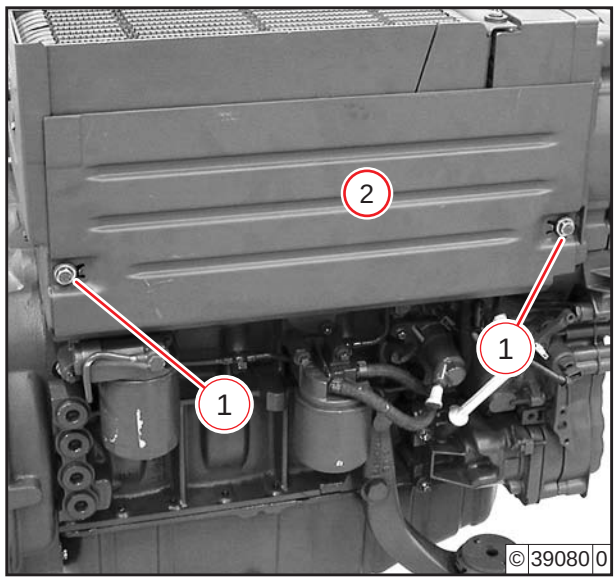
- Collect drained operating materials in suitable vessels and dispose of according to regulations.
- A test stand run is necessary to set the charging pressure-dependent full load stop.

6

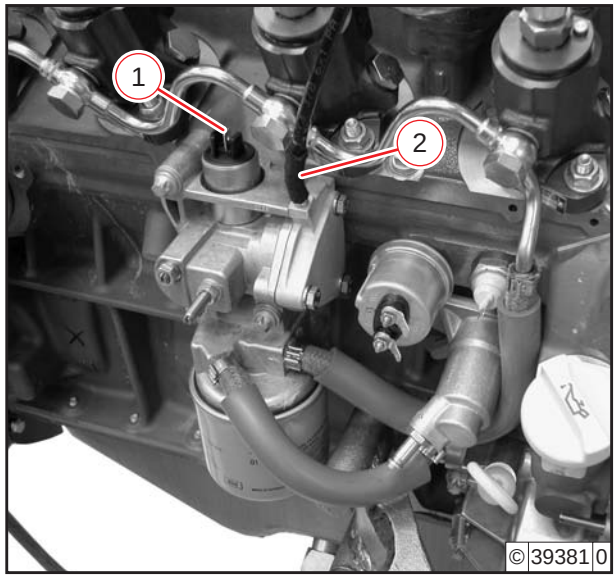
Remove charging pressure full load stop

In FL, BFL engines

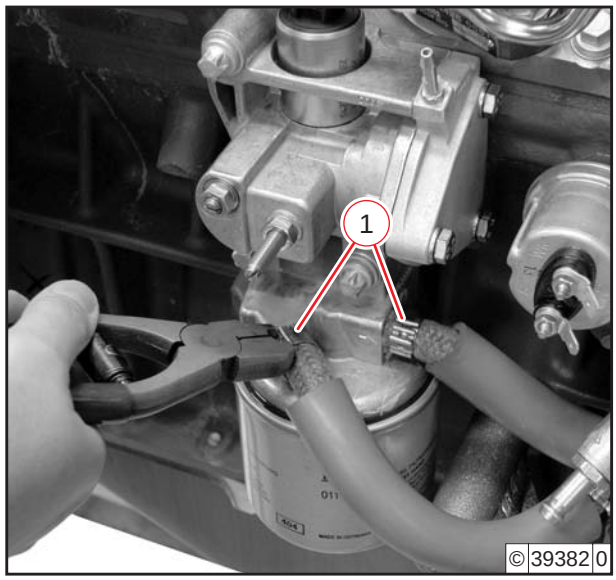
- Unscrew screws (1) and remove the air duct cover (2).



- Pull the cable plug out of the solenoid valve (1) if available.
- Pull out the underpressure line (2).

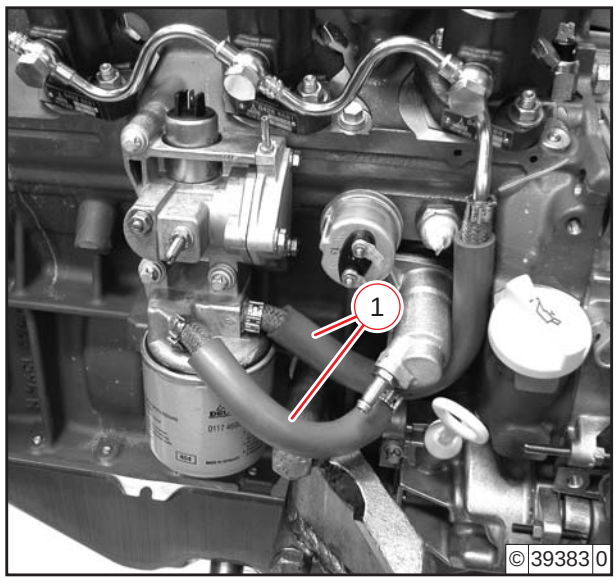


- Loosen the hose clips (1) with clamping pliers.

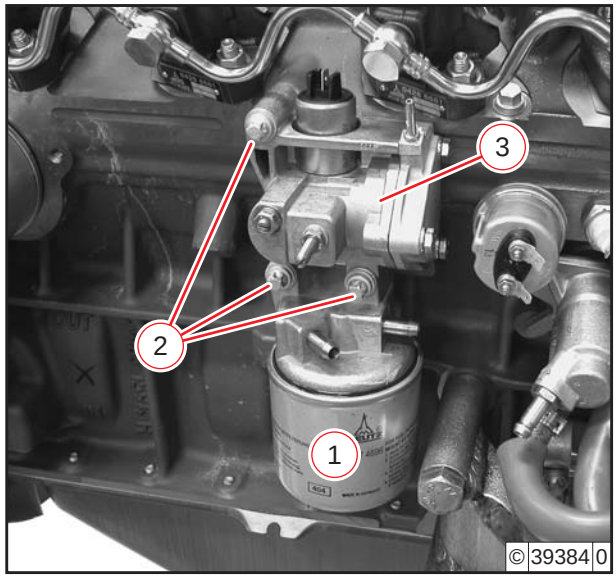


6

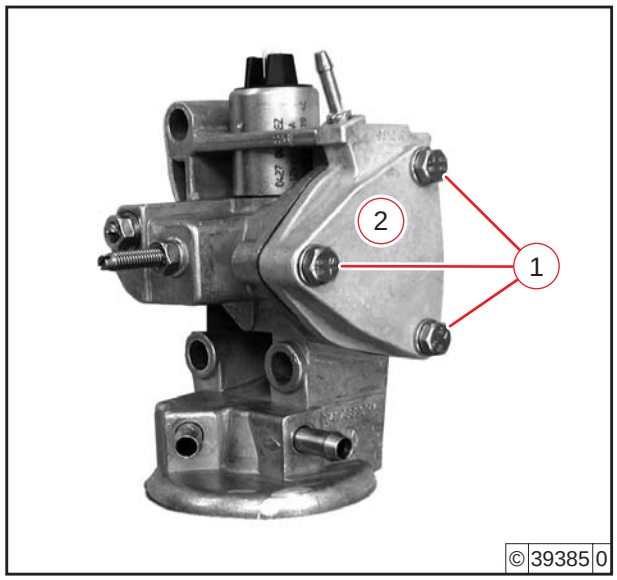
- Pull off the fuel pipes (1).



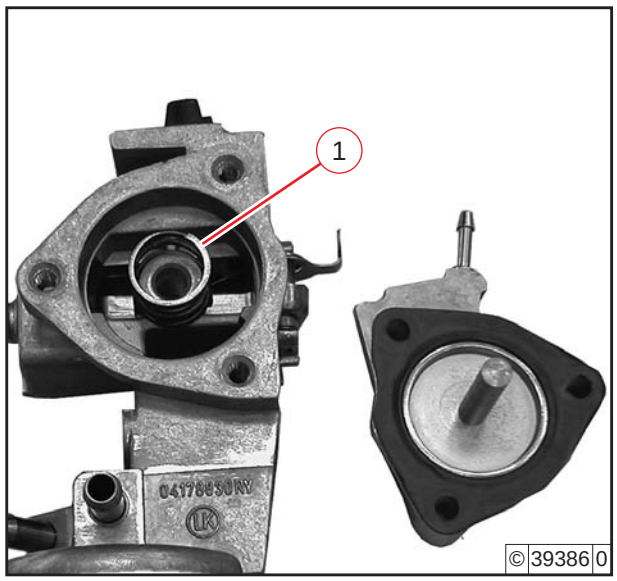
- Unscrew fuel filter (1) with special wrench.
- Unscrew screws (2) and remove fuel filter console (3) with LDA.



- Unscrew screws (1), remove cover (2) with diaphragm.



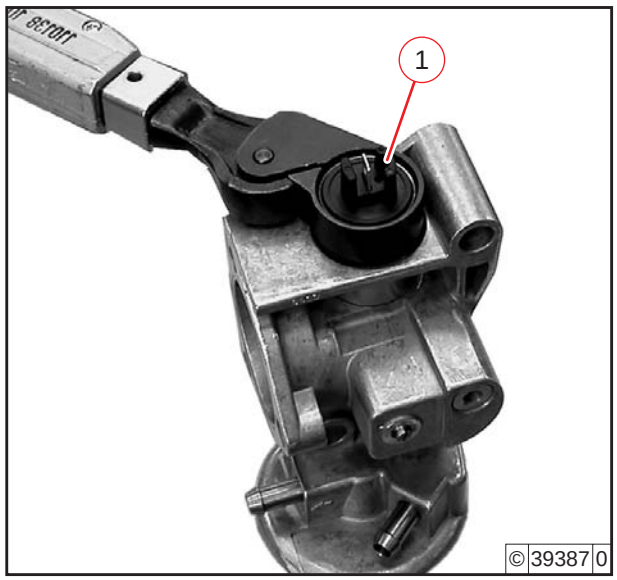
- Remove spring (1).



- Unscrew solenoid valve (1) with pliers insert and remove sealing ring.

Note
- Note clamping direction of the pliers insert.

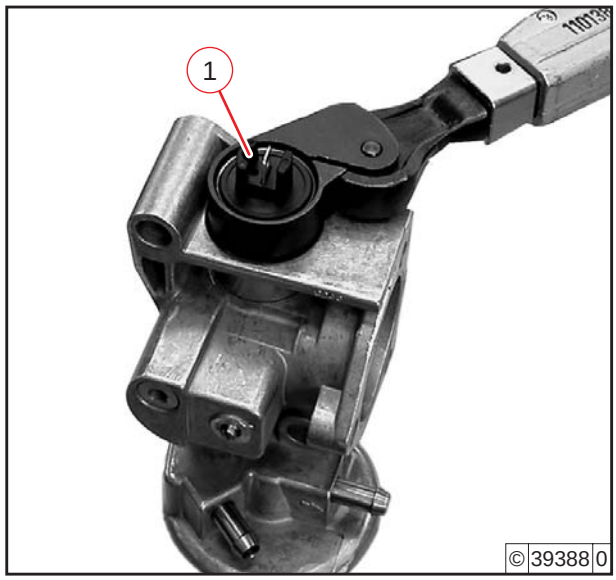
- Check components for visible signs of damage.



Install charging pressure dependent full load stop

- Mount solenoid valve (1) with new CU sealing ring and tighten with pliers insert.

06094



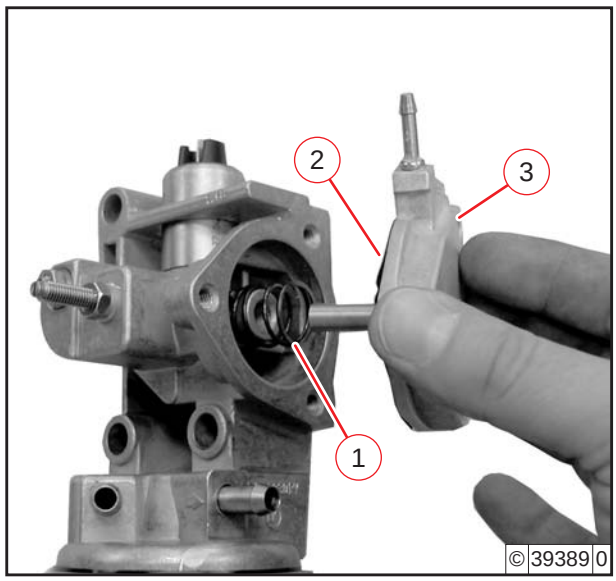
6

- Mount spring (1), diaphragms (2) and cover (3).

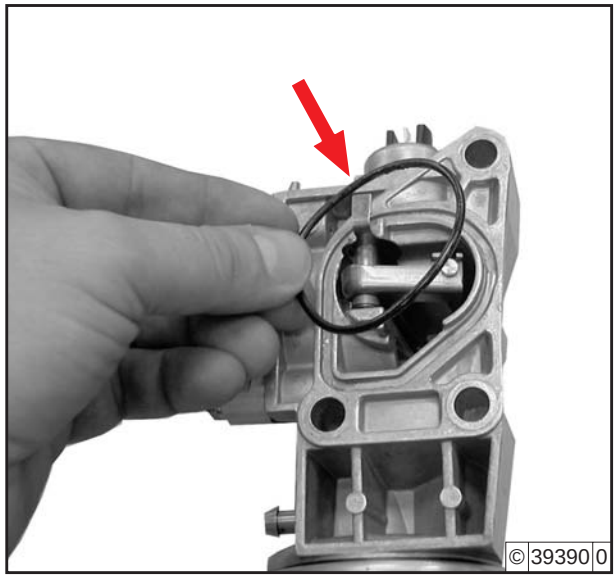
Note
Note the installation position of the cover, the underpressure connection must face upwards.

- Tighten screws.

07096



- Clean the sealing surface on the fuel filter console and crankcase.
- Renew the gasket (arrow).

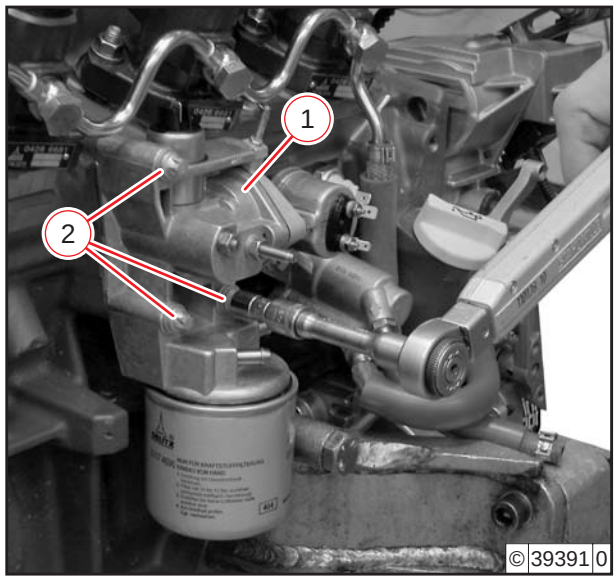


- Mount fuel filter console (1) with LDA and tighten screws (2).

07095

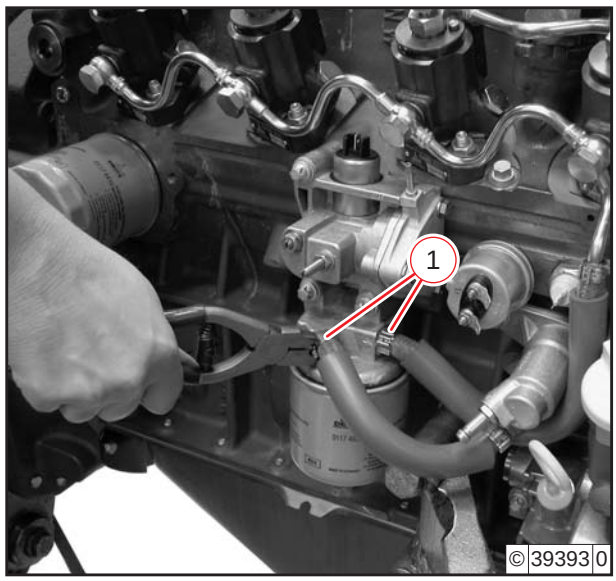
- Oil sealing ring on fuel filter lightly.
- Tighten fuel filter hand tight.

07099

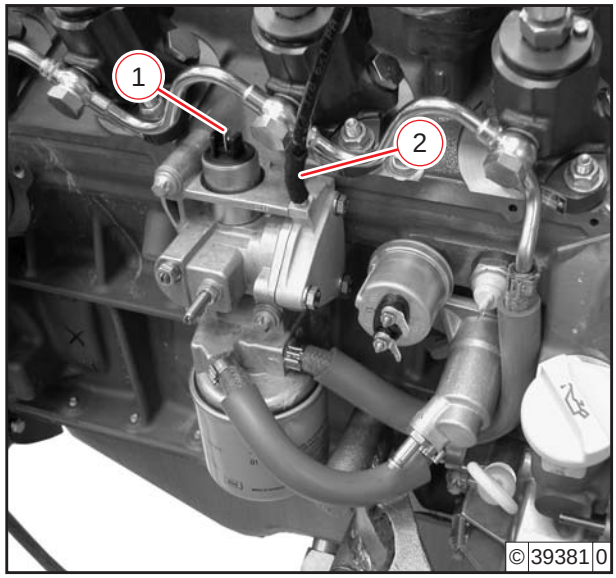


- Plug fuel pipes and fix pipe clips (1) with clamping pliers.

Note
- Check fuel pipes and renew if necessary.
- Observe assignment of the fuel pipes.



- Plug cable plug to solenoid valve (1) if available.
- Plug on the underpressure line (2).

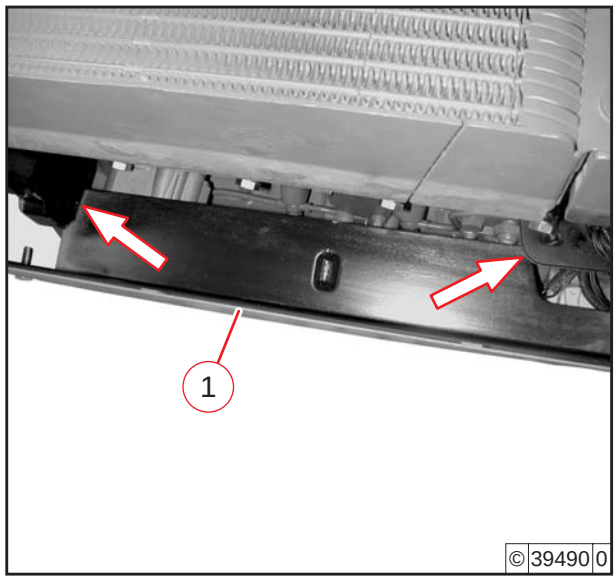


6

In FL, BFL engines

- Mount air duct cover (1).

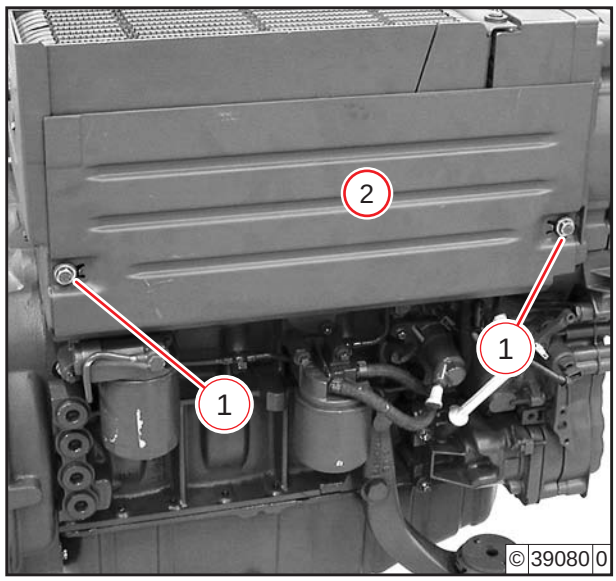
Note
The air duct cover must be under the stand plate and the profile rubber (arrows).



6

- Fix air duct cover (2).
  Tighten screws (1).

09087



Remove and install fuel lines (with Motorpal injection pumps)

Tools

- Commercial tools

8011 - Clamping pliers

Note

Collect drained operating materials in suitable vessels and dispose of according to regulations.

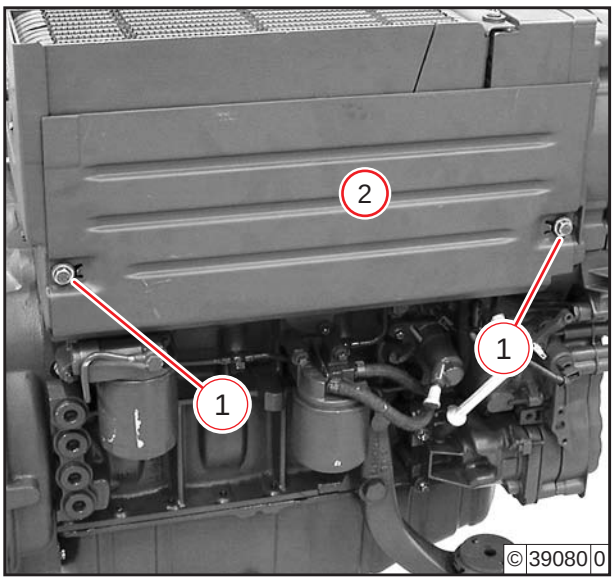
Caution!

Observe the safety regulations and and national specifications for handling fuels!

Remove fuel lines

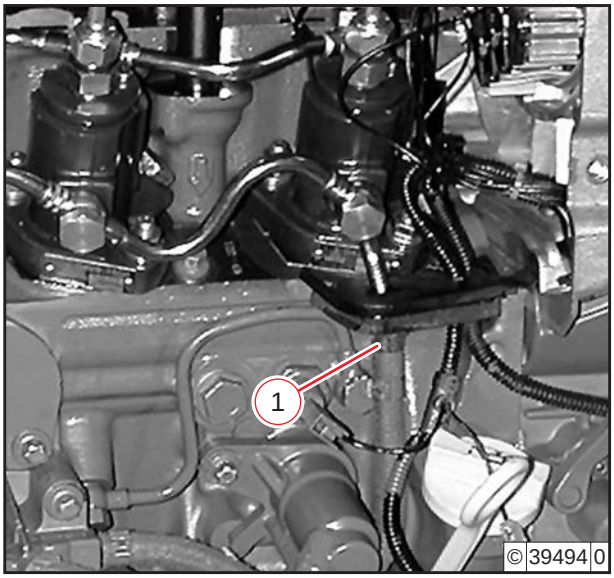
In FL, BFL engines

- Unscrew screws (1) and remove air duct cover (2).

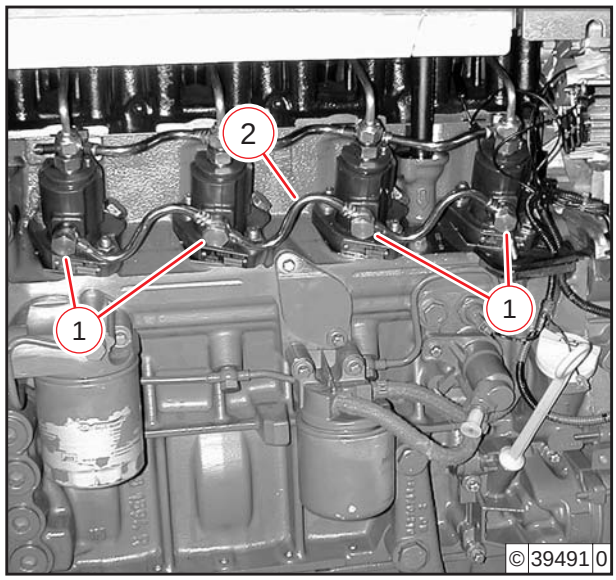


Remove fuel supply line

- Loosen pipe clip (1) and pull off fuel pipe.



- Unscrew hollow screws (1), remove fuel supply line (2) and sealing rings.
- Check components for visible signs of damage.

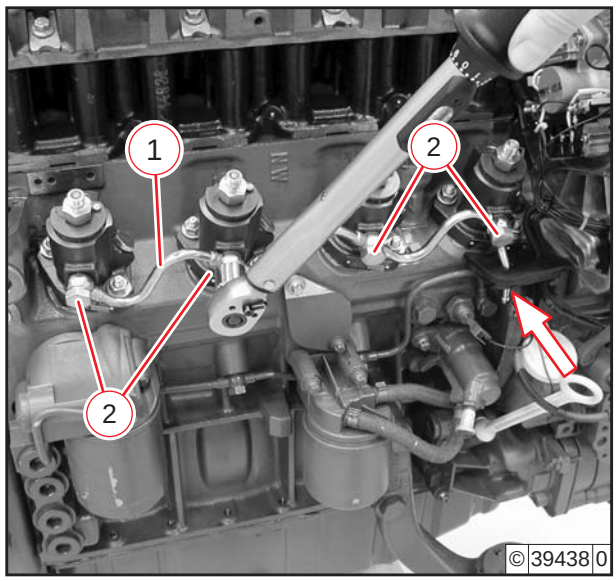


6

Install fuel supply line

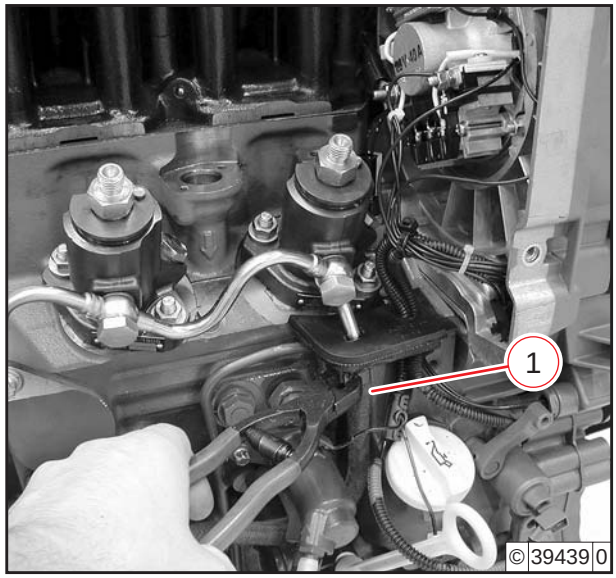
- Push fuel supply line (1) through the profile rubber (arrow) and position.
- Tighten hollow screws (2) with new CU sealing rings.

07015



- Attach fuel hose (1) and fix hose clip with clamping pliers.

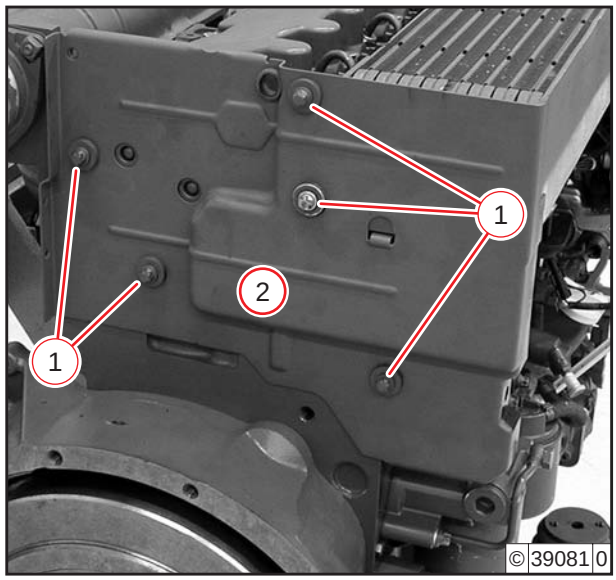
Note
Check fuel pipe and renew if necessary.



Remove overflow pipe

In FL, BFL engines

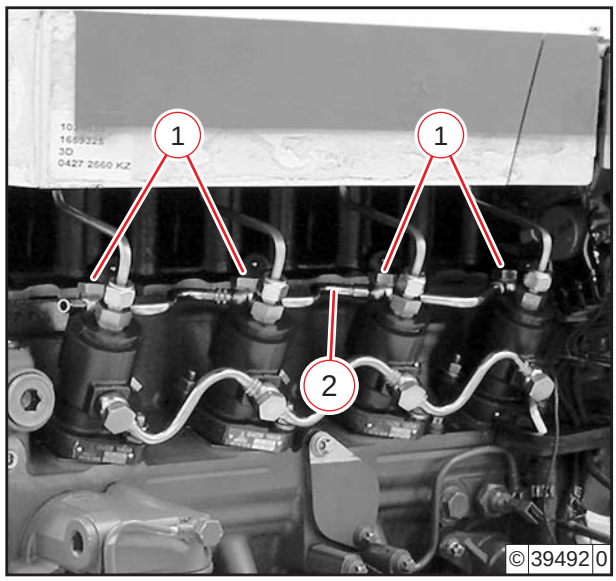
- Unscrew screws (1) and remove standing plate (2).



- Unscrew hollow screws (1), remove overflow pipe (2) and sealing rings.

Note
Remove overflow pipe to flywheel side.

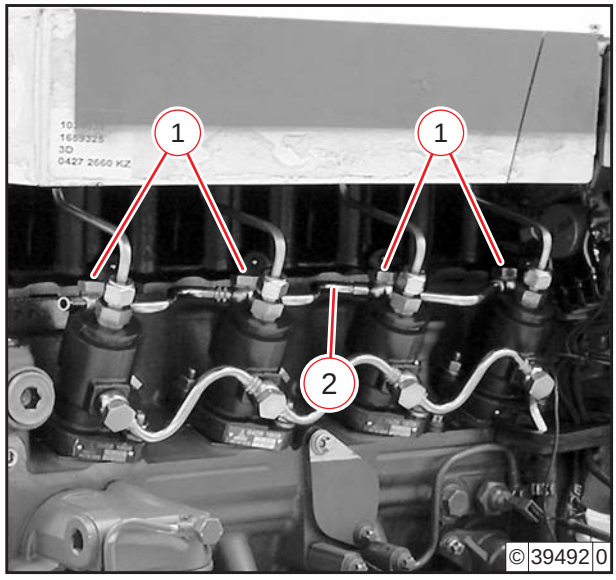
- Check components for visible signs of damage.



Install overflow pipe

- Mount overflow pipe (2), tighten hollow screws (1) with new CU sealing rings.

07061



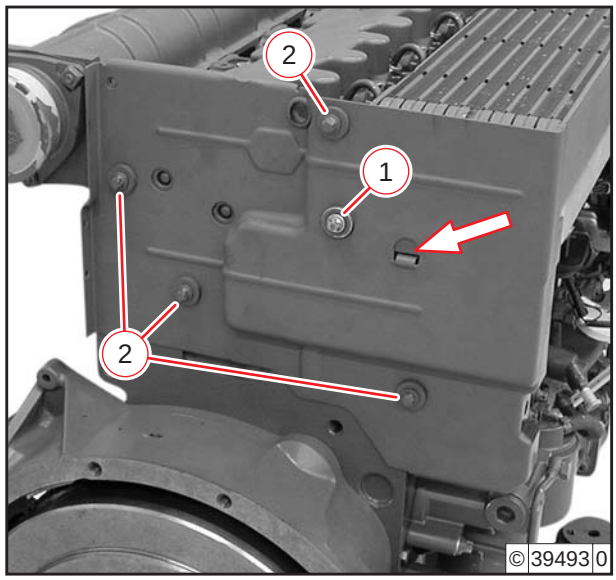
In FL, BFL engines

- Mount the standing plate and tighten the screws.

Note
- Note different screw length (1 and 2).
- The oil cooler must be on the latch (arrow).

- Tighten screws (1 and 2).

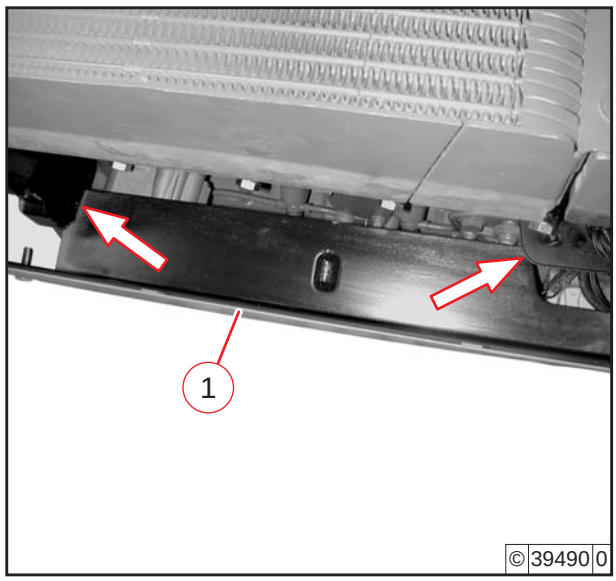
09070



6

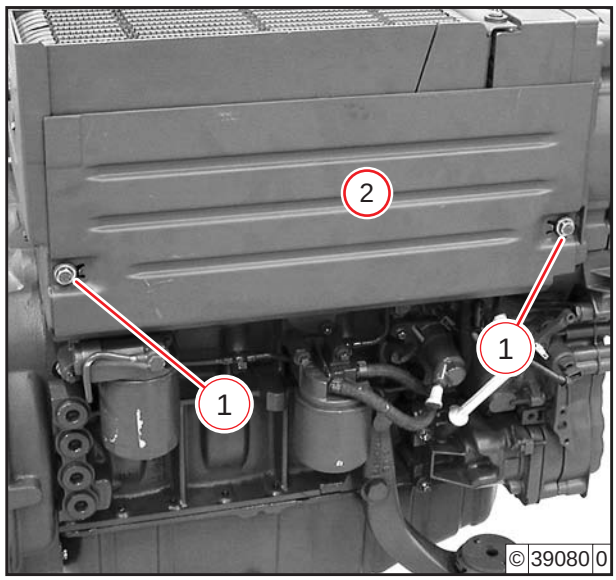
- Mount air duct cover (1).

Note
The air supply cover must be under the stand plate and the profile rubber (arrows).



- Fix air duct cover (2).
  Tighten screws (1).

09087



Remove and install fuel lines (with Bosch injection pumps)

Tools
- Commercial tools
8011 - Clamping pliers

References
- W 08-08-02

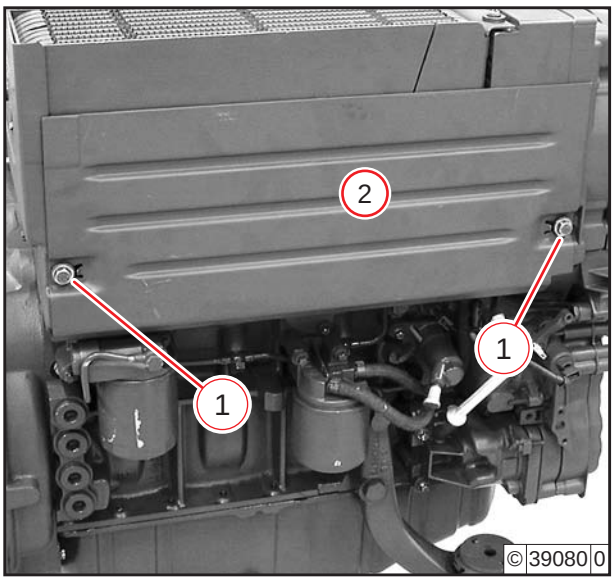
Note
Collect drained operating materials in suitable vessels and dispose of according to regulations.

Caution!
Observe the safety regulations and and national specifications for handling fuels!

Remove fuel lines

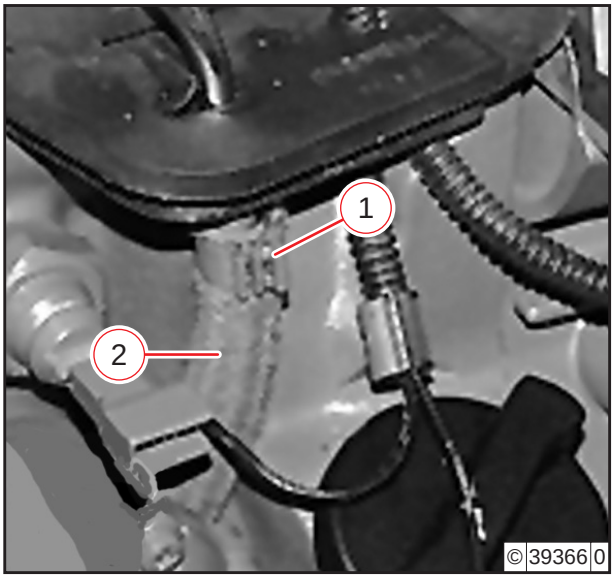
In FL, BFL engines

- Unscrew screws (1) and remove air duct cover (2).

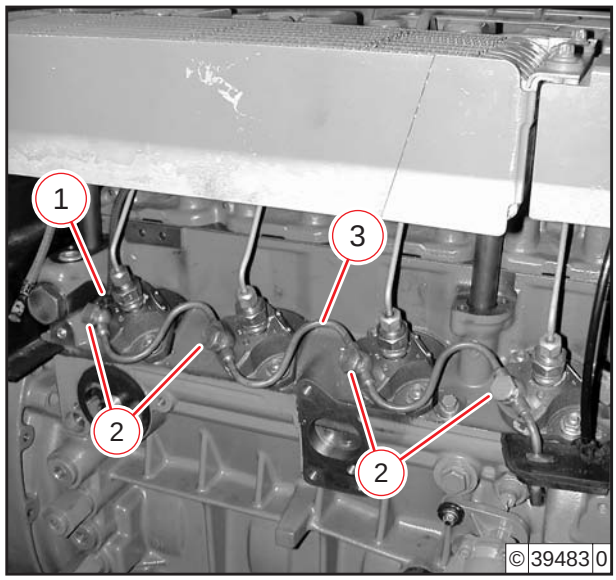


Remove fuel supply line

- Loosen pipe clip (1) and pull off fuel pipe (2).



- Loosen hose clip and pull off return pipe (1).
- Unscrew hollow screws (2), remove fuel supply line (3) and sealing rings.
- Check components for visible signs of damage.

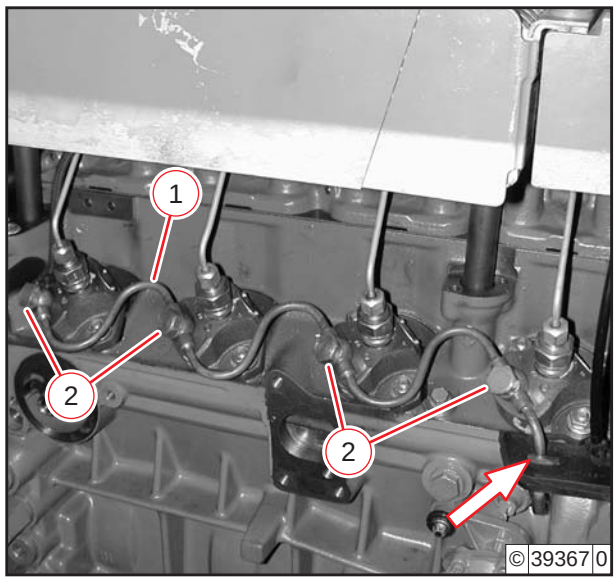


6

Install fuel supply line

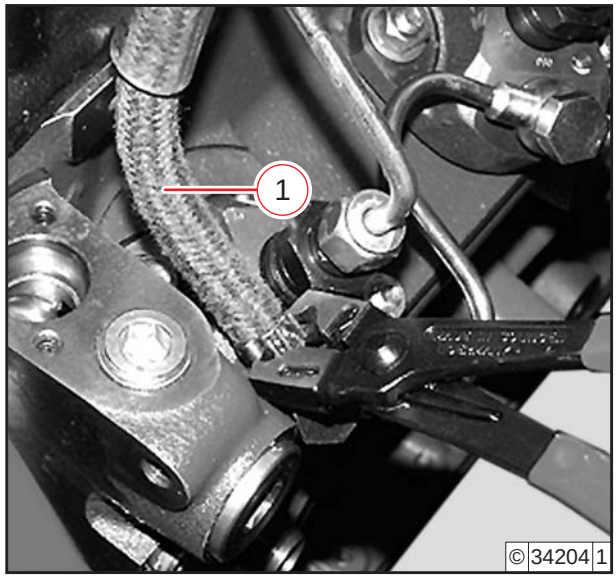
- Push fuel supply line (1) through the profile rubber (arrow) and position.
- Tighten hollow screws (2) with new CU sealing rings.

07015



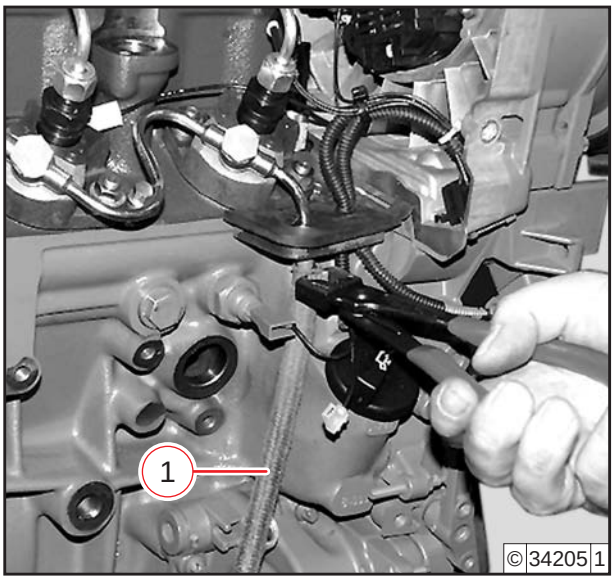
- Attach return hose (1) and fix hose clip with clamping pliers.

Note
Check return pipe, renew if necessary.



- Attach fuel hose (1) and fix hose clip with clamping pliers.

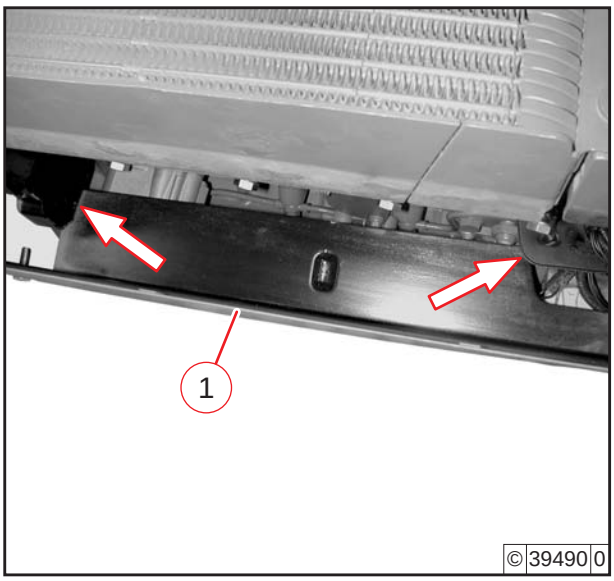
Note
Check fuel pipe and renew if necessary.



In FL, BFL engines

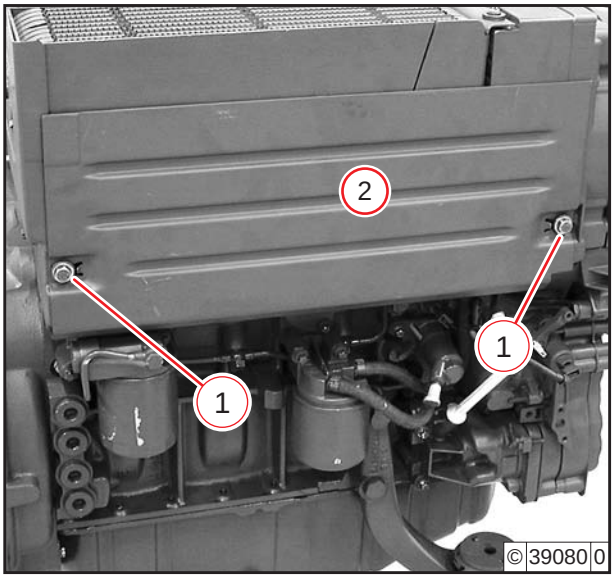
- Mount air duct cover (1).

Note
The air supply cover must be under the stand plate and the profile rubber (arrows).



- Fix air duct cover (2).
  Tighten screws (1).

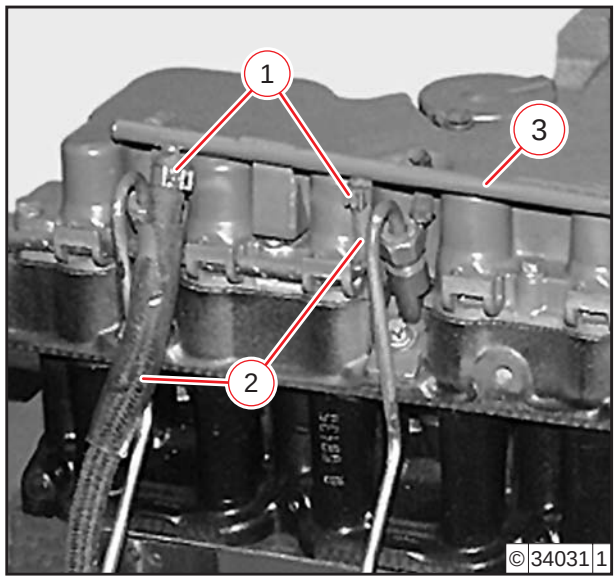
09087



Remove overflow pipe

In FL, BFL engines

- Remove oil cooler
  ➔ Job card **W 08-08-02**.
- Loosen pipe clips (1) and pull off return pipes (2).
- Unscrew screws and remove overflow pipe (3).
- Check components for visible signs of damage.



6

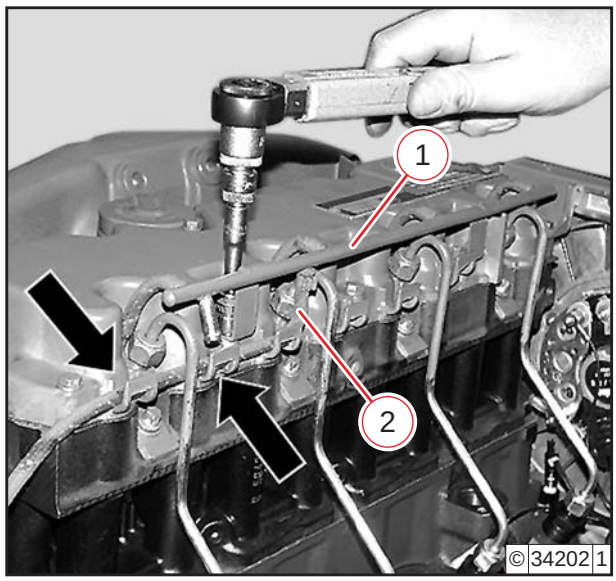
Install overflow pipe

- Mount overflow pipe (1), attach hoses and tighten screws.

07062

- Attach return hose (2) and fix hose clip with clamping pliers.
- Insert return hose in holder (arrows).

Note
The rubber hoses must always be renewed.

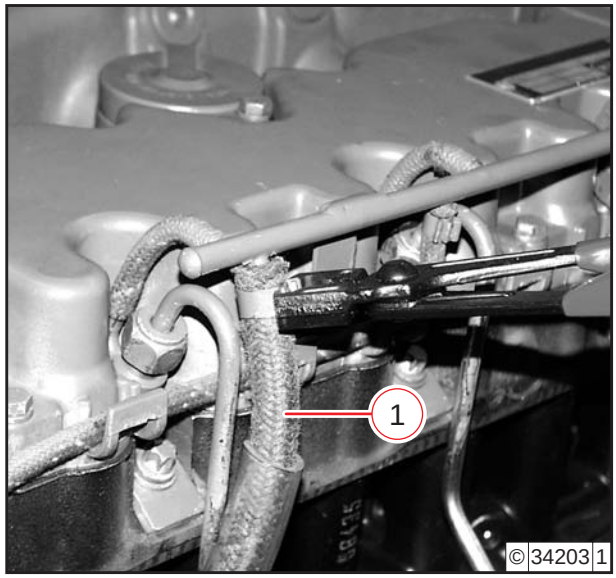


- Attach return hose (1) and fix hose clip with clamping pliers.

Note
Check return pipe, renew if necessary.

In FL, BFL engines

- Install oil cooler
  ➔ Job card **W 08-08-02**.



Remove and install fuel filter console

Tools

- Commercial tools

8011 - Clamping pliers

- Special tools

170 050 - Special wrench

Note

Collect drained operating materials in suitable vessels and dispose of according to regulations.

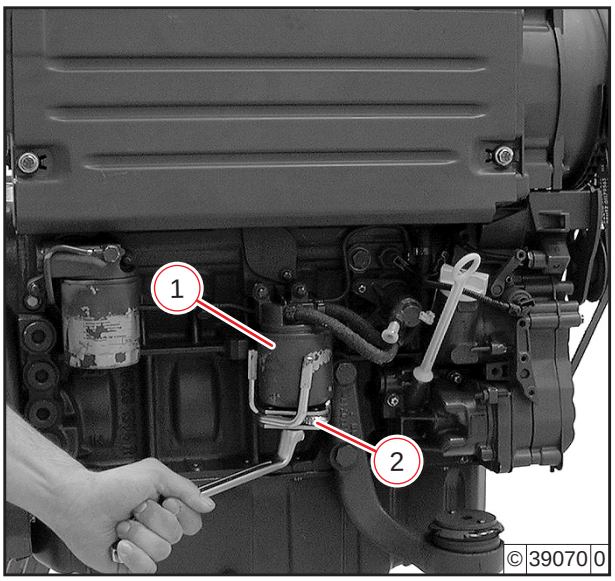
Caution!

Observe the safety regulations and national specifications for handling fuels!

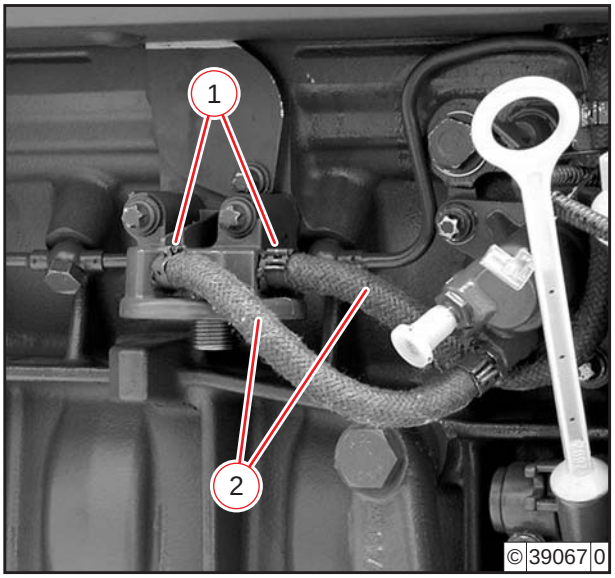
Remove fuel filter console

Remove fuel filter

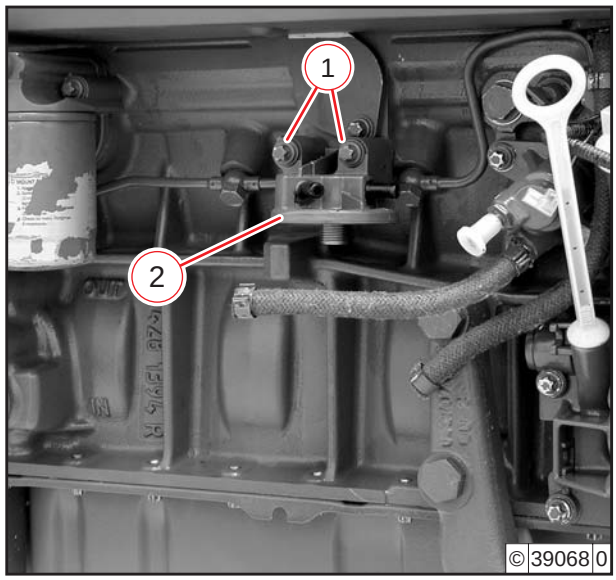
- Unscrew fuel filter (1) with special wrench.



- Loosen pipe clips (1) with clamping pliers and pull off fuel pipes (2).



- Unscrew screws (1) and remove fuel filter console (2).
- Check components for visible signs of damage.

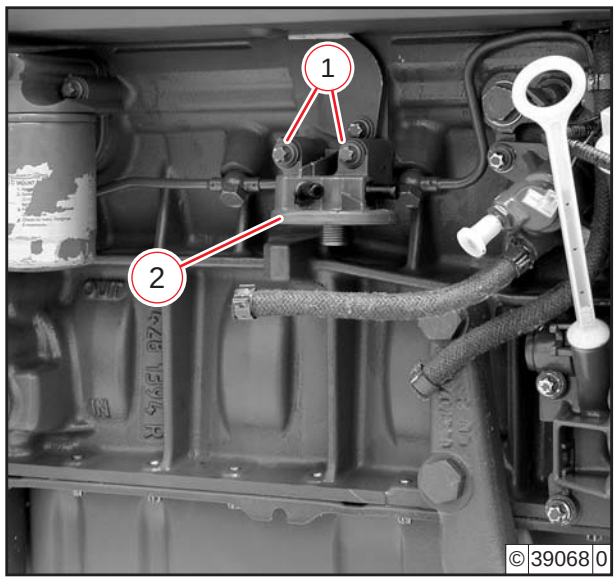


6

Install fuel filter console

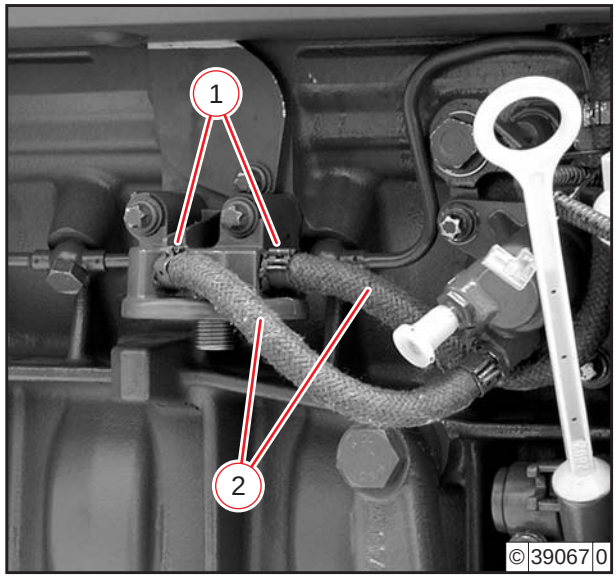
- Mount fuel filter console (2) and tighten screws (1).

07082



- Attach fuel pipes (2) and fix pipe clips (1) with clamping pliers.

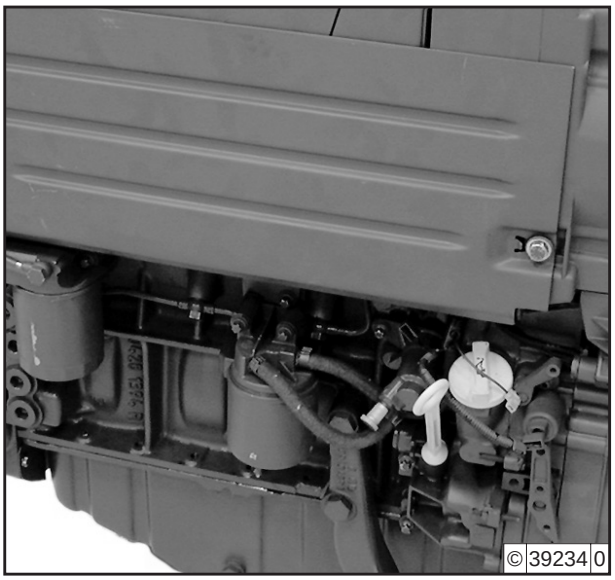
Note
- Check fuel pipes and renew if necessary.
- Observe assignment of the fuel pipes.



Install fuel filter

- Oil sealing ring on fuel filter lightly.
- Tighten new fuel filter hand tight.

07099



Notes

Remove and install fuel pump

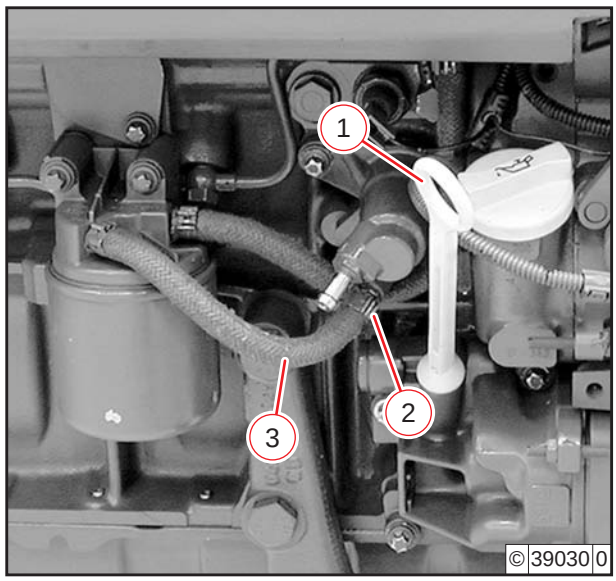
Tools
- Commercial tools
8011 - Clamping pliers

Note
Collect drained operating materials in suitable vessels and dispose of according to regulations.

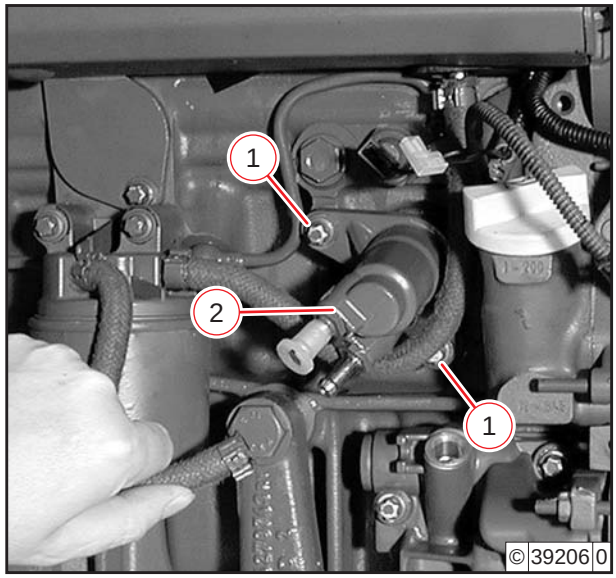
Caution!
Observe the safety regulations and observe national specifications for handling fuels.

Remove fuel pump

- Pull out oil dipstick (1).
- Loosen pipe clip (2) with clamping pliers and pull off fuel pipe (3).

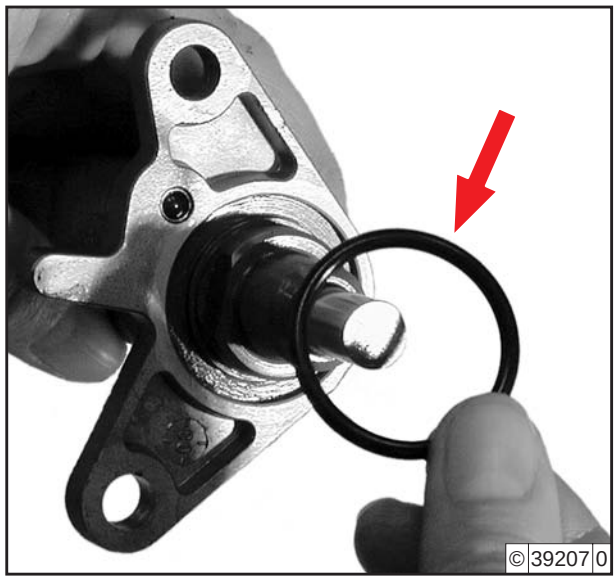


- Unscrew screws (1).
  Remove fuel pump (2) and gasket.
- Check components for visible signs of damage.



Install fuel pump

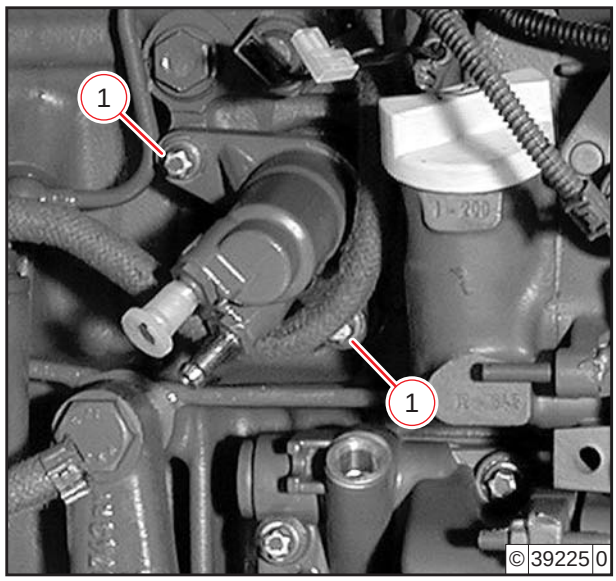
- Clean the sealing surface on the fuel pump and crankcase.
- Pull new round sealing ring (arrow) onto fuel pump.



6

- Mount fuel pump.
- Press in fuel pump to stop and tighten screws (1).
- Tighten screws.

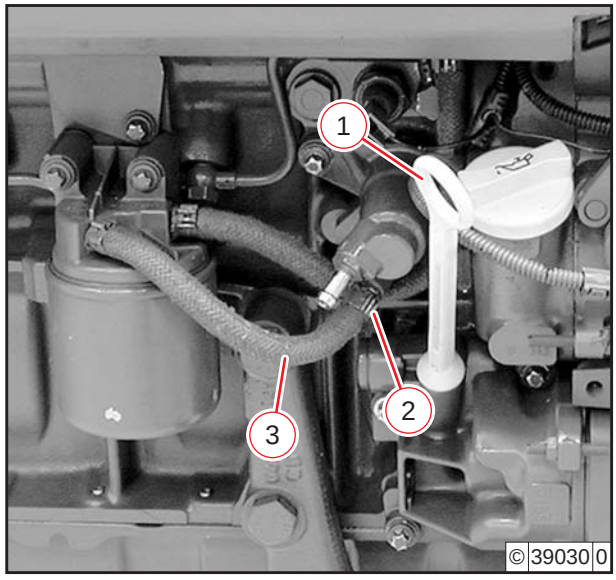
07024



- Attach fuel hose (3) and fix hose clip (2) with clamping pliers.

Note
Check fuel pipe and renew if necessary.

- Insert oil dipstick (1).



Remove and install oil cooler

Tools

- Commercial tools

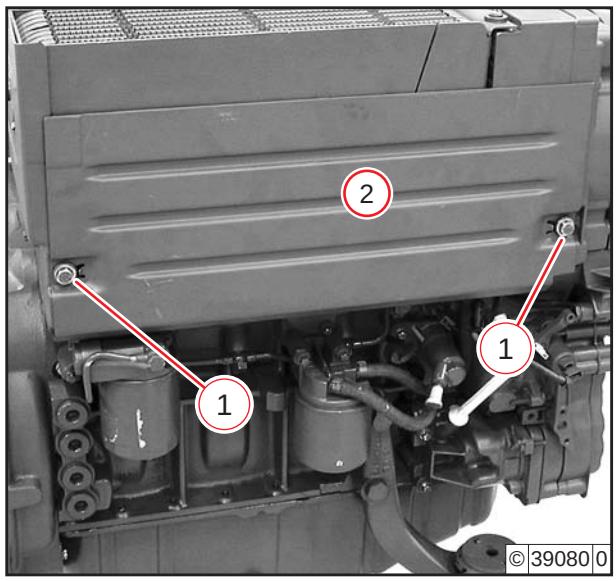
8189 - Torx tool kit

Note

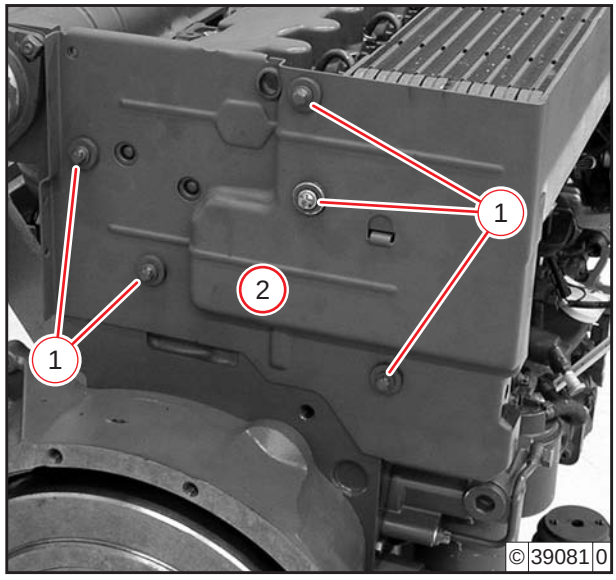
Collect drained operating materials in suitable vessels and dispose of according to regulations.

Remove oil cooler

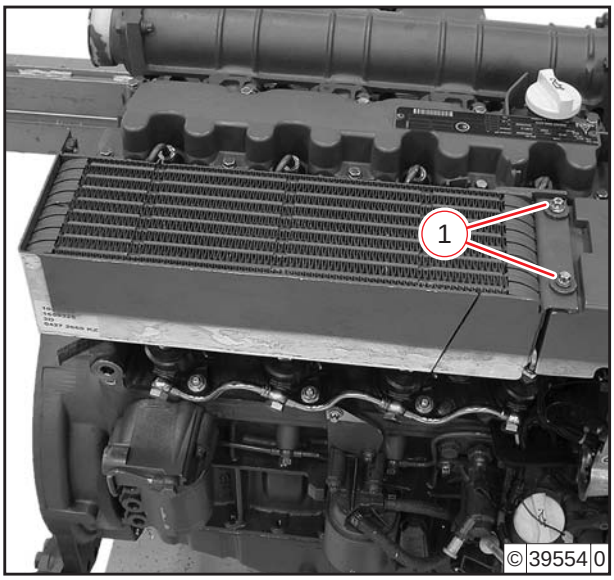
- Unscrew screws (1) and remove air duct cover.



- Unscrew screws (1) and remove standing plate (2).

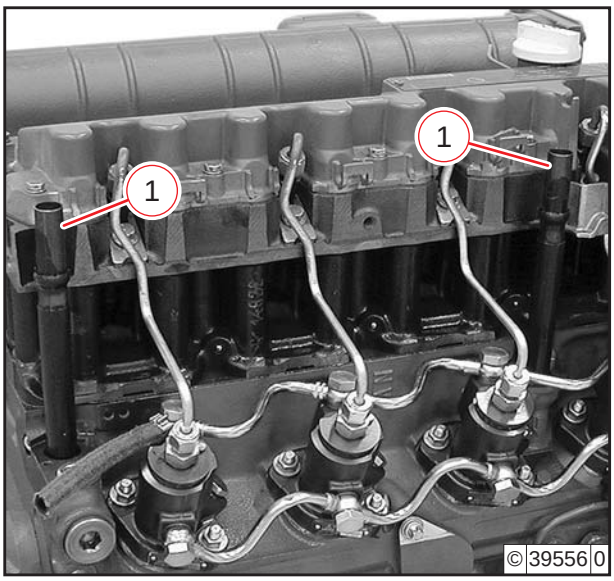


- Unscrew screws (1) and pull oil cooler up.



6

- Pull connections (1) out of crankcase.

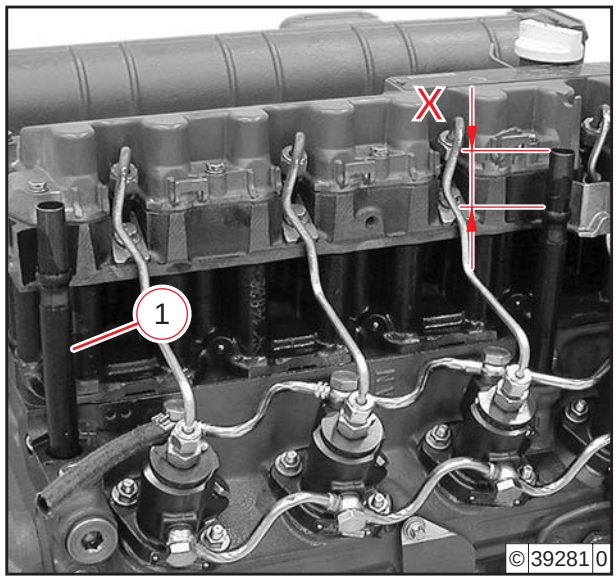


Install oil cooler

- Check connections for visible signs of damage.

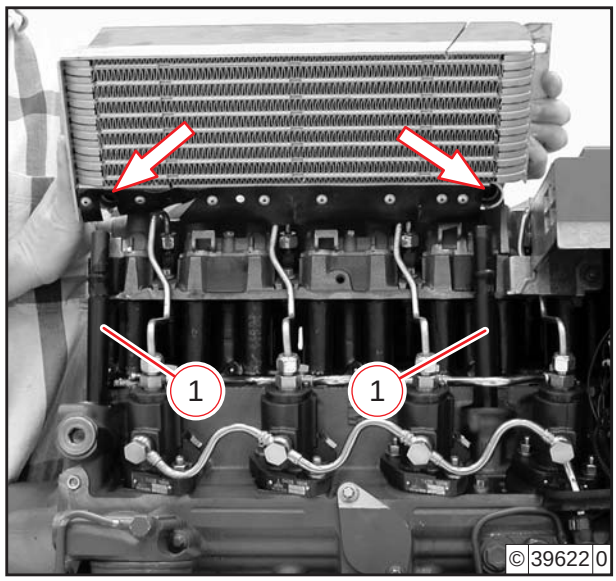
- Press connections (1) into the crankcase to the stop.

Note
The side with the long joint ”X” must face upwards.



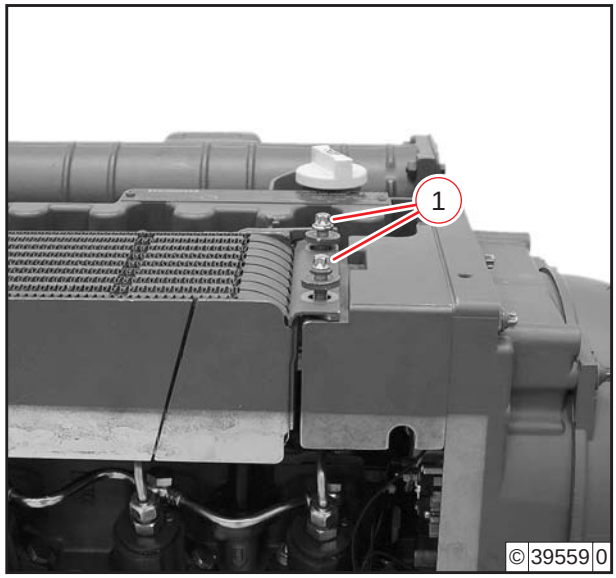
- Press the oil cooler onto the connections to the stop.

Note
Insert connections (1) in the bores (arrows).



- Turn on screws (1).

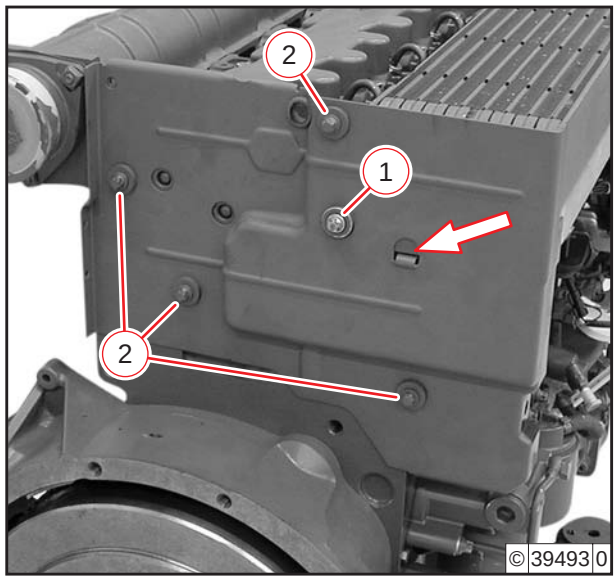
Note
Do not tighten screws.



- Mount the standing plate and turn on the screws.

Note
- Note different screw length (1 and 2).
- The oil cooler must be on the latch (arrow).

09070



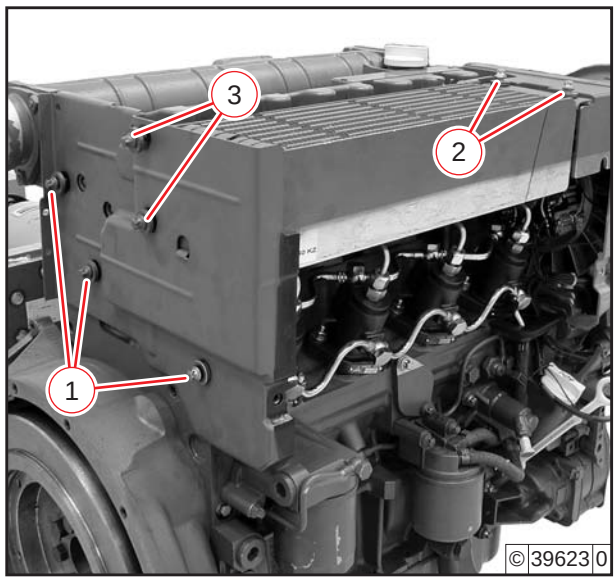
6

- Tighten screws (1 and 3).

09070

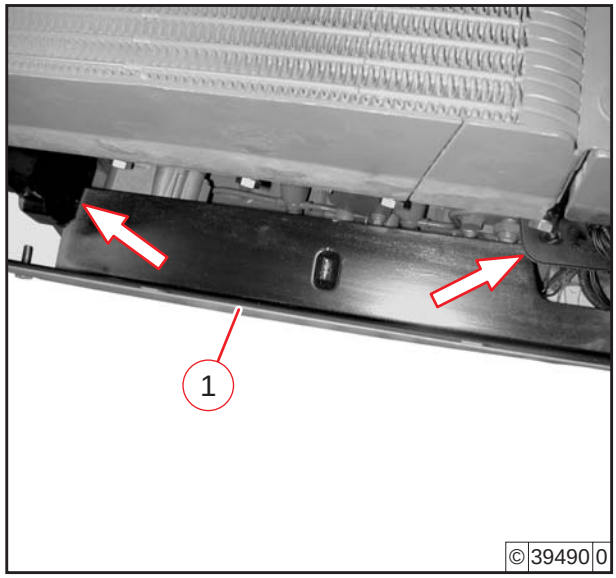
- Tighten screws (2).

08051



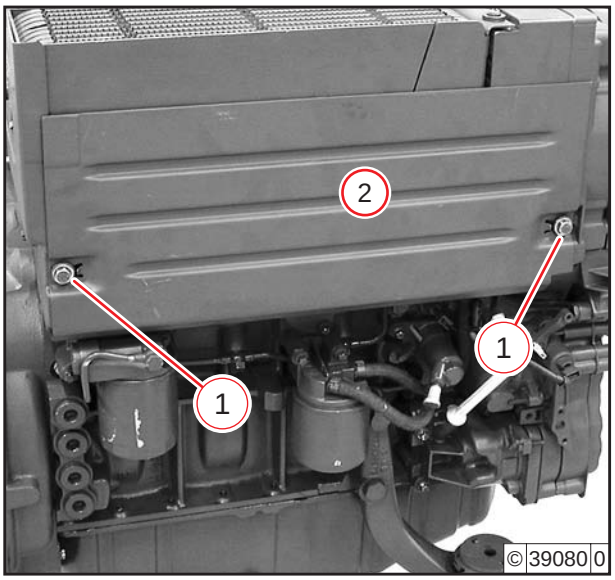
- Mount air duct cover (1).

Note
The air duct cover must be under the stand plate and the profile rubber (arrows).



- Fix air duct cover (2).
  Tighten screws (1).

09087



6

Notes

Remove and install oil filter cartridge

Tools

- Commercial tools

- Special tools

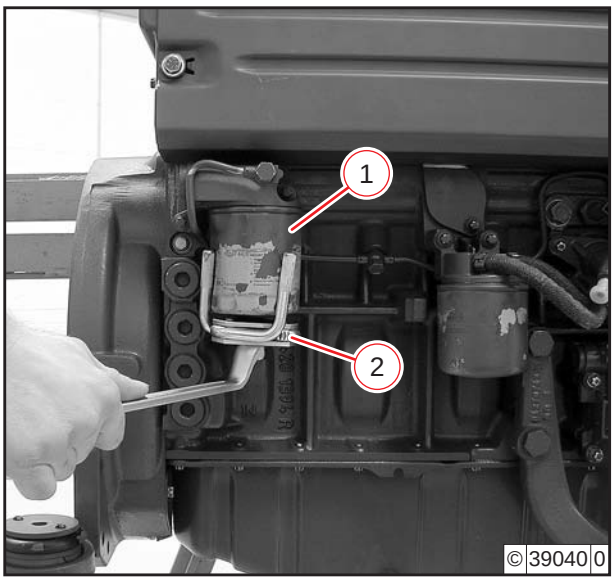
170 050 - Special wrench

Note

Collect drained operating materials in suitable vessels and dispose of according to regulations.

Remove oil filter cartridge

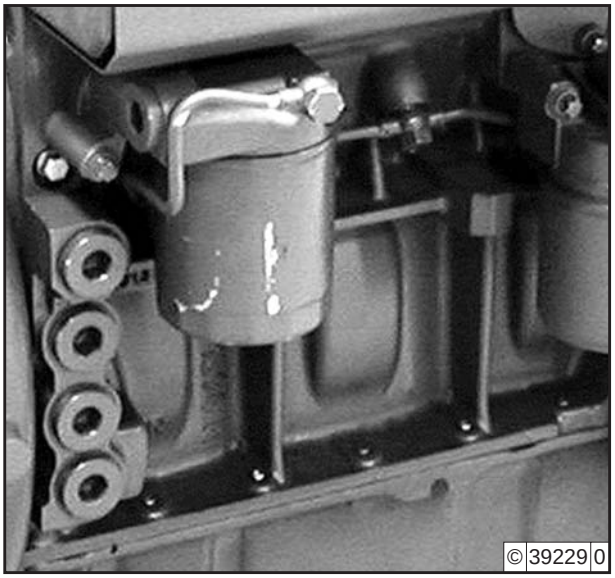
- Unscrew oil filter cartridge (1) with special device (2).



Install oil filter cartridge

- Oil the sealing ring of the new oil filter cartridge lightly and screw on hand tight.

08001



Notes

Remove and install oil filter console

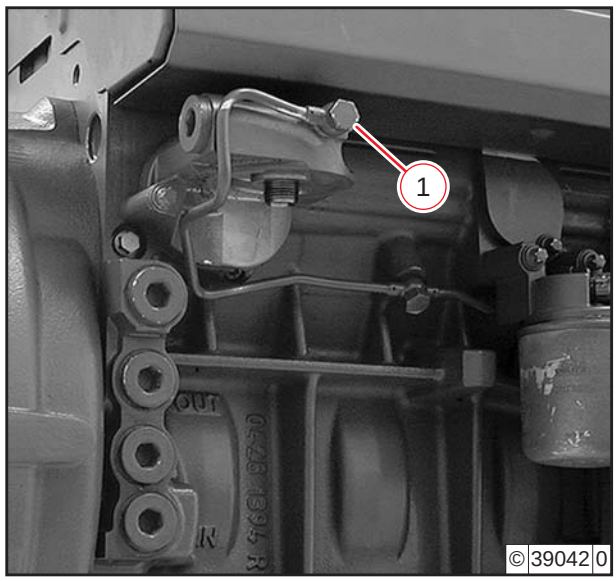
Tools
- Commercial tools

References
- W 08-10-06

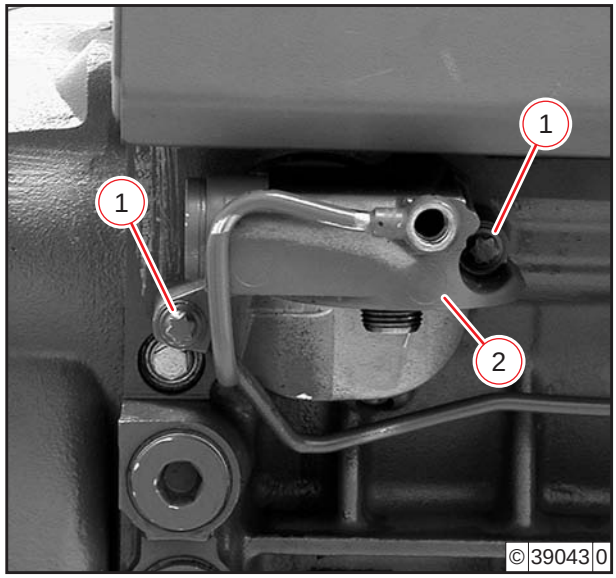
Note
Collect drained operating materials in suitable vessels and dispose of according to regulations.

Remove oil filter console

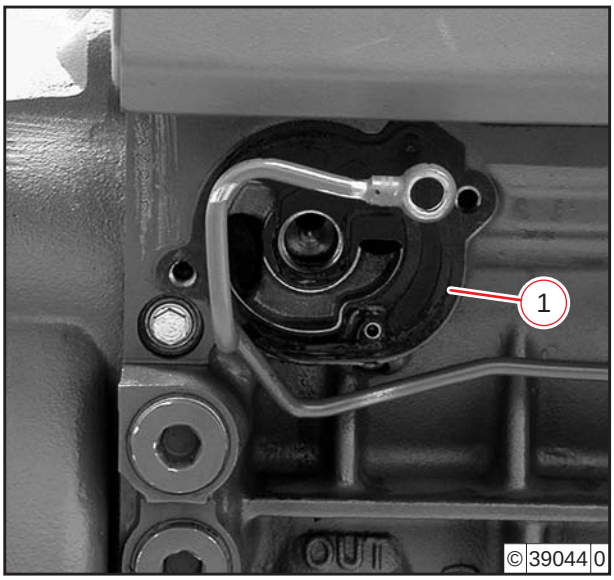
- Remove oil filter cartridge
  ➔ Job card **W 08-10-06**.
- Unscrew hollow screw (1) and remove sealing rings.



- Unscrew screws (1) and remove oil filter console (2).



- Remove gasket (1).
- Check components for visible signs of damage.

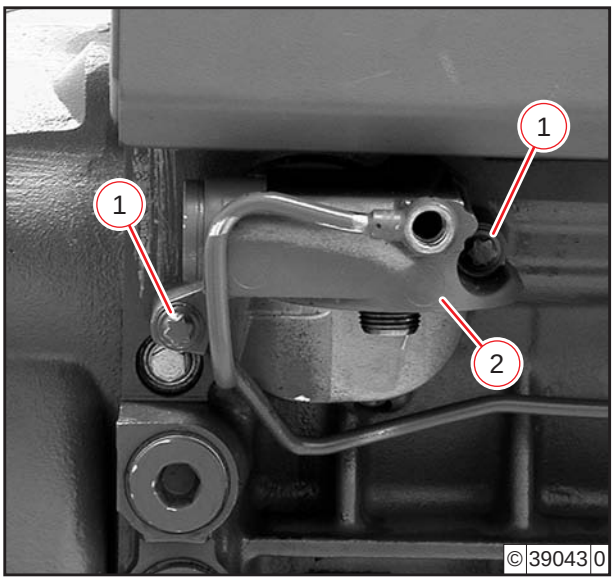


6

Install oil filter console

- Clean the sealing surface of the oil filter console and crankcase.
- Mount oil filter console (2) with new gasket and tighten screws (1).

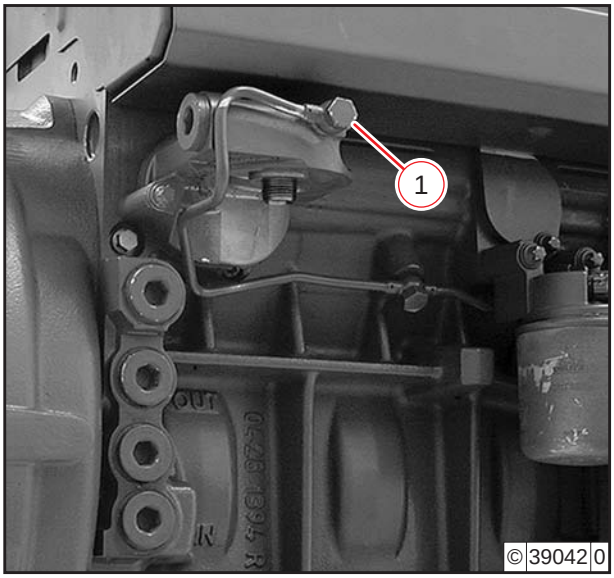
08003



- Tighten hollow screw (1) with new CU sealing rings.

08048

- Install oil filter cartridge
  ➔ Job card **W 08-10-06**.



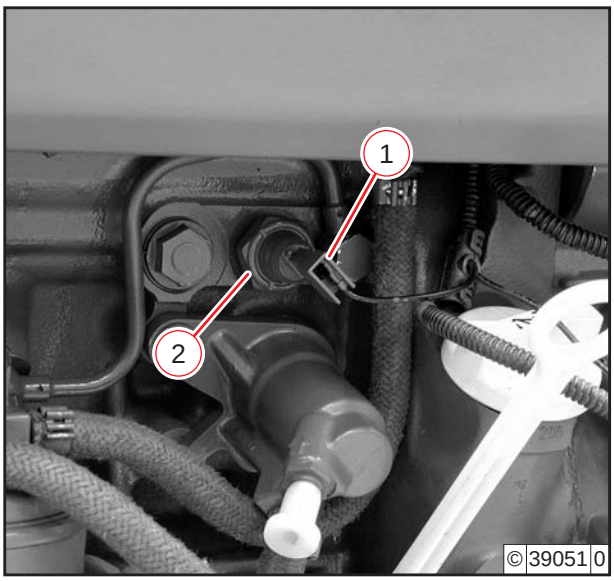
Remove and install oil pressure switch

Tools
- Commercial tools

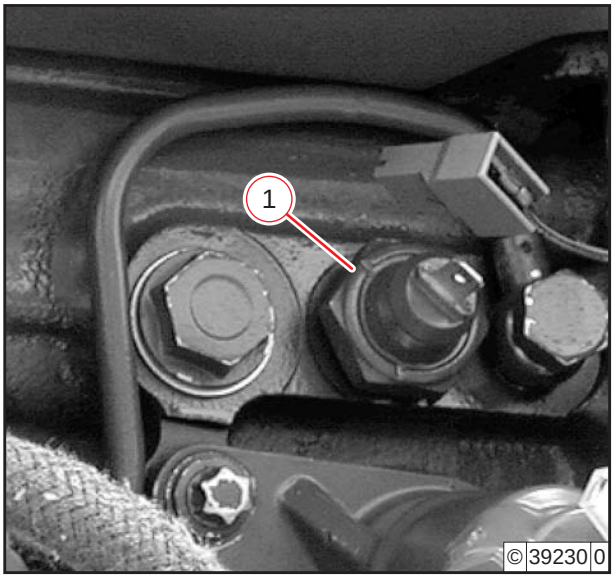
Note
Collect drained operating materials in suitable vessels and dispose of according to regulations.

Remove oil pressure switch

- Pull cable plug (1) out of oil pressure switch (2).



- Unscrew oil pressure switch (1) with sealing ring.
- Check component for visible signs of damage.

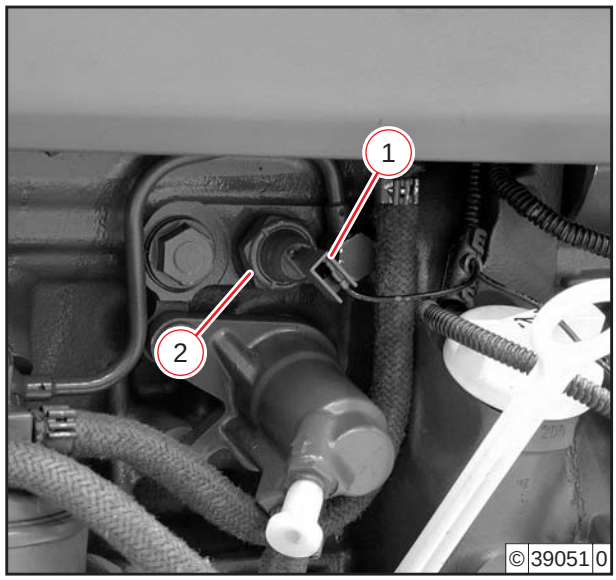


Install oil pressure switch

- Tighten oil pressure switch (2) with sealing ring.

08091

- Plug cable plug (1) to oil pressure switch.



6

Remove and install oil pressure sensor

Tools

- Commercial tools

- Special tools

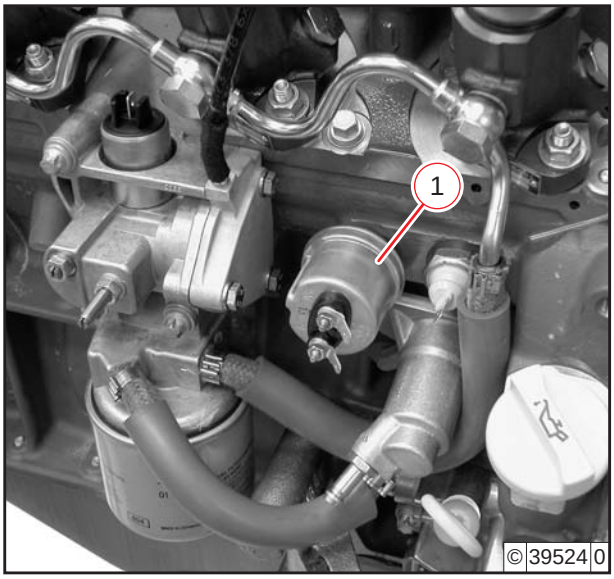
170 110 - Special wrench

Note

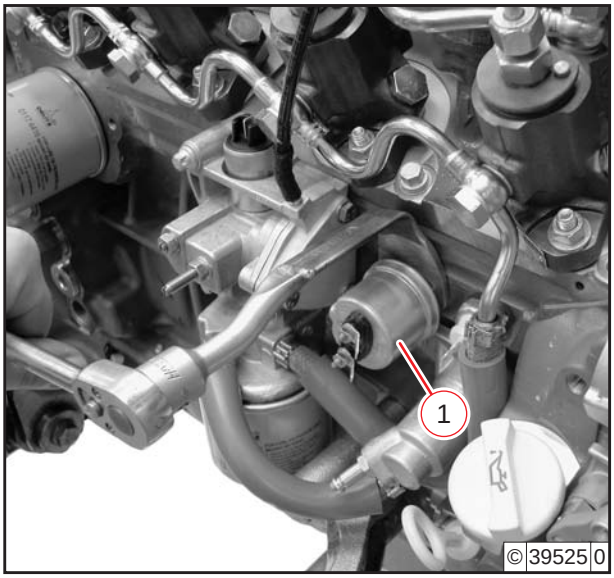
Collect drained operating materials in suitable vessels and dispose of according to regulations.

Remove oil pressure sensor

- Pull off cable plug from oil pressure sensor (1) if available.



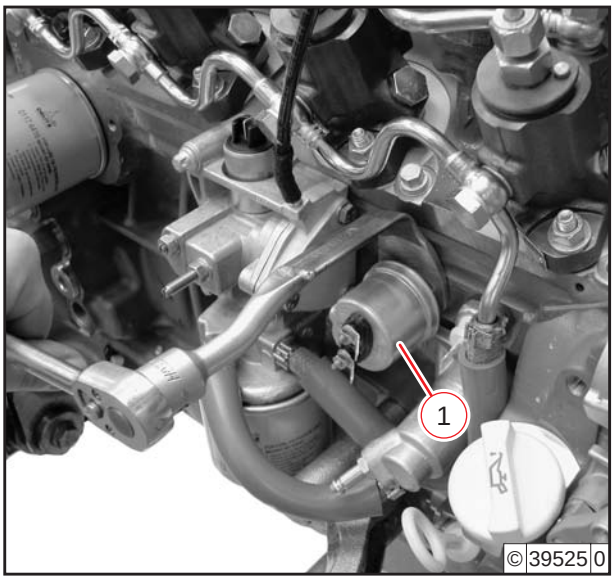
- Unscrew oil pressure sensor (1) with special wrench and remove sealing ring.
- Check components for visible signs of damage.



Install oil pressure sensor

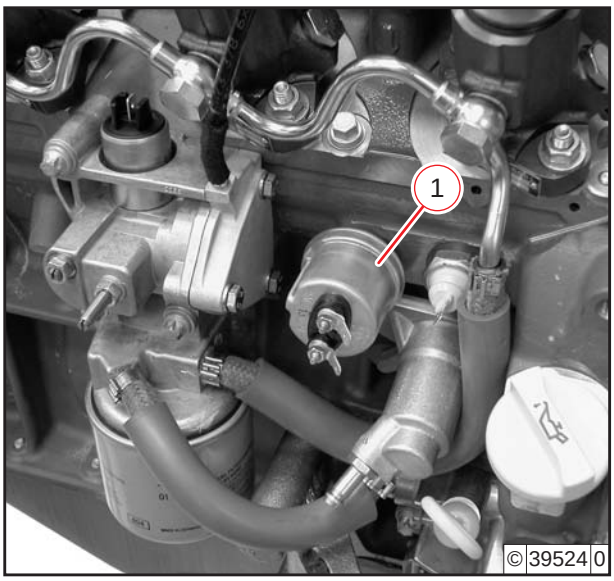
- Mount oil pressure sensor (1) with new CU sealing ring and tighten with special wrench.

08093



6

- Plug cable plug to oil pressure sensor (1) if available.



Remove and install oil temperature sensor

Tools
- Commercial tools

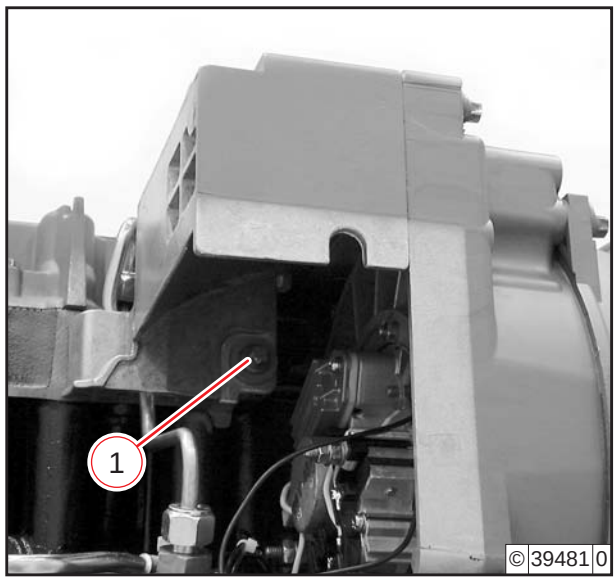
References
- W 08-08-02

Note
Collect drained operating materials in suitable vessels and dispose of according to regulations.

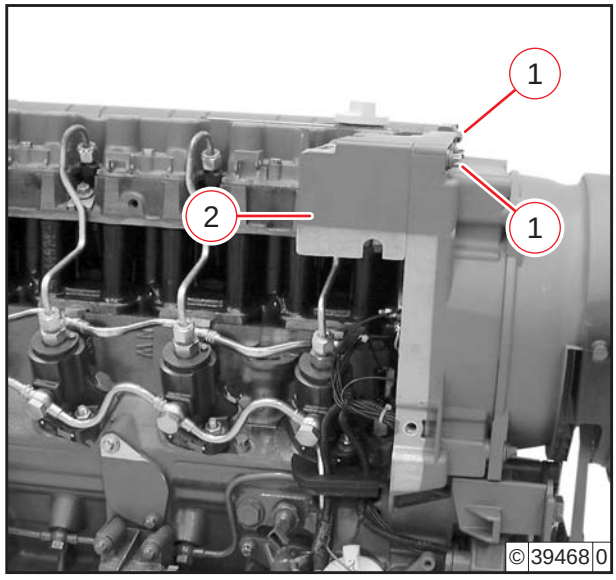
Remove oil temperature sensor

In FL, BFL engines

- Remove oil cooler
  ➔ Job card **W 08-08-02**.
- Unscrew screw (1).

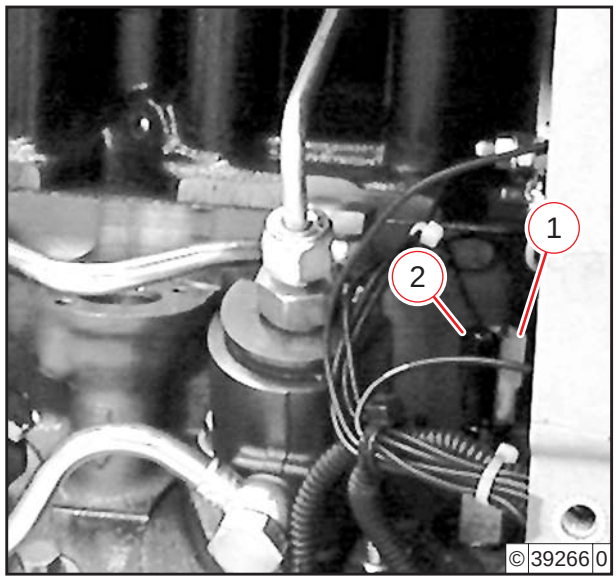


- Unscrew screws (1) and remove air duct (2).



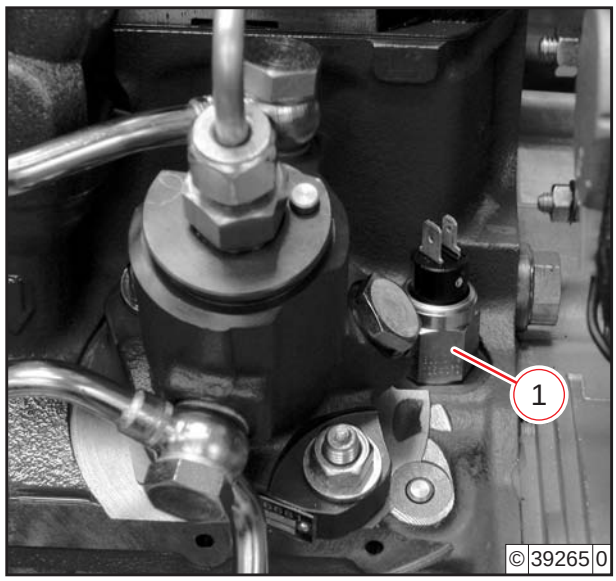
- Pull cable plugs (1and 2) from the oil temperature sensor.

Note
Note the assignment of the cable plugs.



6

- Unscrew oil temperature sensor (1) and remove sealing ring.

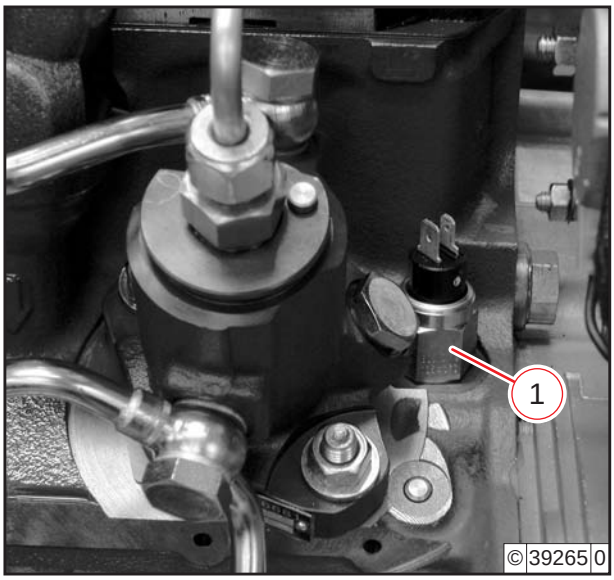


- Check components for visible signs of damage.

Install oil temperature sensor

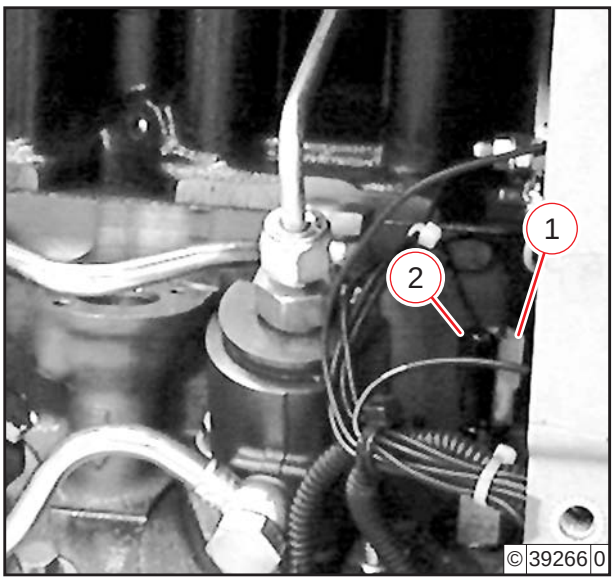
- Tighten oil temperature sensor (1) with new sealing ring.

08095



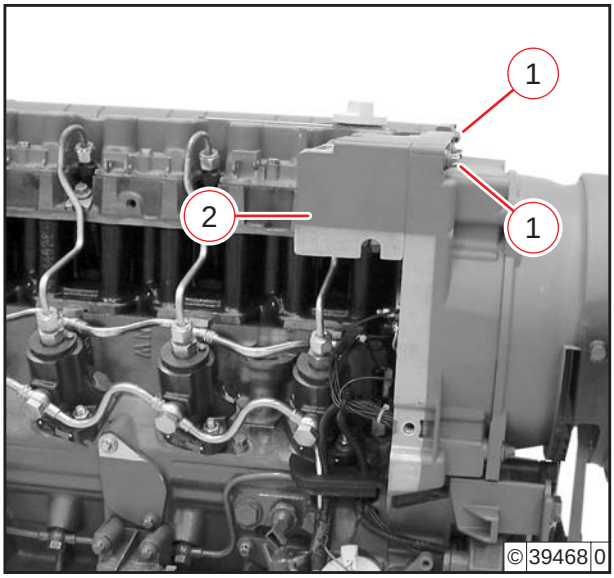
- Plug cable plugs (1 and 2) into oil temperature sensor (2).

Note
Note the assignment of the cable plugs.



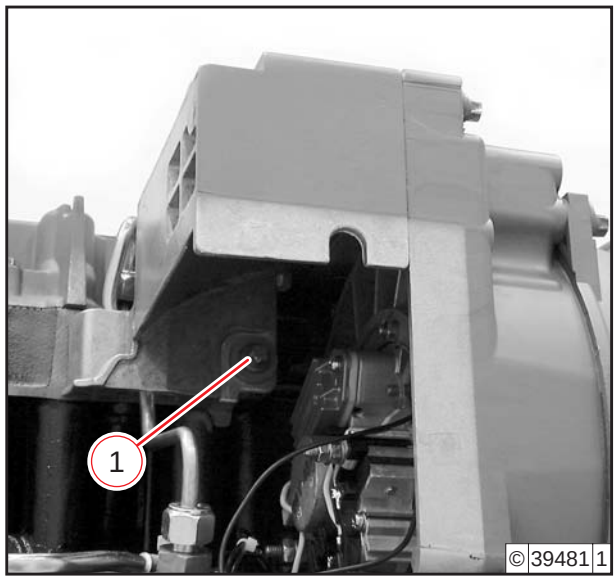
In FL, BFL engines

- Mount air duct (2) and tighten screws (1).



6

- Tighten screw (1).



6

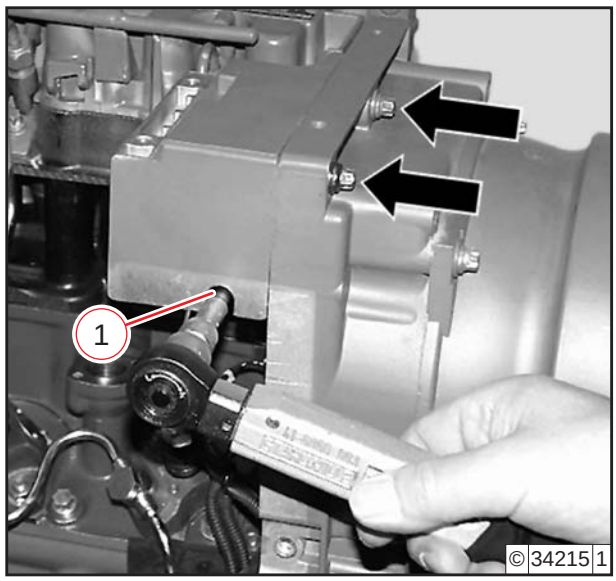
- Pre-tighten screw (1) on cylinder head and tighten screws (arrows).

09089

- Tighten screw (1) on cylinder head.

09089

- Install oil cooler
  ➔ Job card **W 08-08-02**.



Remove and install oil thermostat (oil cooler)

Tools
- Commercial tools
Caliper gauge

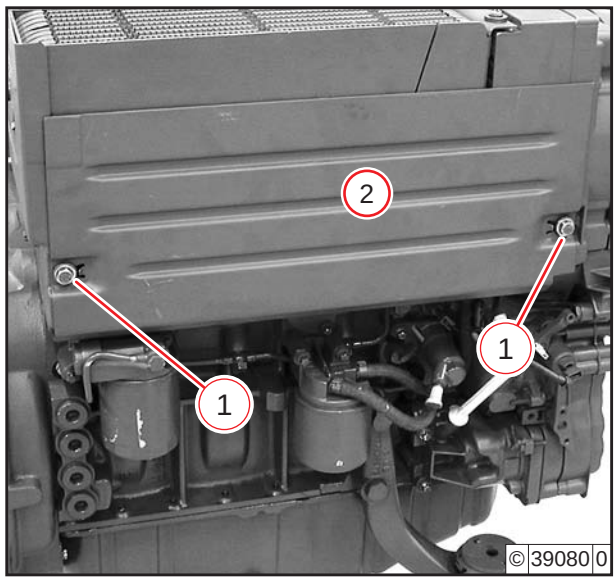
Auxiliary material
- Assembly sleeve

Note
Collect drained operating materials in suitable vessels and dispose of according to regulations.

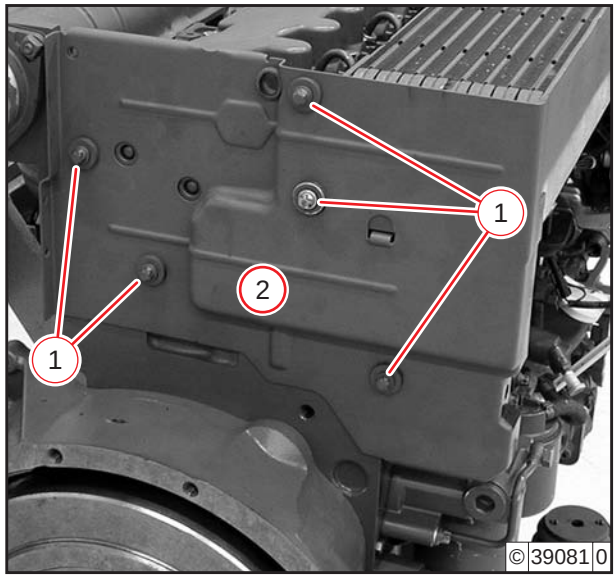
Remove oil thermostat (oil cooler)

In FL, BFL engines

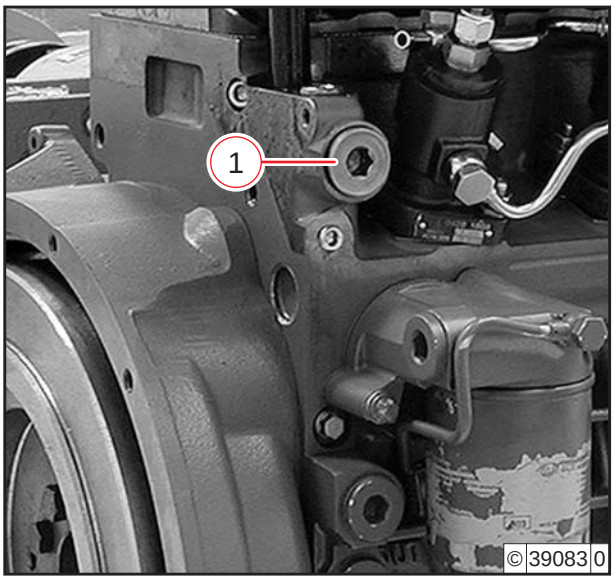
- Unscrew screws (1) and remove air duct cover (2).



- Unscrew screws (1) and remove standing plate (1).



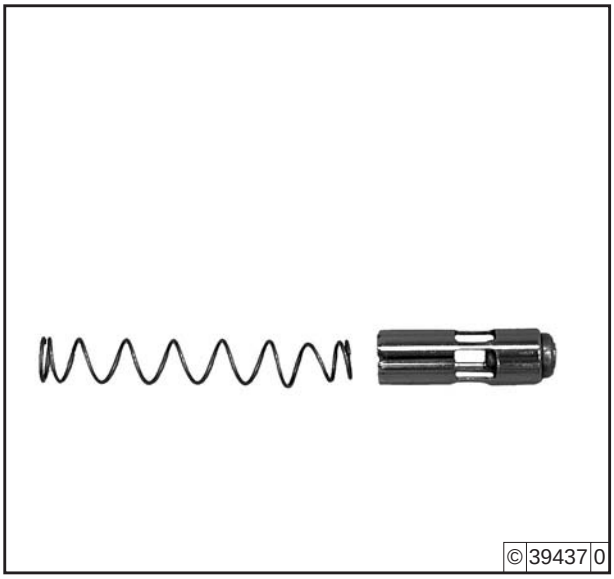
- Unscrew cap (1), remove oil thermostat with compression spring.



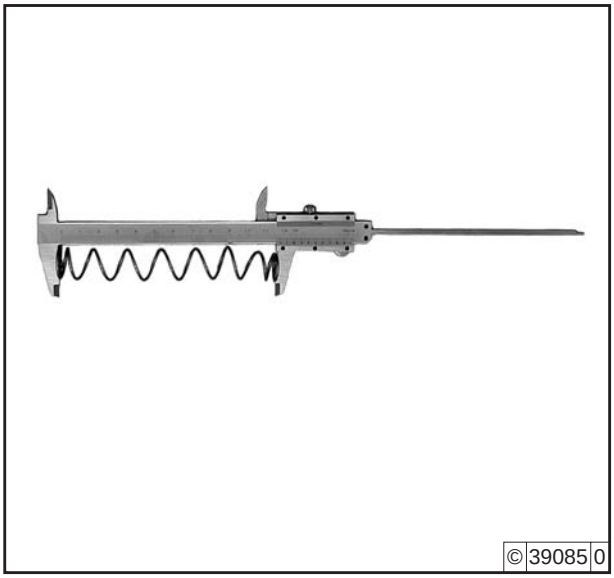
Note
When removing, the following parts may jump out under the pressure of the compression spring.

6

- Check components for visible signs of wear.



- Measure length of the compression spring with caliper gauge.



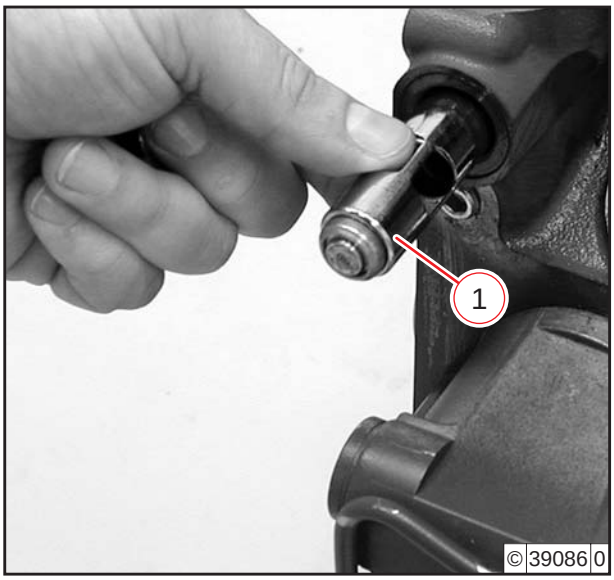
Note
If the wear limit is reached, the compression spring has to be changed.

08 74

Install oil thermostat (oil cooler)

- Insert oil thermostat (1) with compression spring.

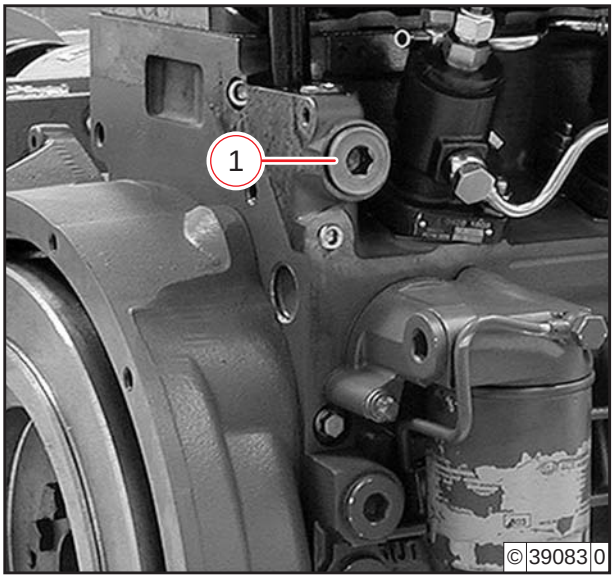
Note
- Oil the oil thermostat lightly.
- Note installation order.



- Pull the new round sealing ring onto the cap.

Note
Use the assembly sleeve.

- Tighten locking screw (1).

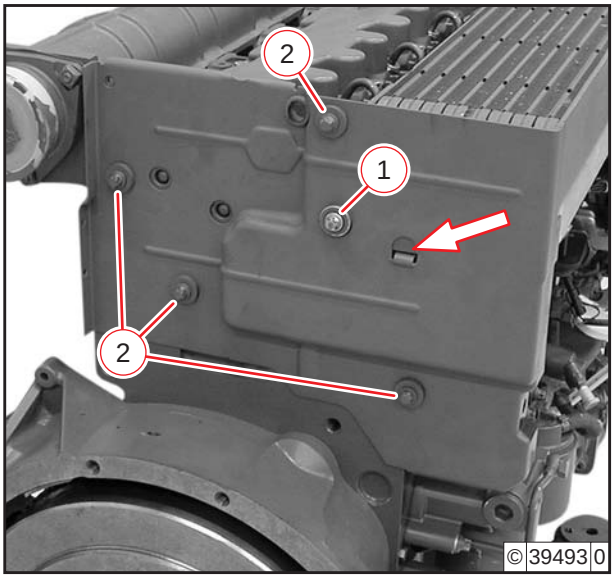


In FL, BFL engines

- Mount the standing plate and turn on the screws.

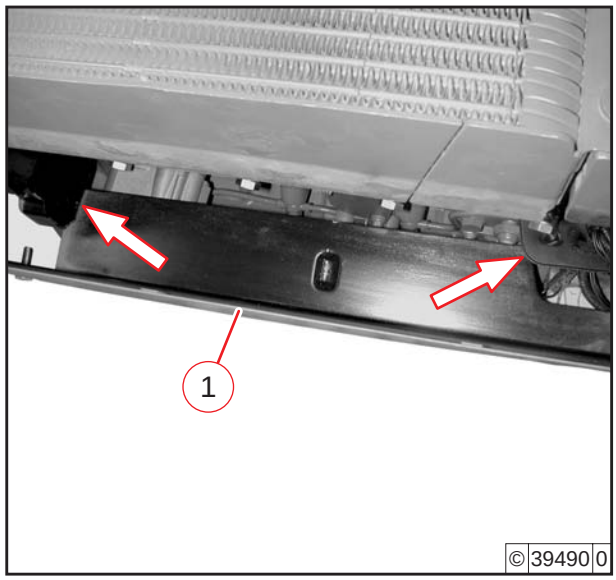
Note
- Note different screw length (1 and 2).
- The oil cooler must be on the latch (arrow).

- Tighten screws (1 and 2).



- Mount air duct cover (1).

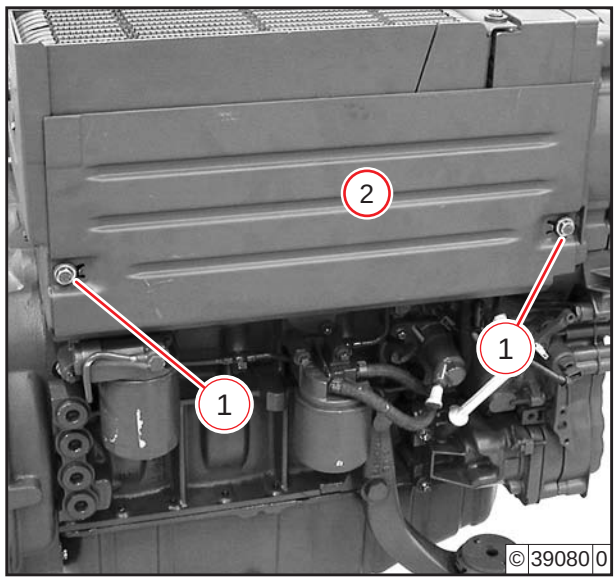
Note
The air duct cover must be under the stand plate and the profile rubber (arrows).



6

- Fix air duct cover (2).
  Tighten screws (1).

09087



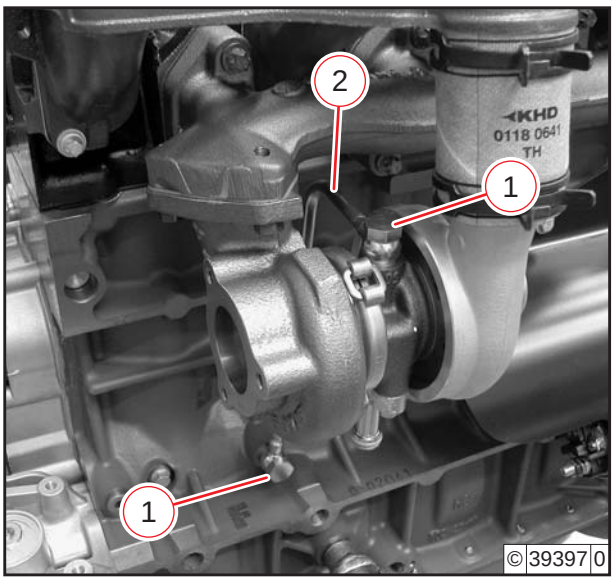
Remove and install oil pressure line (turbocharger)

Tools
- Commercial tools

Note
Collect drained operating materials in suitable vessels and dispose of according to regulations.

Remove oil pressure l-ine

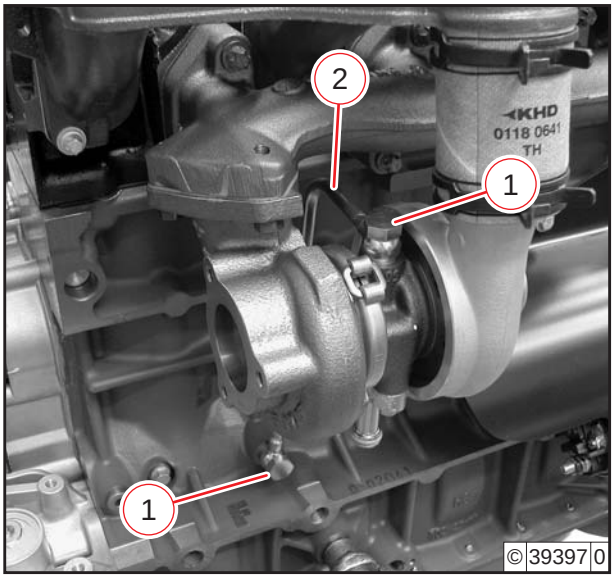
- Unscrew hollow screws (1), remove oil pressure line (2) and sealing rings.
- Check components for visible signs of damage.



Install oil pressure line

- Mount oil pressure line (2), tighten hollow screws (1) with new CU sealing rings.

08042



Notes

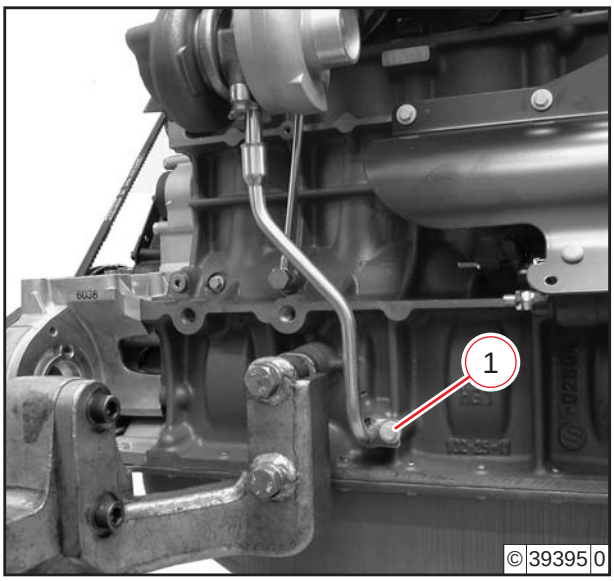
Remove and install oil return line (turbocharger)

Tools
- Commercial tools

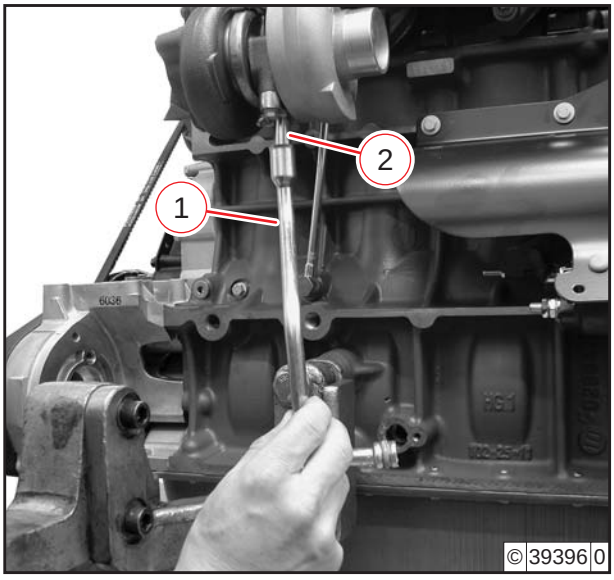
Note
Collect drained operating materials in suitable vessels and dispose of according to regulations.

Remove oil return line

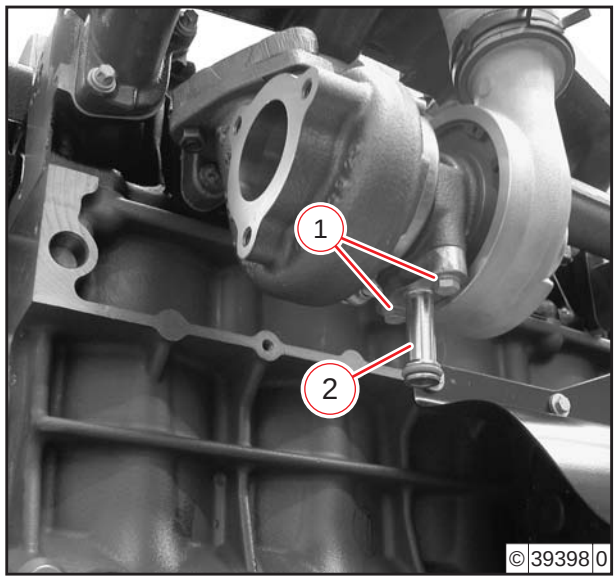
- Unscrew screw (1) and remove holder.



- Pull oil return line (1) out of the crankcase and pull off from oil return pipe flange support (2).



- Unscrew screws (1), remove oil return pipe flange support (2) and gasket.
- Check components for visible signs of damage.

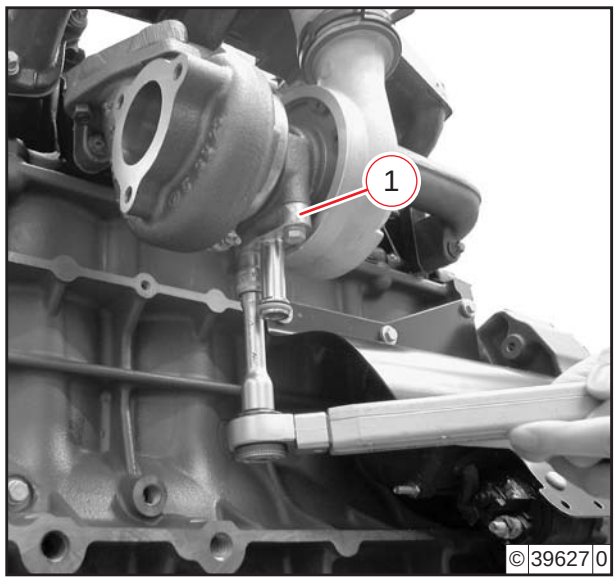


6

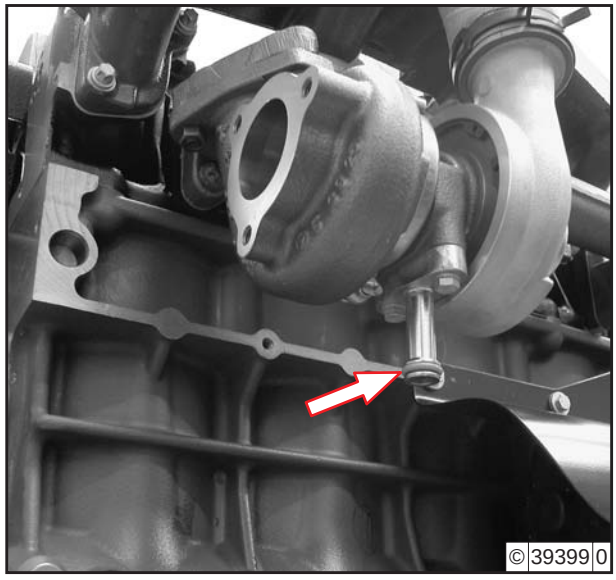
Install oil return line

- Clean the sealing surface of the turbocharger and oil return pipe flange support.
- Mount oil return pipe flange support (1) with new gasket and tighten screws (2).

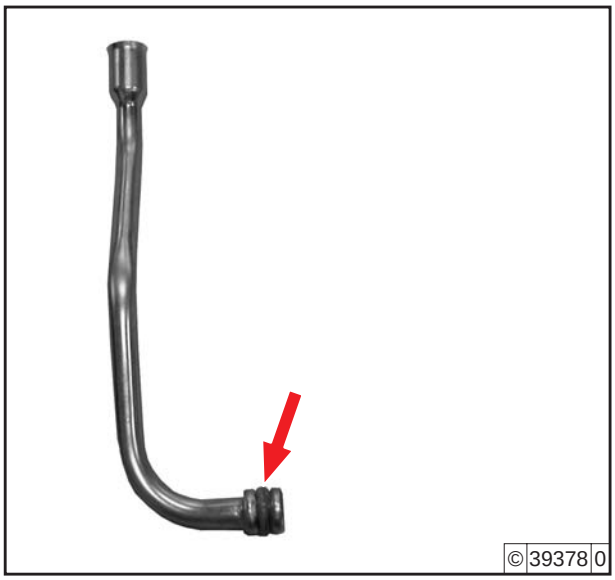
08044



- Pull new round sealing ring (arrow) onto oil return pipe flange support.

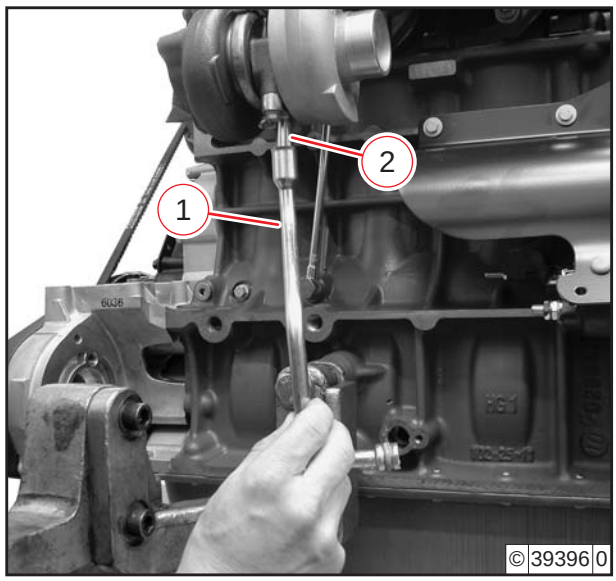


- Pull new round sealing ring (arrow) onto oil return line.



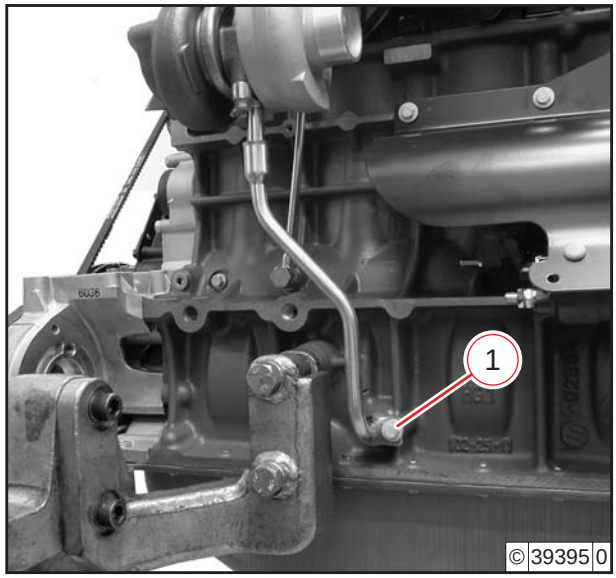
- Push oil return line (1) onto oil return line flange support (2) and insert in crankcase.

Note
Oil round sealing rings lightly.



- Mount holder and tighten screw (1).

08046



Notes

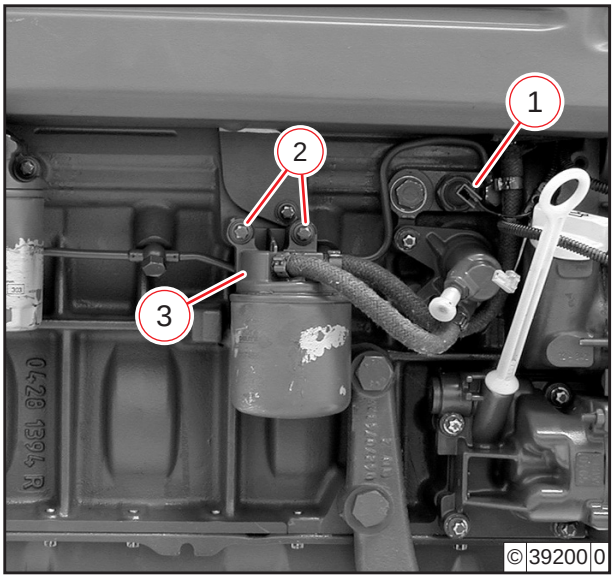
Remove and install oil line for injection adjuster supply

Tools
- Commercial tools

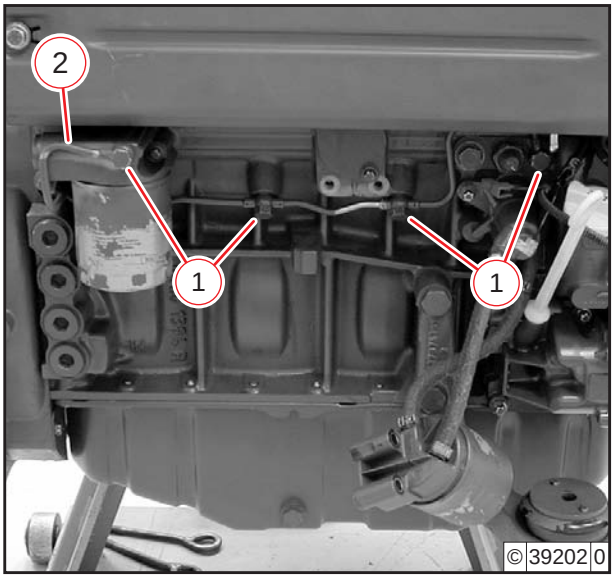
Note
Collect drained operating materials in suitable vessels and dispose of according to regulations.

Remove oil line

- Pull cable plug (1) out oil pressure switch.
- Unscrew screws (2), remove fuel filter console (3) and hang aside.



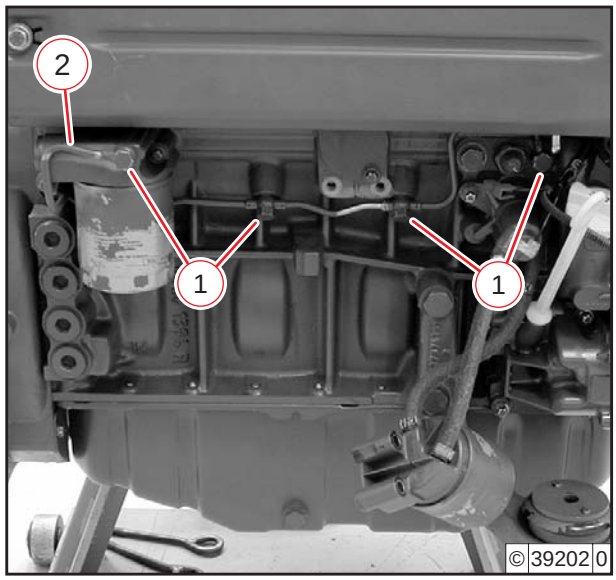
- Unscrew hollow screws (1), remove oil line (2) and sealing rings.
- Check components for visible signs of damage.



Install oil line

- Mount oil line (2), tighten hollow screws (1) with new CU sealing rings.

08048

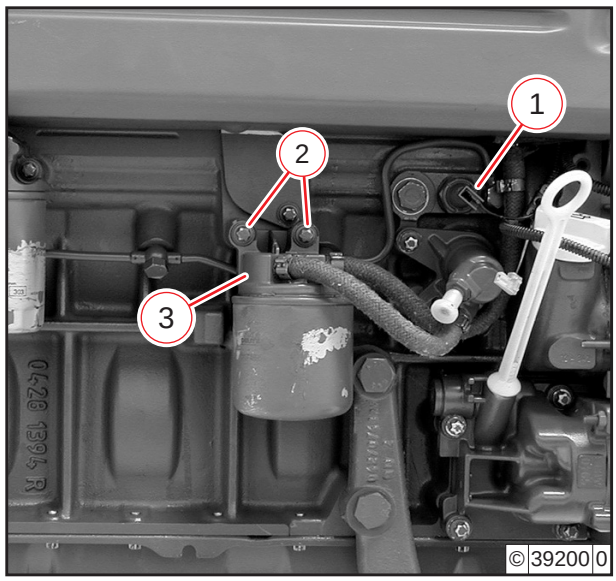


6

- Fit fuel filter console (3) and tighten screws (2).

07082

- Plug cable plug (1) to oil pressure switch.



Remove and install cooling blower

Tools

- Commercial tools

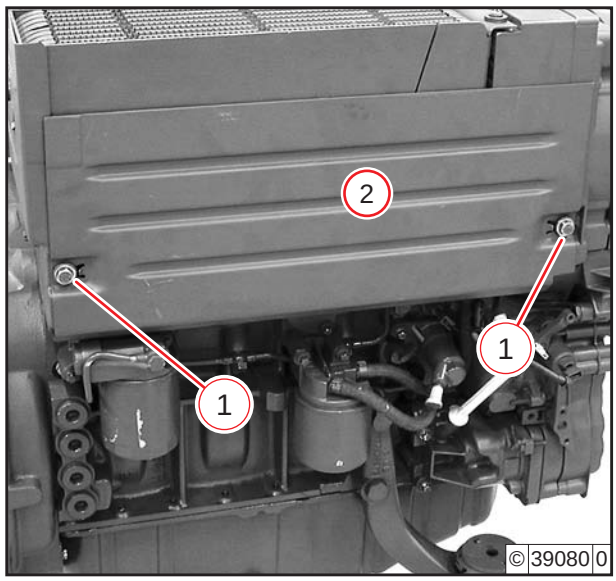
8189 - Torx tool kit

References

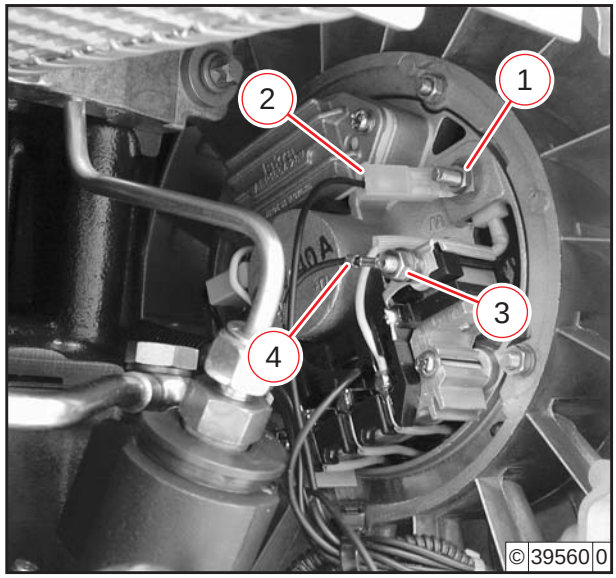
- W 12-02-01 (FL, BFL engines)

Remove cooling blower

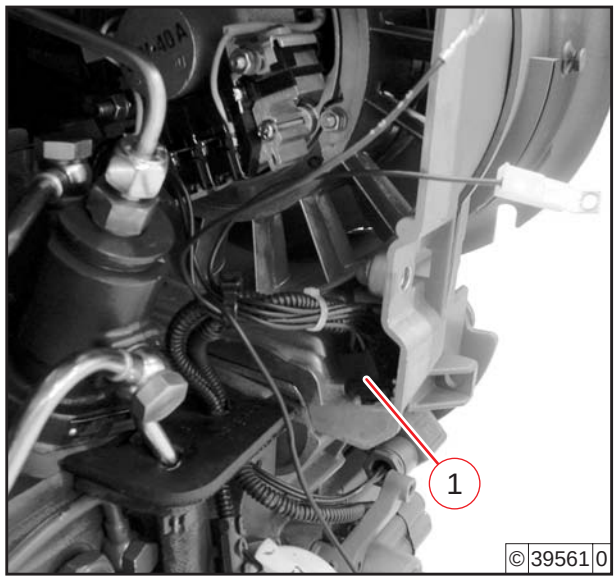
- Remove V-belt
  ➔ Job card **W 12-02-01**.
- Unscrew screws (1) and remove air duct cover (2).



- Remove cable from generator.
  Unscrew nut (1) and remove cable ”G1.W” (2).
- Unscrew nut (3) and remove cable ”G1.D+” (4).

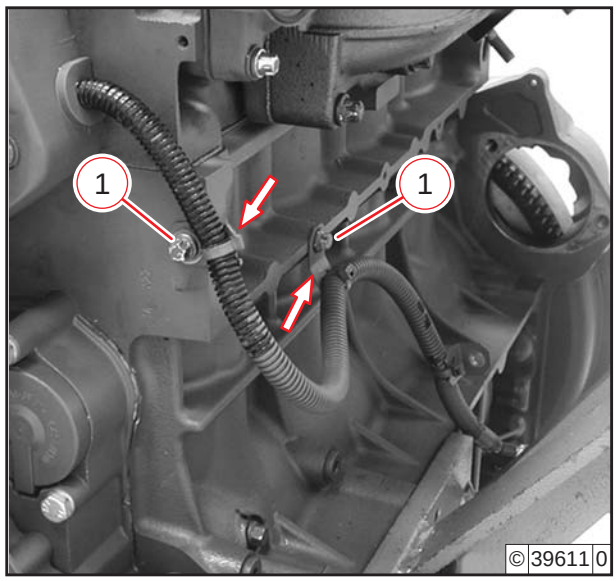


- Unclip cable plug (1).

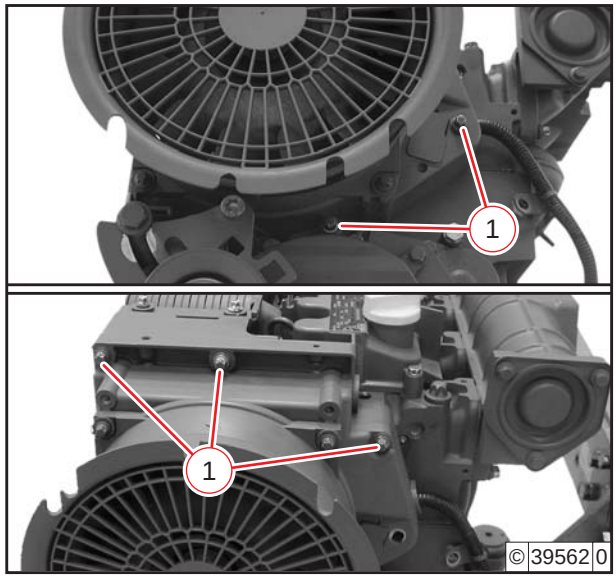


6

- Unscrew screws (1) and remove cable holders (arrows).



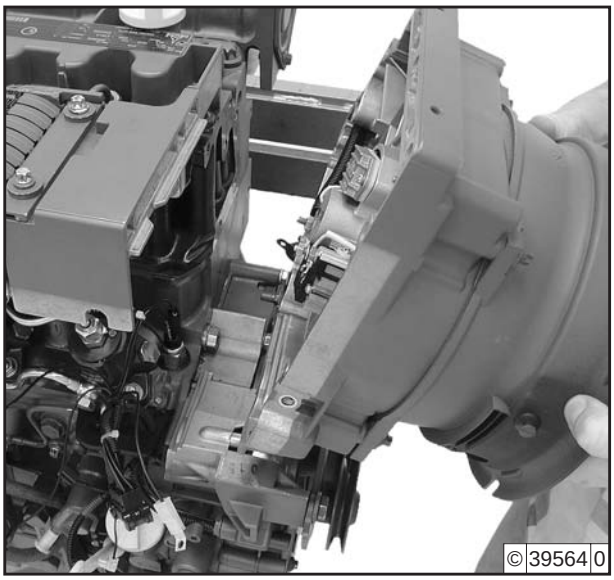
- Unscrew screws (1) and remove cooler blower with generator.
- Check components for visible signs of damage.



Install cooling blower

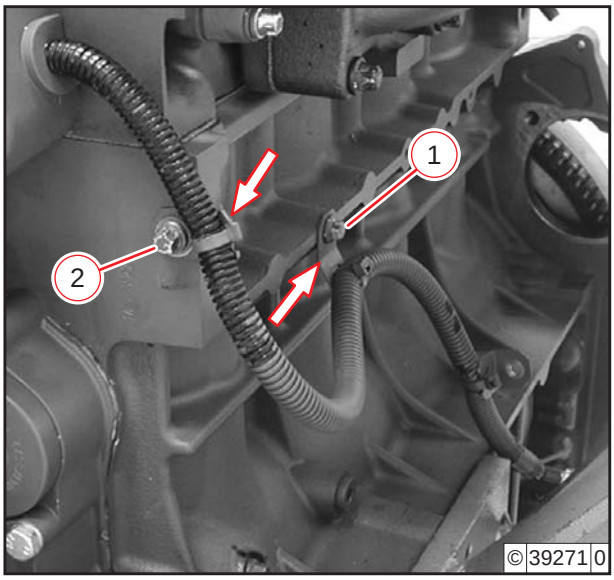
- Mount cooler blower with generator and tighten screws.

09066



- Position cable holders (arrows) and tighten screws.

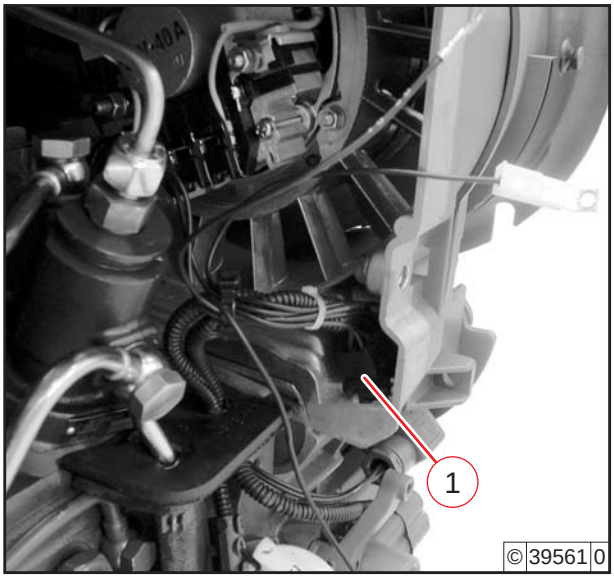
Note
Note different screw length:
Screw M6 x 12 mm (1)
Screw M8 x 20 mm (2)



- Tighten screw (1 and 2).

13092

- Clip in cable plug (1).



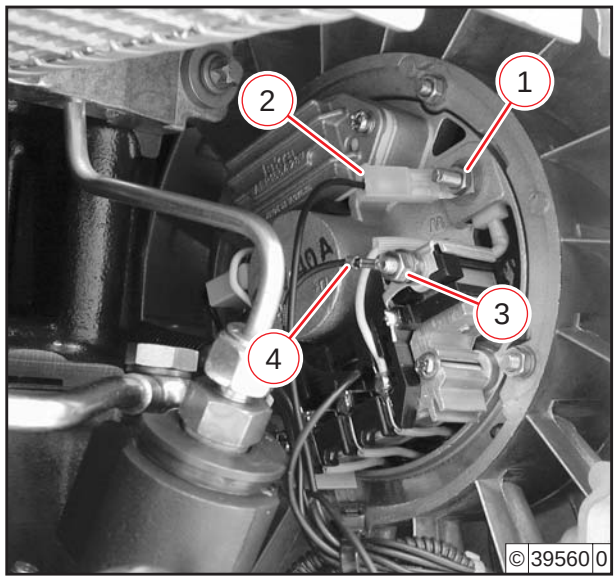
6

- Plug cable to generator.
  Attach cable "G1.D+" (4) and tighten nut (3).

13082

- Attach cable "G1.W" (2) and tighten nut (1).

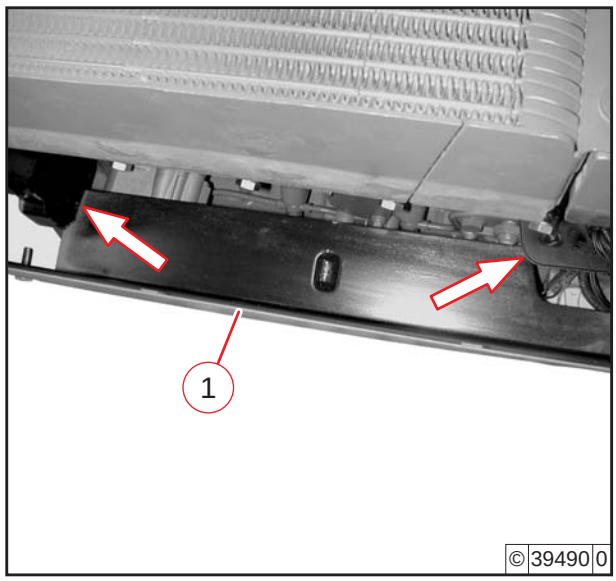
13083



6

- Mount air duct cover (1).

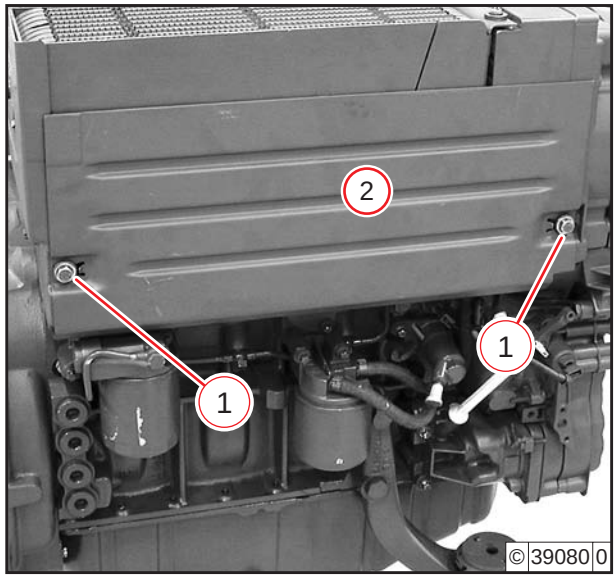
Note
The air duct cover must be under the stand plate and the profile rubber (arrows).



- Fix air duct cover (2).
  Tighten screws (1).

09087

- Install V-belt.
  ➔ Job card **W 12-02-01**.



Remove and install lifting magnet (shutoff magnet)

Tools
- Commercial tools

References
- W 12-02-06
- W 13-02-03 (FM, BFM engines)

6

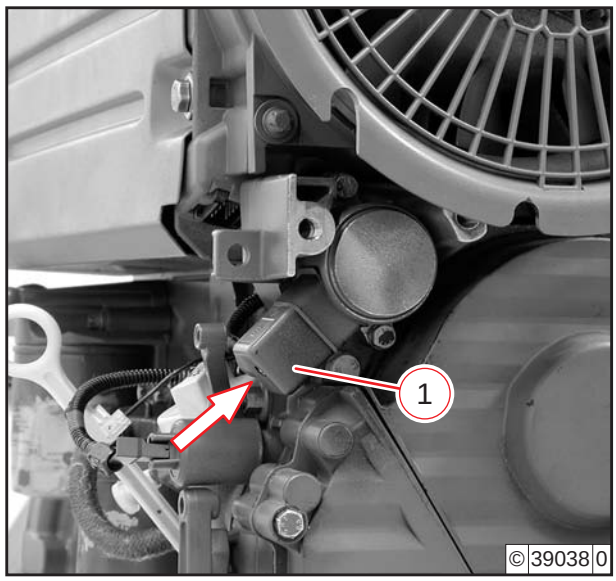
Remove lifting magnet (shutdown magnet)

In FM, BFM engines

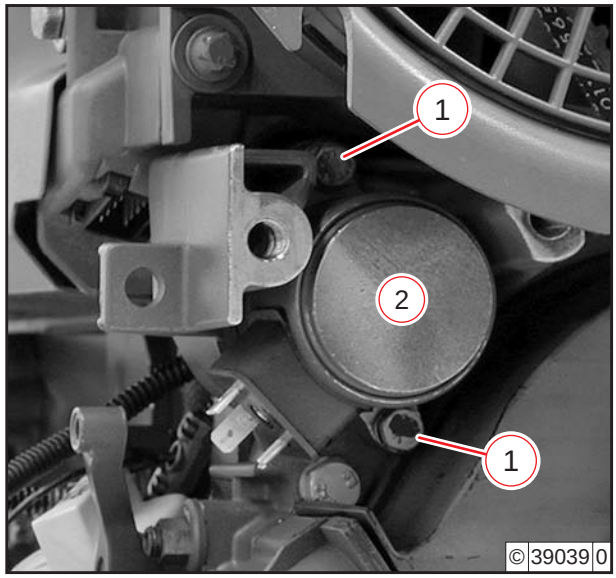
- Remove generator
  ➔ Job card **W 13-02-03**.

In FL, BFL engines

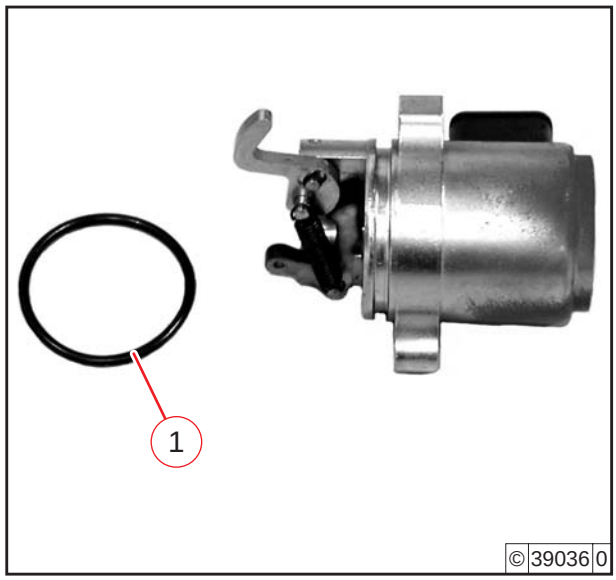
- Remove V-belt clamping roller
  ➔ Job card **W 12-02-06**.
- Unscrew screw (arrow) and pull off cable plug (1).



- Unscrew screws (1) and remove lifting magnet (2).
- Check components for visible signs of damage.



- Pull new round sealing ring (1) onto lfiting magnet.

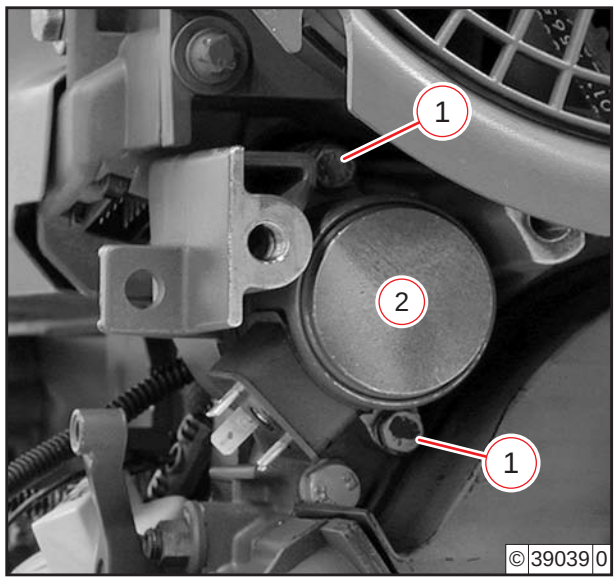


6

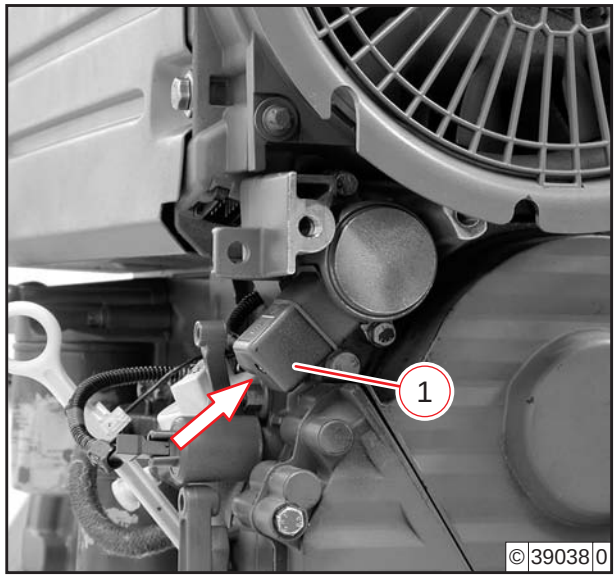
Install lifting magnet

- Insert lifting magnet (2) and tighten screws (1).

05041



- Plug cable plug (1) and tighten screw (arrow).



In FL, BFL engines

- Install V-belt clamping roller
  ➔ Job card **W 12-02-06**.

In FM, BFM engines

- Install generator
  ➔ Job card **W 13-02-03**.

Check, renew V-belt (in FM, BFM engines)

Tools

- Commercial tools

8115 - V-belt pulley tension measuring appliance

Note

- The V-belt tension of new V-belts must be checked after they have been running for 15 minutes.
- One variant has been described. The procedure is the same accordingly for other variants.

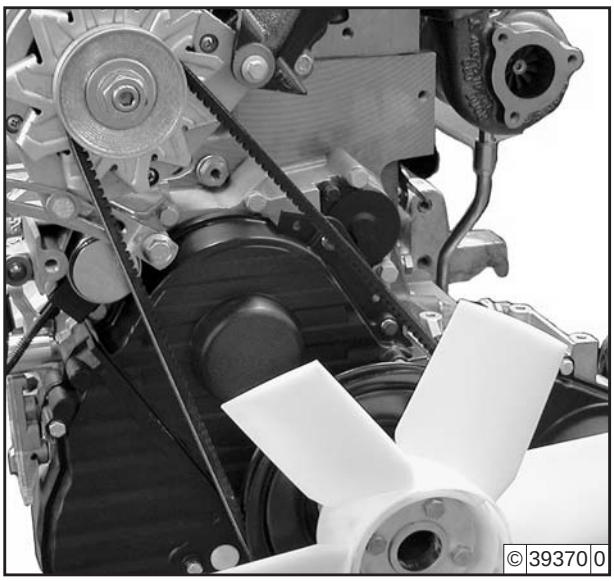
Caution!

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

6

Test V-belt

- Inspect the V-belt visually for wear all round.

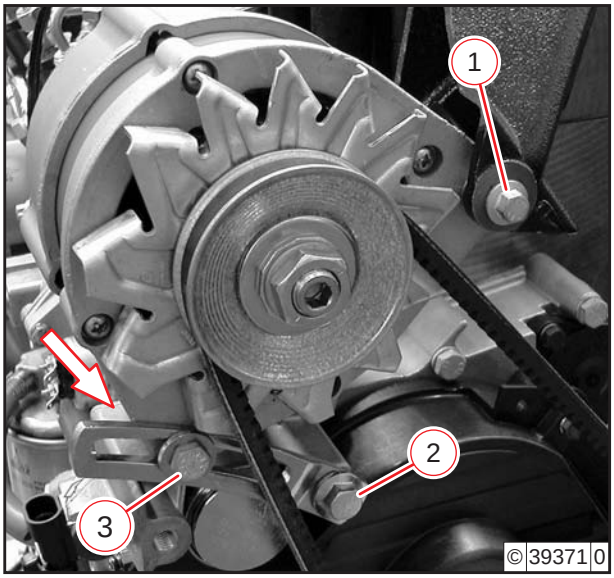


Renew V-belt

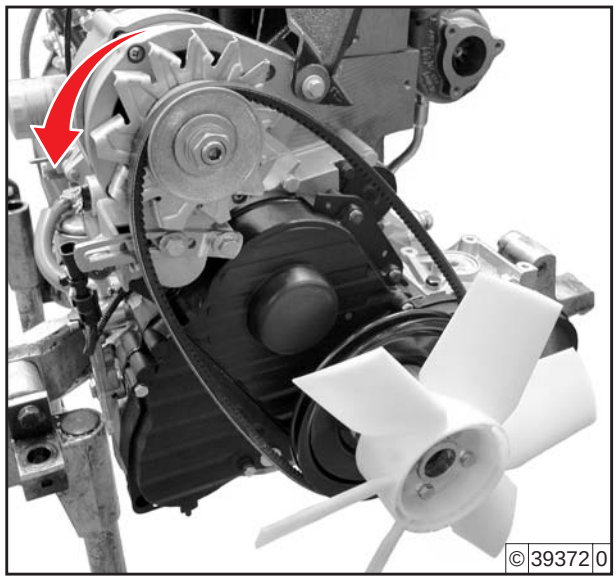
- Loosen screws (1).
- Loosen screw (2).

Note

Hold nuts (arrow).



- Swing generator aside (arrow).
- Remove V-belt.

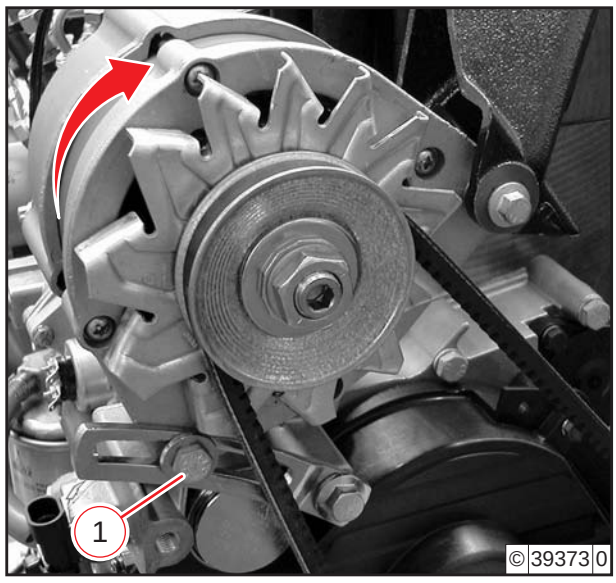


6

- Fit V-belt.
- Tighten V-belt.
  Push back generator with suitable tool (arrow) and tighten screw (1).

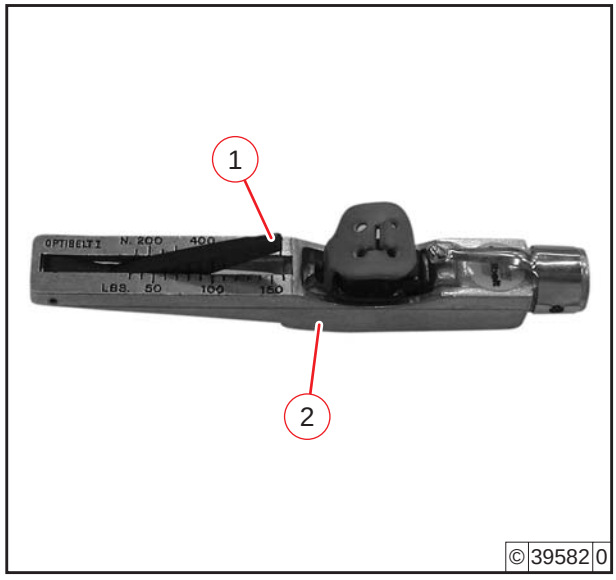
Note
Hold nuts.

13015



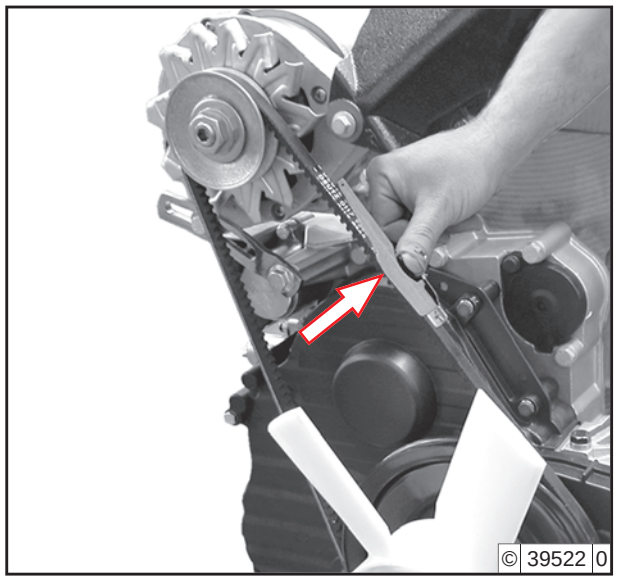
Check the V-belt tension with the V-belt tension measuring appliance.

- Lower indicator arm (1) into V-belt tension measuring appliance (2).



- Mount V-belt tension measuring appliance on the V-belt.

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

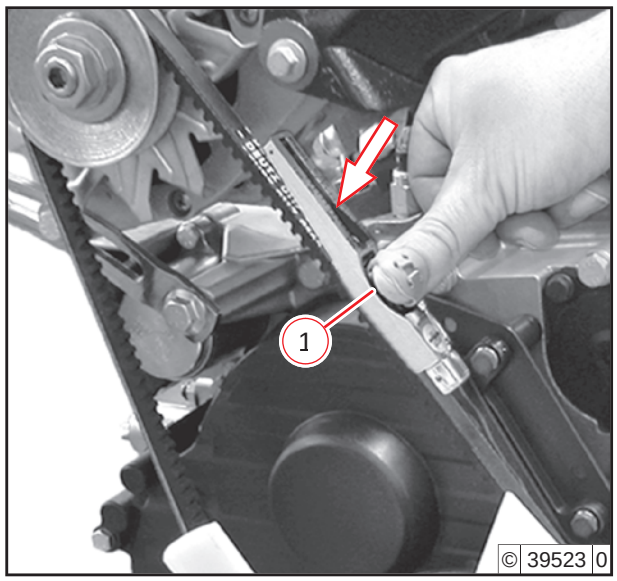


- Press the V-belt measuring appliance against the V-belt with the button (1) until you hear it click.
- Read the measured value at the point of intersection of the indicator arm and the scale (arrow).

Note
Note different unit on the scale.

12 11 12 21

- If the setpoint is not reached, the clamping procedure must be repeated.



- Tighten screw (1).

13012

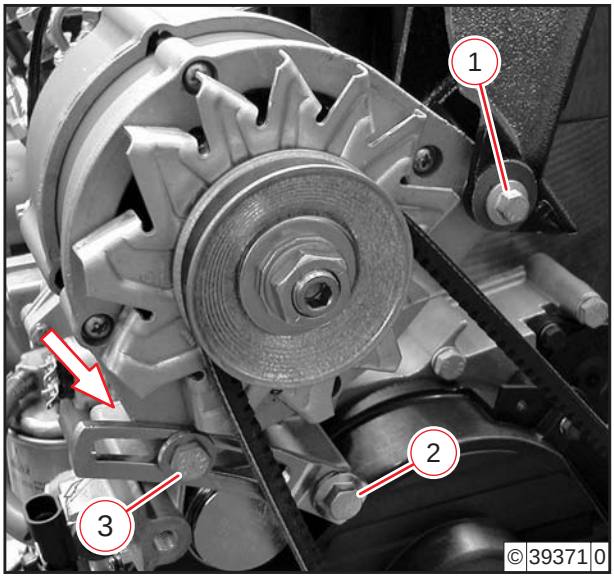
- Tighten screws (2).

13017

- Tighten screw (3).

Note
Hold nuts (arrow).

13015



Generator fastening with built-up fan drive (unit design)

- Tighten screw (1).

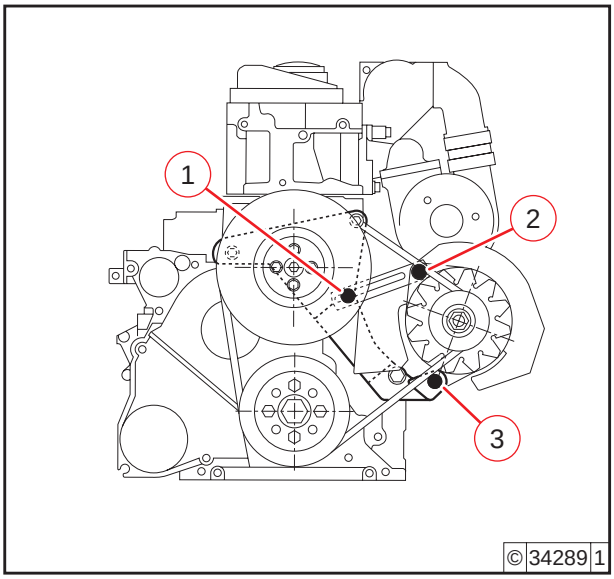
13016

- Tighten screw (2).

13015

- Tighten screw (3).

13012



6

Generator fastening with built-up fan drive (building machine design)

- Tighten screw (1).

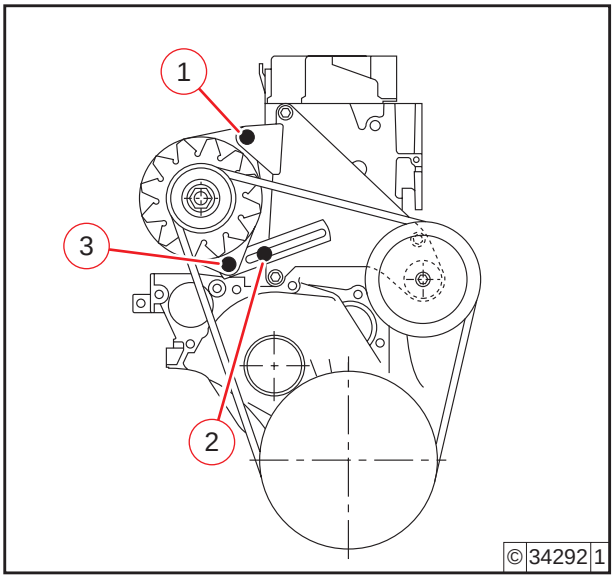
13012

- Tighten screw (2).

13016

- Tighten screw (3).

13015



Check V-belt, renew (in FL and BFL engines)

Tools

- Commercial tools

8115 - V-belt pulley tension measuring appliance

Note

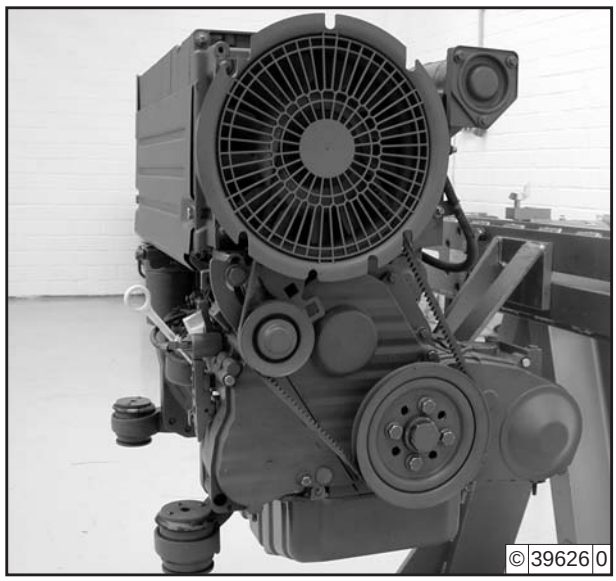
The V-belt tension of new V-belts must be checked after they have been running for 15 minutes.

Caution!

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

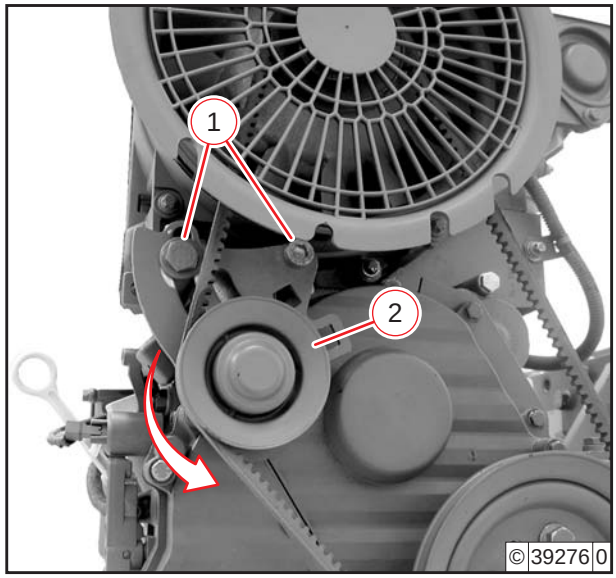
Test V-belt

- Inspect the V-belt visually for wear all round.



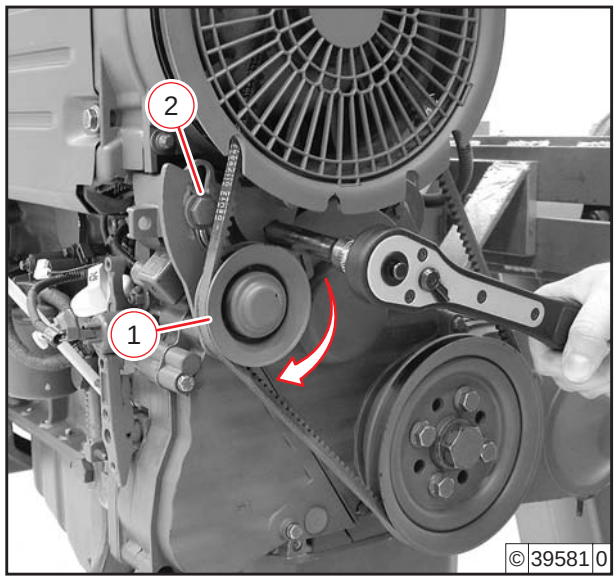
Renew V-belt

- Loosen screws (1).
- Swing V-belt clamping roller (2) to the side (arrow).
- Remove V-belt.



- Fit V-belt.
- Tighten V-belt.
  Press the V-belt clamping roller (1) in the direction of the arrow with a suitable tool and tighten the screw (2).

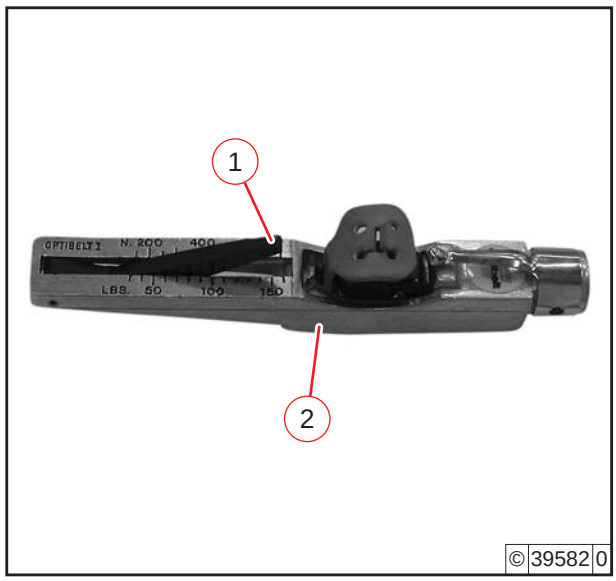
12041



6

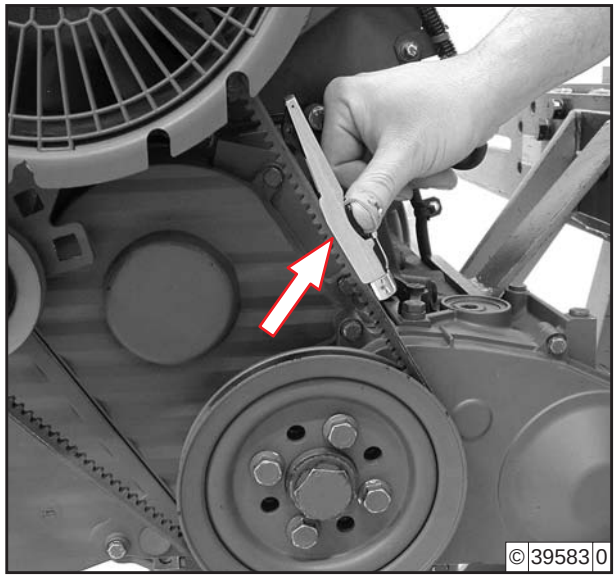
Check the V-belt tension with the V-belt tension measuring appliance.

- Lower indicator arm (1) into V-belt tension measuring appliance (2).

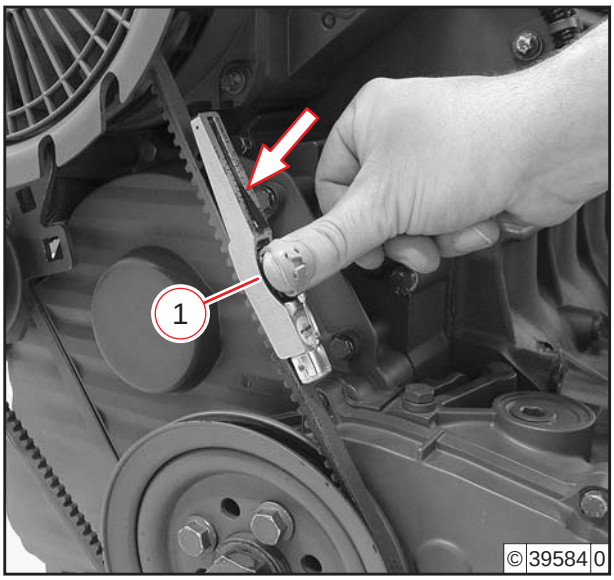


- Mount V-belt tension measuring appliance on the V-belt.

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



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



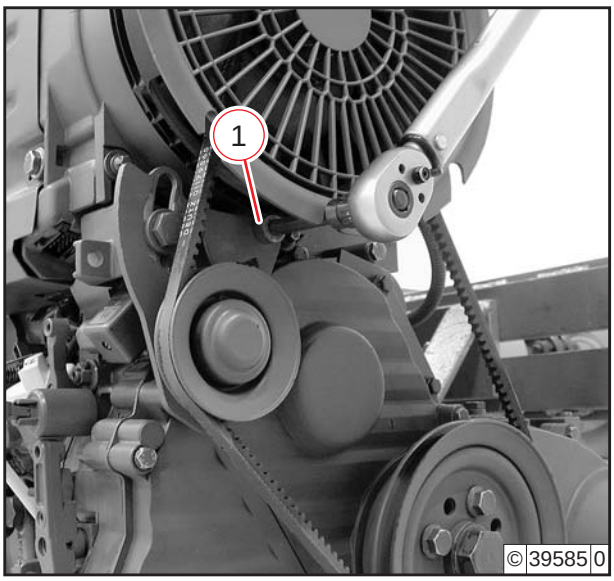
Note
Note different unit on the scale.

12 11 12 21

- If the setpoint is not reached, the clamping procedure must be repeated.

- Tighten screw (1).

12041



6

Notes

Remove and install V-belt clamping roller

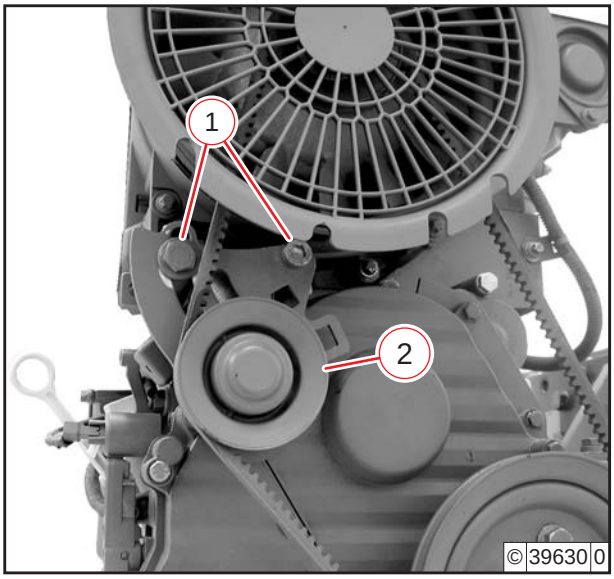
Tools
- Commercial tools

References
- W 12-02-01 FL and BFL engines
- W 12-02-01 FM and BFM engines

Note
- Only the old version of the clamping roller has been described.
- The procedure is the same accordingly for other versions.

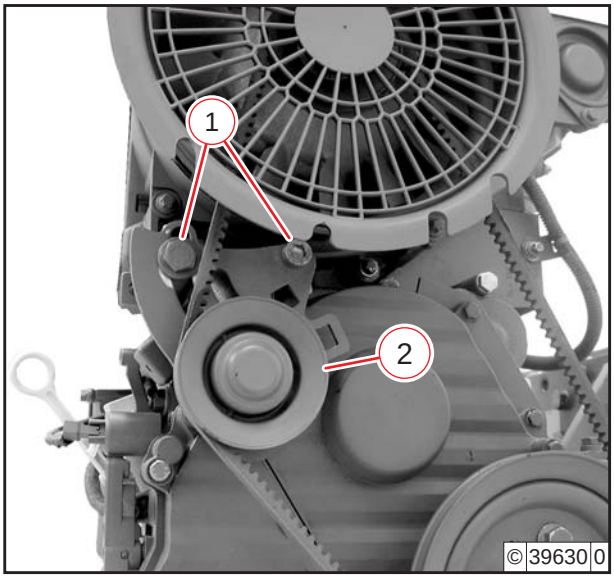
Remove V-belt clamping roller

- Unscrew screws (1) and remove V-belt clamping roller (2).
- Check component for visible signs of damage.



Install V-belt clamping roller

- Fit V-belt clamping roller (2) and tighten screws (1).
- Tighten V-belt.
  ➔ Job card **W 12-02-01** (FL and BFL engines)
  ➔ Job card **W 12-02-01** (FM and BFM engines).



Notes

Remove and install flywheel

Tools

- Commercial tools

- Special tools

Guide pin (self made)

143 100 - Pressing device

6

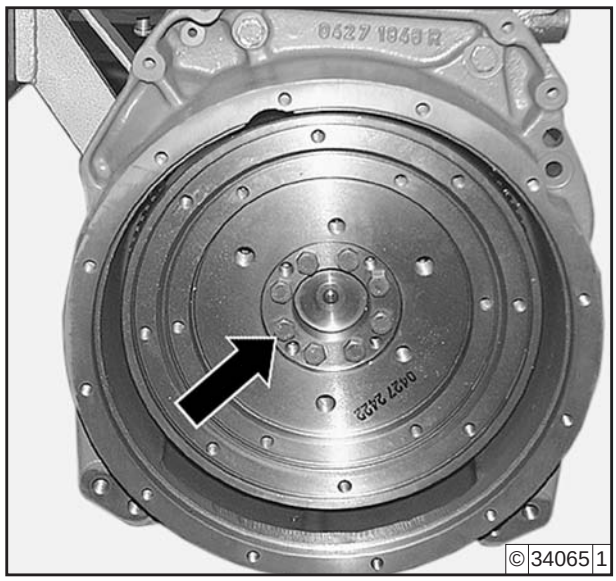
Remove flywheel

- Unscrew all screws (arrow).

Note

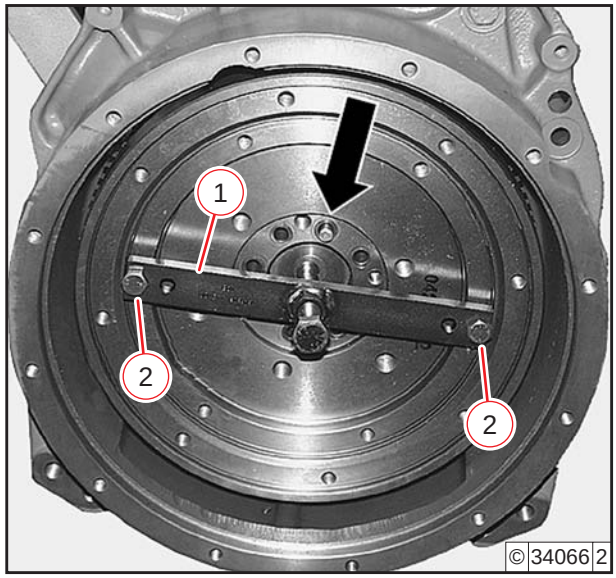
Block flywheel with suitable tool.

- Remove flywheel.

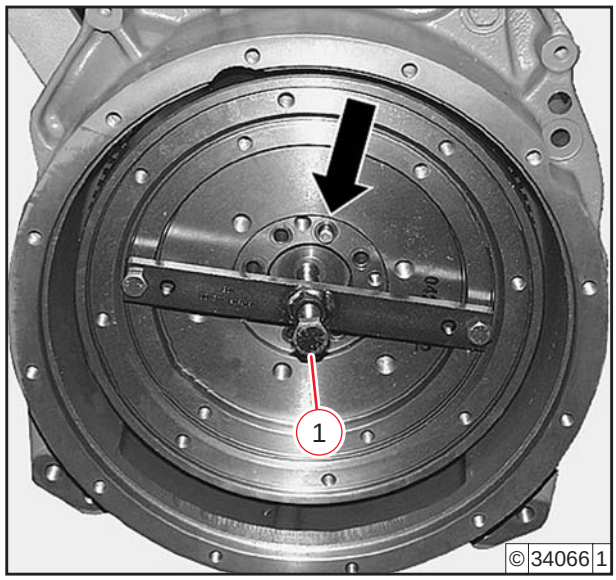


Remove stuck flywheel

- Turn in self-made guide pin (arrow).
- Apply pressing tool (1) and tighten screws (2).



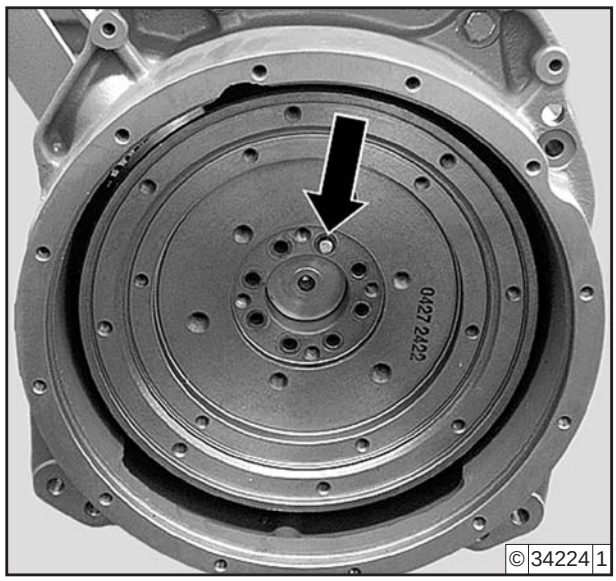
- Press down flywheel by turning in the center screw (1).
- Remove pressing tool.
- Unscrew self-made guide pin (arrow).
- Visually inspect the flywheel and toothed starter ring for damage.



6

Install flywheel

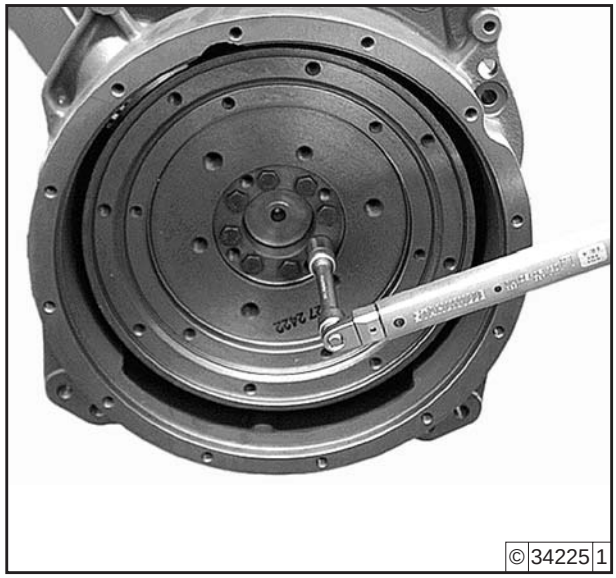
- Mount flywheel using a self-made guide pin (arrow).



- Tighten all screw with angled wrench alternately.

Note
- Use new screws.
- Block flywheel with suitable tool.

12001



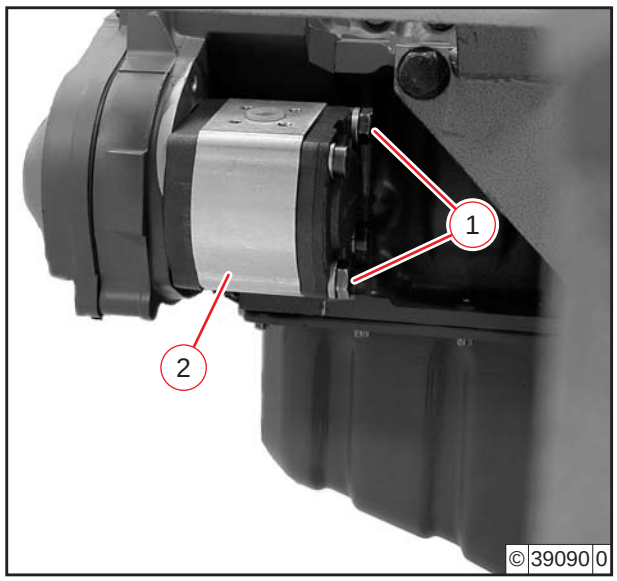
Remove and install hydraulic pump

Tools
- Commercial tools

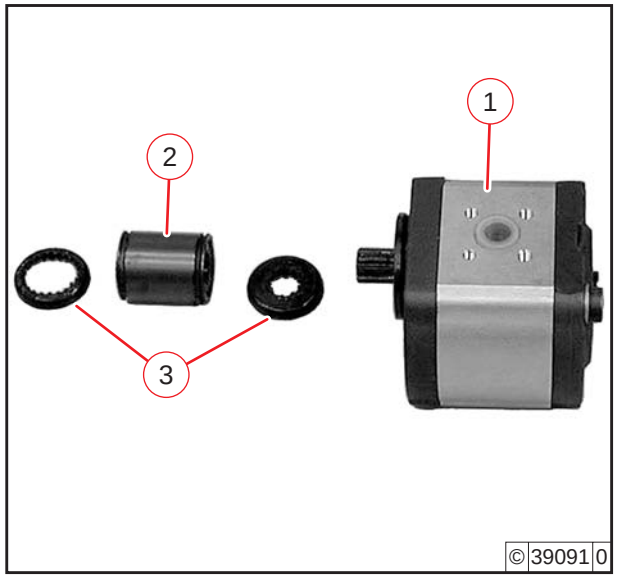
Auxiliary material
- Graphite grease G 500, 20g tube

Remove hydraulic pump

- Unscrew hexagon bolts (1), remove hydraulic pump (2) and coupling sleeve.



- Visually inspect hydraulic pump (1), coupling sleeve (2) and jackets (3) for damage, change if necessary.

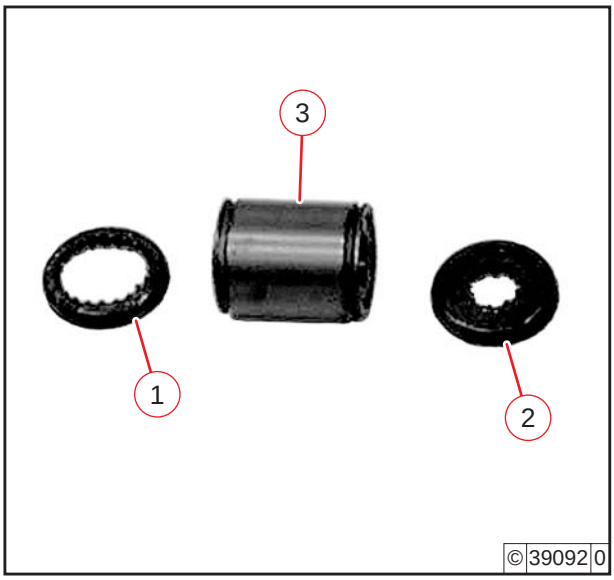


Install hydraulic pump

- Pull jackets (1 and 2) onto coupling sleeve (3).

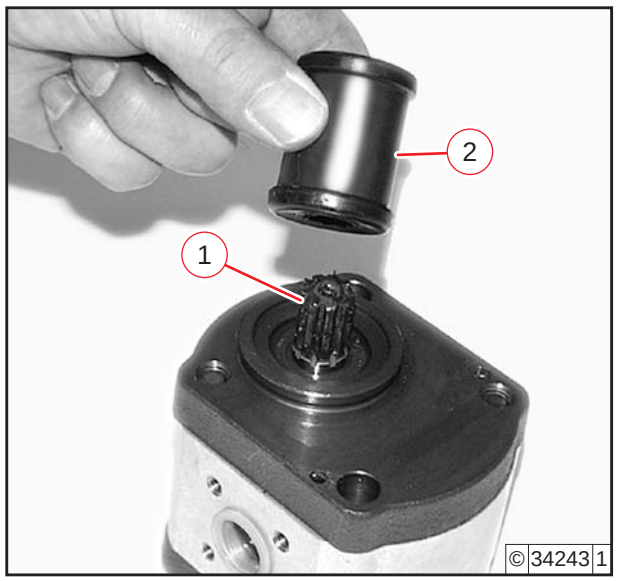
Note
The punch-out of the jackets must be aligned to the teeth of the coupling sleeve.

- Grease the inside teeth of the coupling sleeve with graphite grease **G 500**.



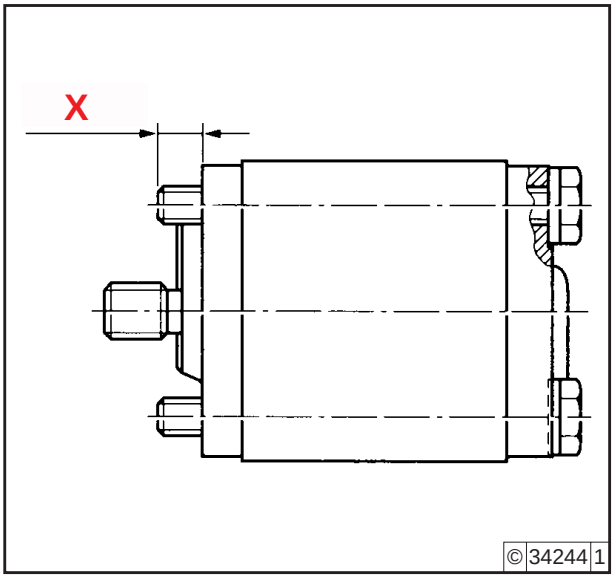
- Grease the toothed shaft with graphite grease **G 500**.
- Plug the coupling sleeve (2) to the toothed shaft.

Note
- Note installation position.
- The teeth of the coupling sleeve must engage the toothed shaft.



- Insert hexagon bolts in the hydraulic pump.
- Check the protrusion of the bolts.

Note
The maximum protrusion ”X” may not be greater than 18 mm, renew bolts if necessary or place additional washers under the bolt head.

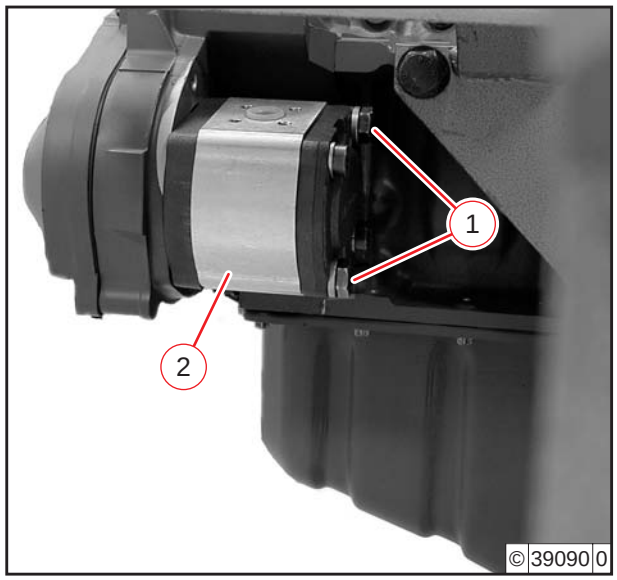


- Grease the toothed shaft of the hydraulic pump drive with graphite grease **G 500**.
- Insert hydraulic pump (2) with coupling sleeve and tighten hexagon bolts (1).

Note

The teeth of the coupling sleeve must engage the hydraulic pump drive.

12051



6

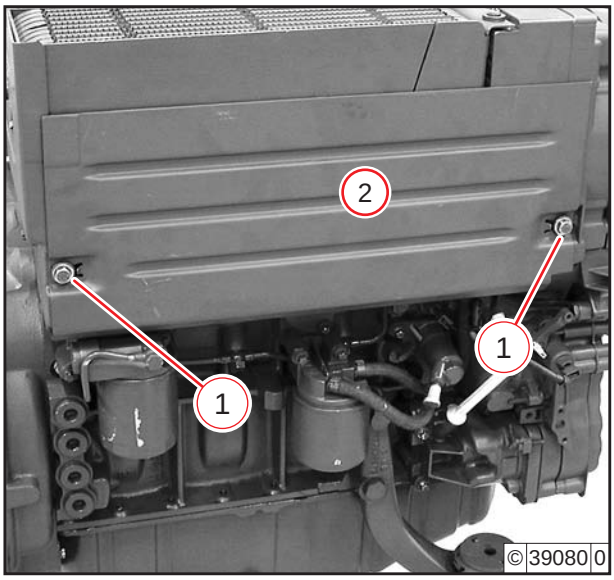
Notes

Remove and install cable harness

Tools
- Commercial tools

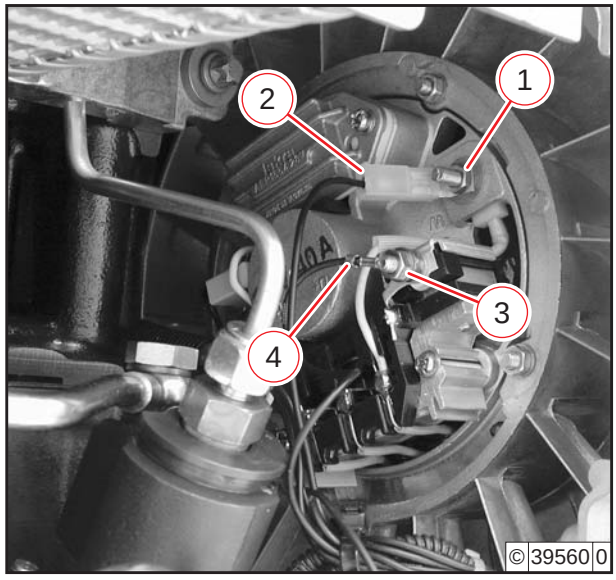
Note
The repair procedure refers to FL, BFL engines.
In FM, BFM engines the repair procedure must be performed accordingly.

- Unscrew screws (1) and remove air duct cover (2).

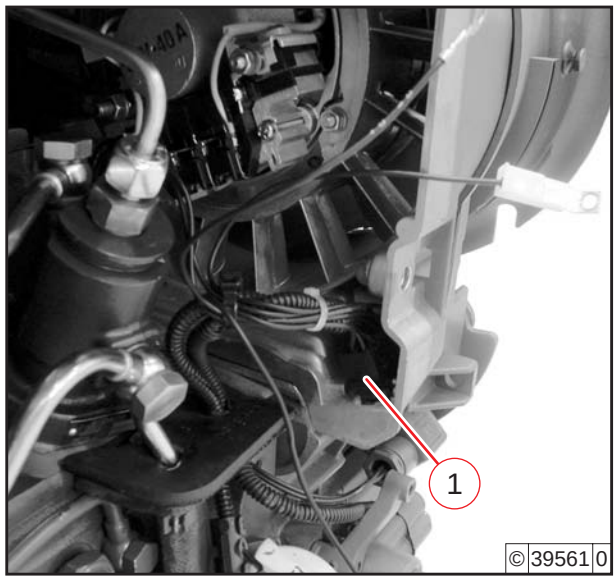


Remove cable harness

- Remove cable from generator.
  Unscrew nut (1) and remove cable ”G1.W” (2).
- Unscrew nut (3) and remove cable ”G1.D+” (4).



- Unclip cable plug (1).



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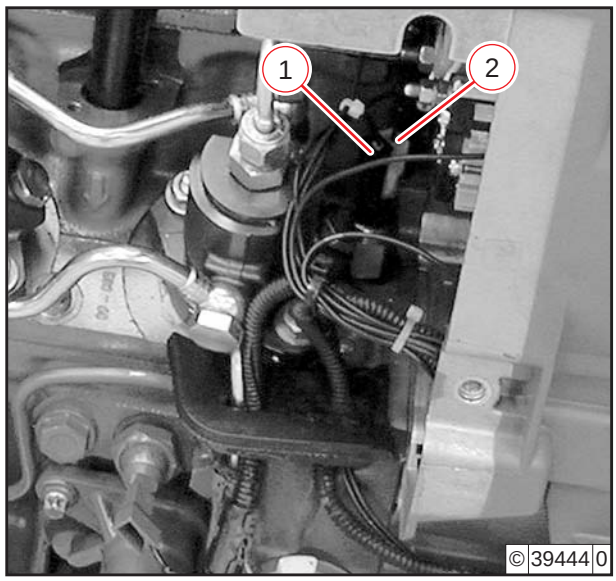
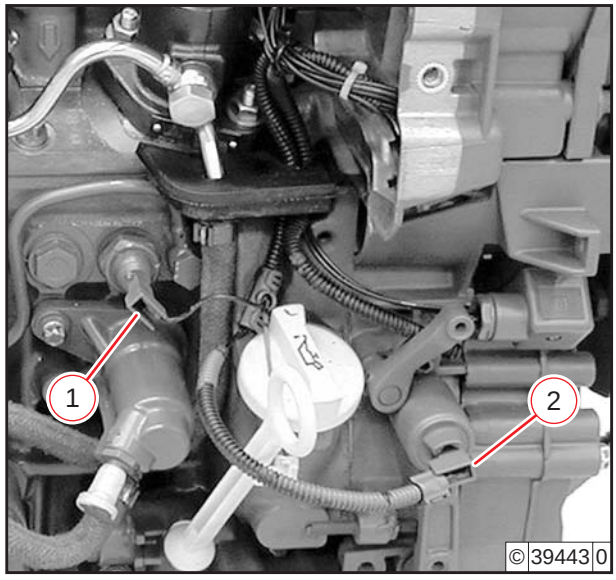
- Pull out cable plug (1), with black housing, with cable "B3.WK" from the oil temperature sensor.
- Pull out the cable plug (2), without housing, with cable ”B3.G” from the oil temperature sensor.



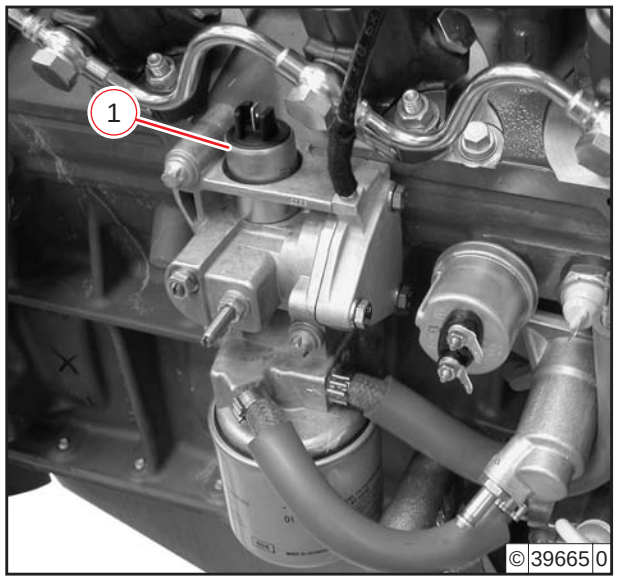
- Pull out the cable plug (1) with cable "F1/B6.WK" from the oil pressure switch.

Note
If available, pull out the cable plug with cable ”F1/B6.WK” and cable plug with cable ”B6.G” from the oil pressure sensor.

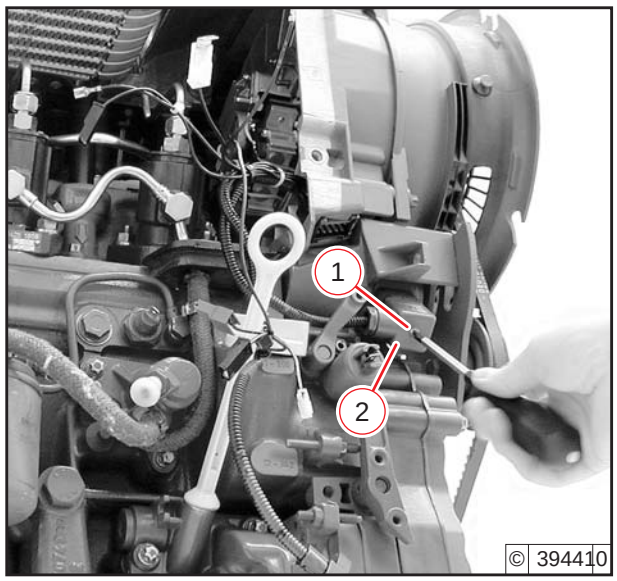
- Pull out the cable plug (2) from the release magnet.



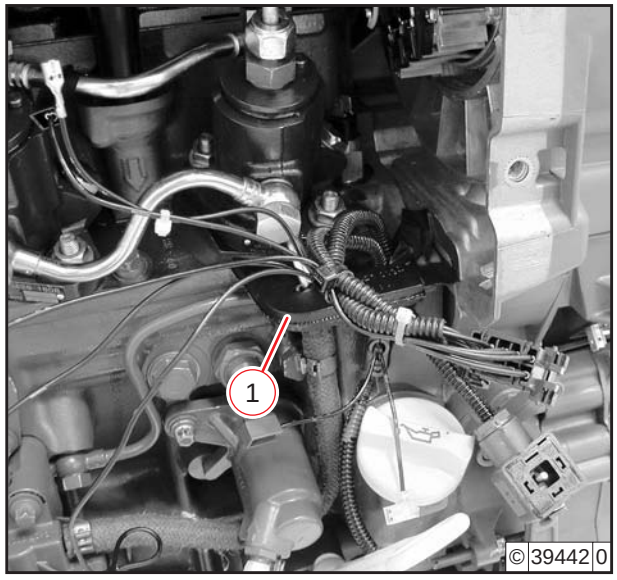
- Pull off cable plug from solenoid valve (1) if available.



- Unscrew screw (1) and remove cable plug (2) from engine shutdown.

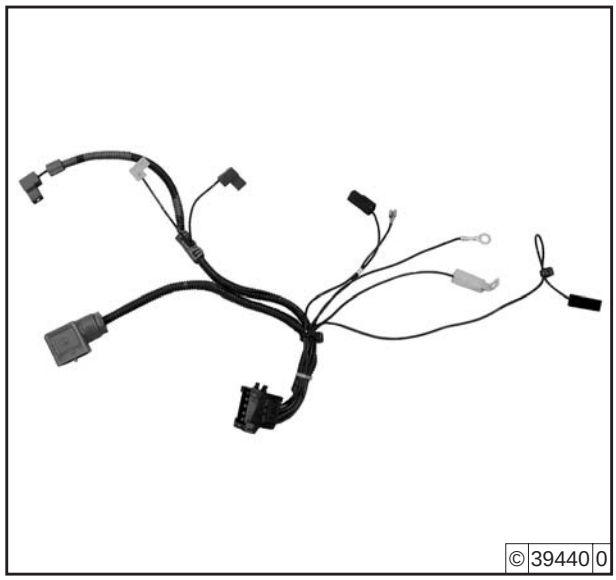


- Pull off profile rubber (1) from the clamping pins and remove the cable harness.



- Visually inspect the cable harness.

Note
The connections to the cable harness depend on the engine requirements.



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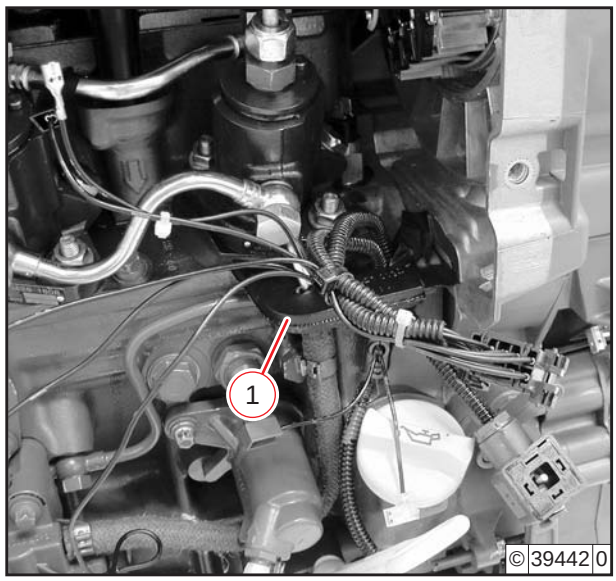
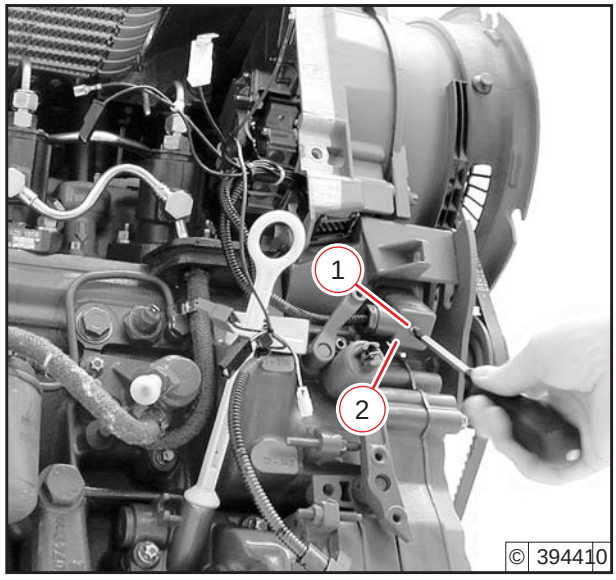
Install cable harness

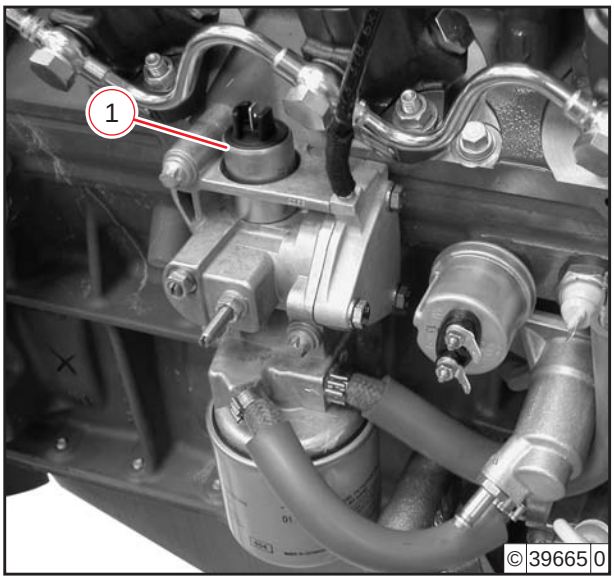
- Insert the cable harness in the profile rubber (1) and plug the profile rubber to the clamping pins.



- Plug the cable plug (2) to the engine shutdown and tighten the screw (1).



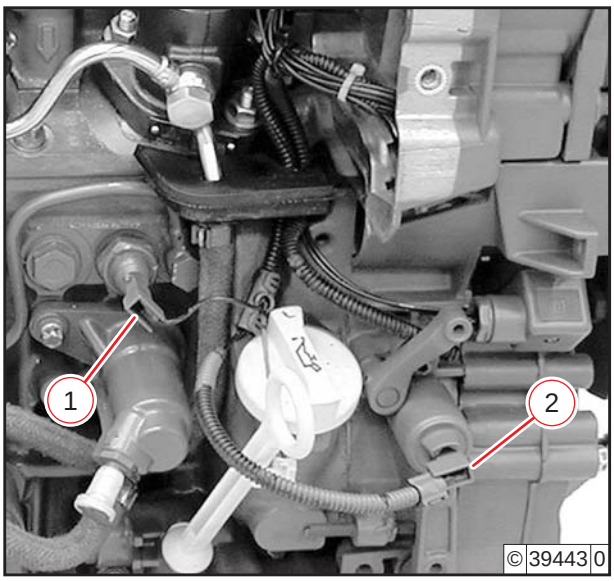
- Plug cable plug to solenoid valve (1) if available.



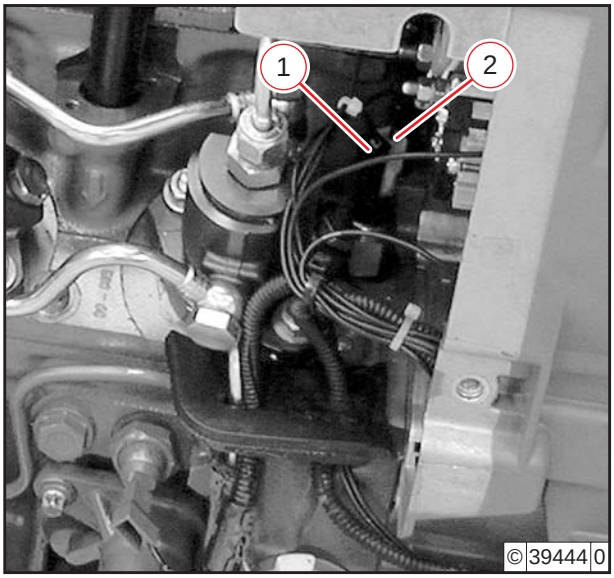
- Plug the cable plug (1) with cable "F1/B6.WK" to the oil pressure switch.

Note
If available, plug the cable plug with cable ”F1/B6.WK” and cable plug with cable ”B6.G” to the oil pressure sensor.

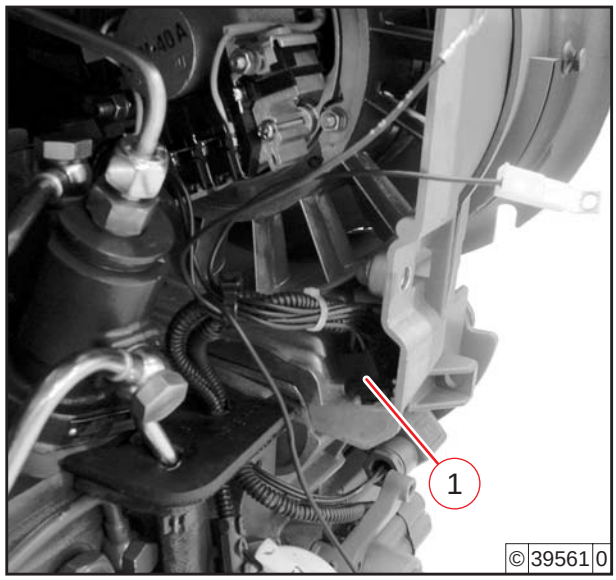
- Plug the cable plug (2) with cable to the release magnet.



- Plug cable plug (1), with black housing, with cable "B3.WK" to the oil temperature sensor.
- Plug the cable plug (2), without housing, with cable ”B3.G” to the oil temperature sensor.



- Clip in cable plug (1).



- Connect cable to generator.
- Attach cable "G1.W" (4) and tighten nut (3)
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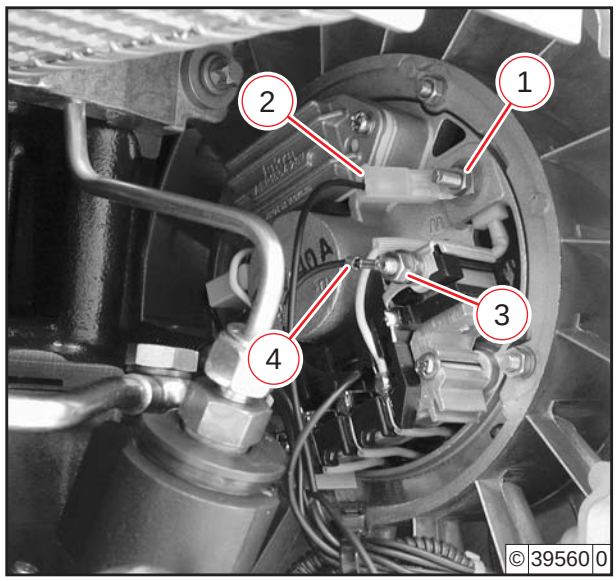
13083

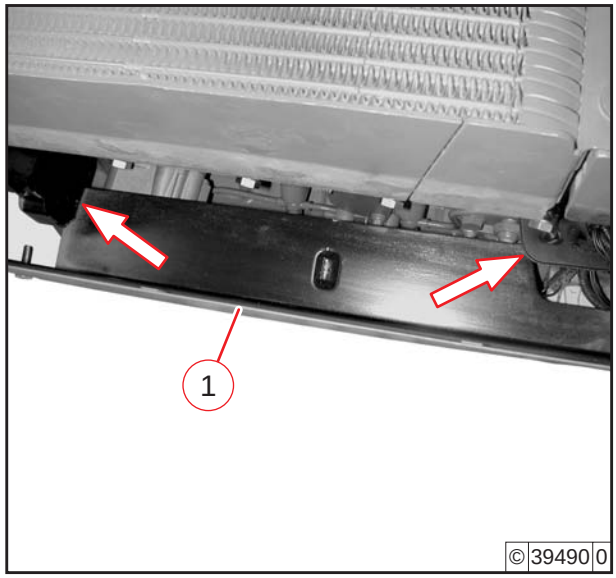
- Attach cable "G1.D+" (2) and tighten nut (1).

13082



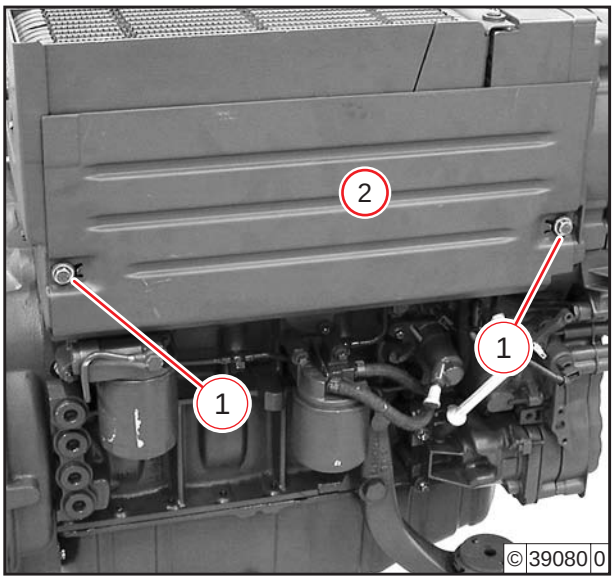
- Mount air duct cover (1).

Note
The air duct cover must be under the stand plate and the profile rubber (arrows).



- Fix air duct cover (2).
  Tighten screws (1).

09087



6

Notes

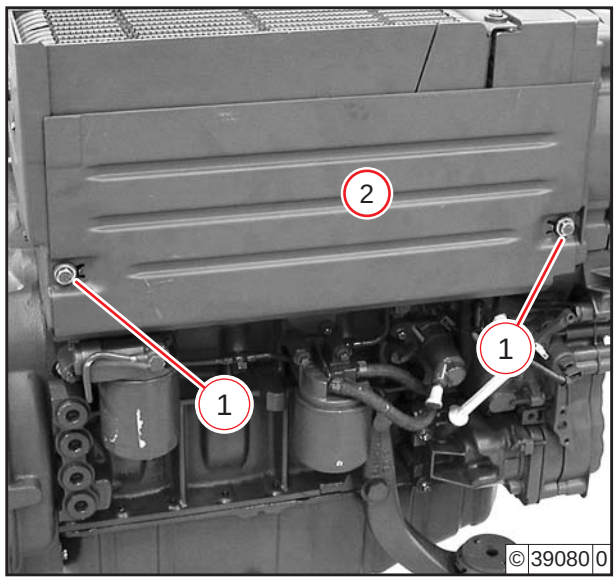
Remove and install generator (in FL and BFL engines)

Tools
- Commercial tools
8189 - Torx tool kit

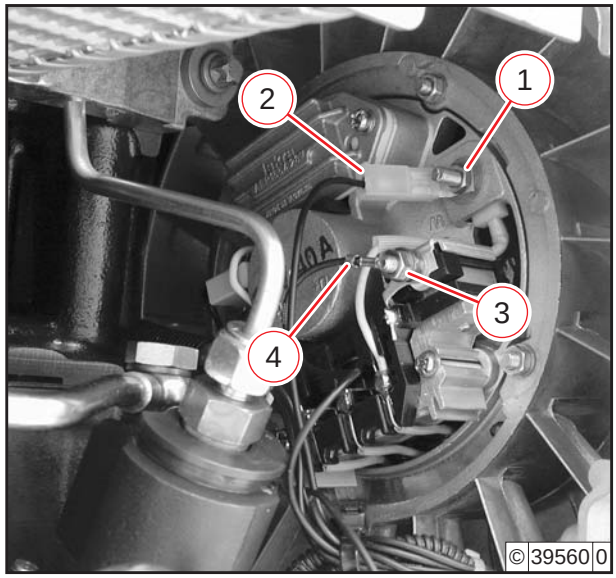
References
- W 12-02-01

Remove generator

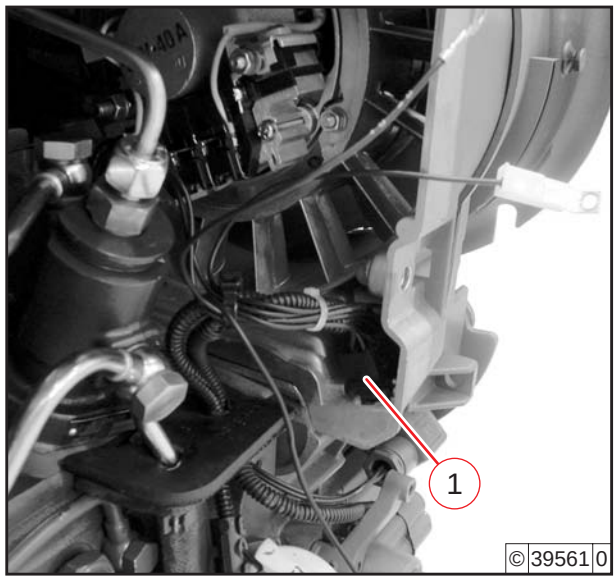
- Remove V-belt
  ➔ Job card **W 12-02-01**.
- Unscrew screws (1) and remove air duct cover (2).



- Remove cable from generator.
  Unscrew nut (1) and remove cable ”G1.W” (2).
- Unscrew nut (3) and remove cable ”G1.D+” (4).



- Unclip cable plug (1).



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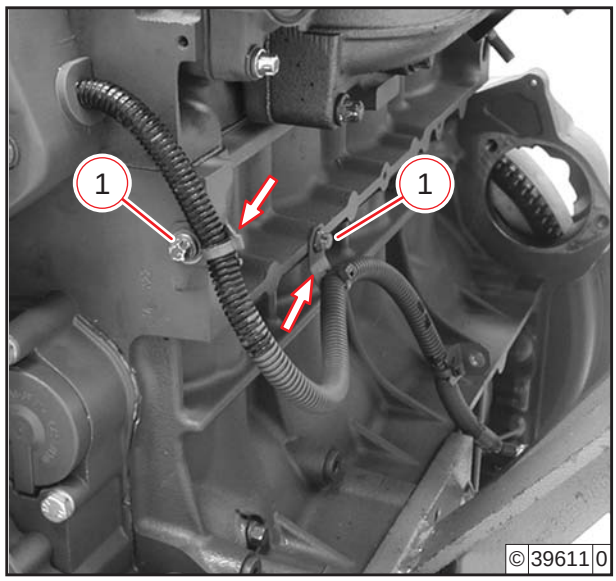
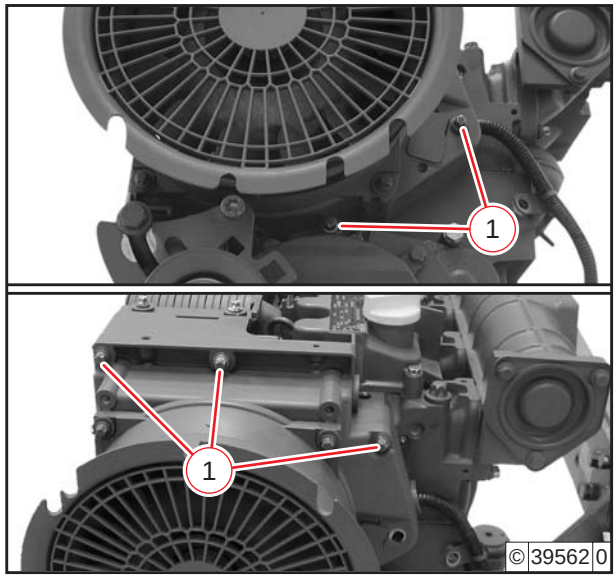
- Unscrew screws (1) and remove cable holders (arrows).

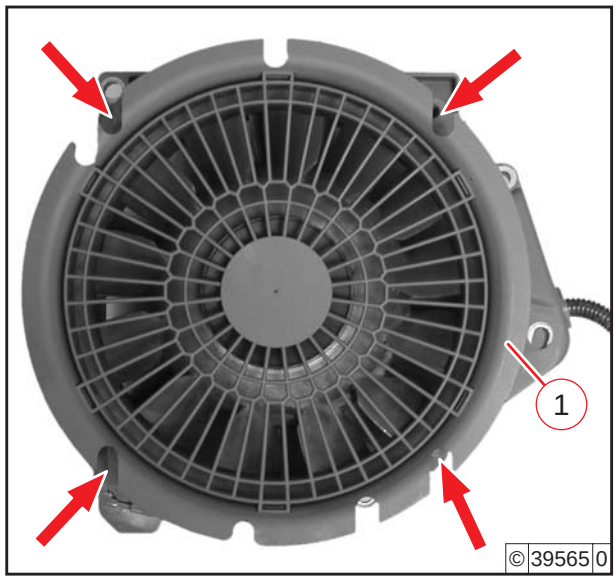


- Unscrew screws (1) and remove cooler blower with generator.



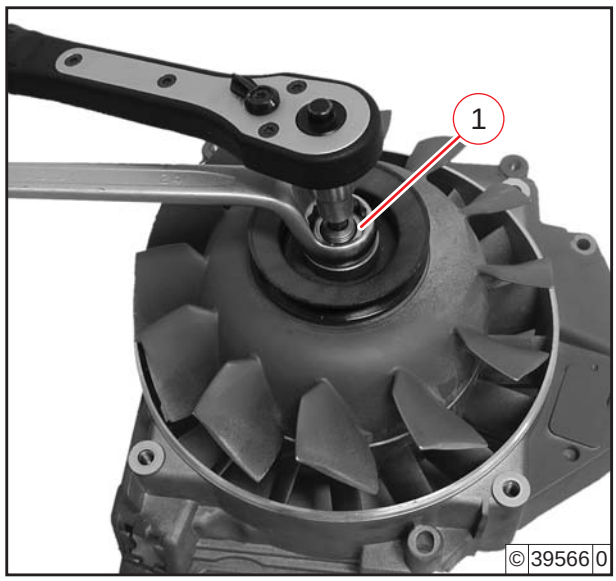
Remove generator from cooling blower

- Unscrew screws (arrows) and remove blower jacket inlet (1).

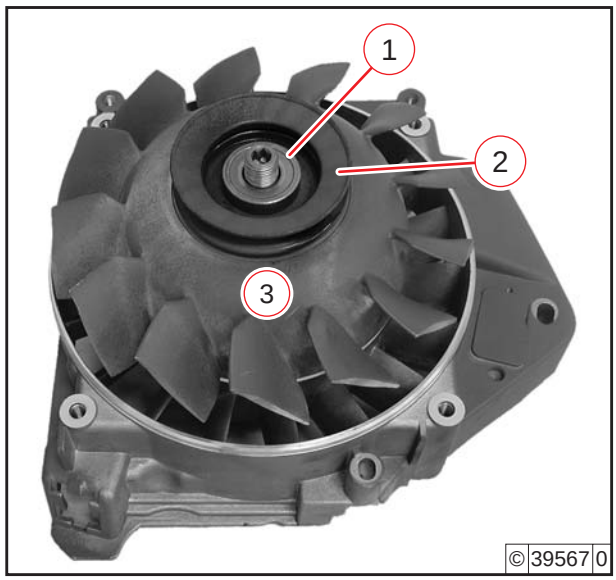


- Unscrew nut (1).

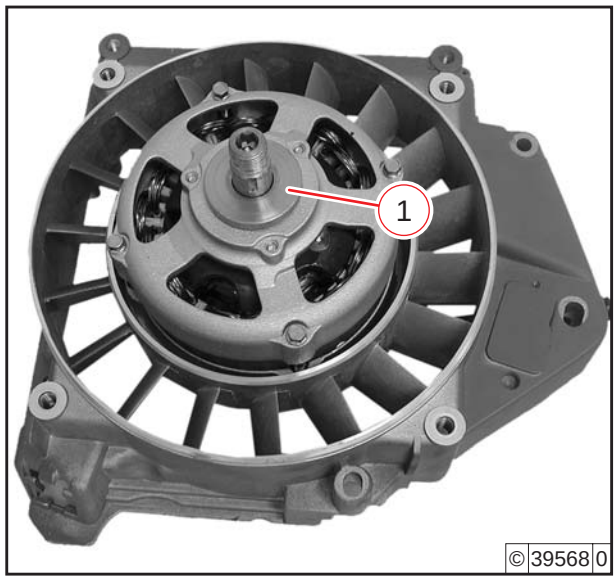
Note
Hold shaft.



- Remove disc (1), V-belt pulley (2) and running wheel (3).

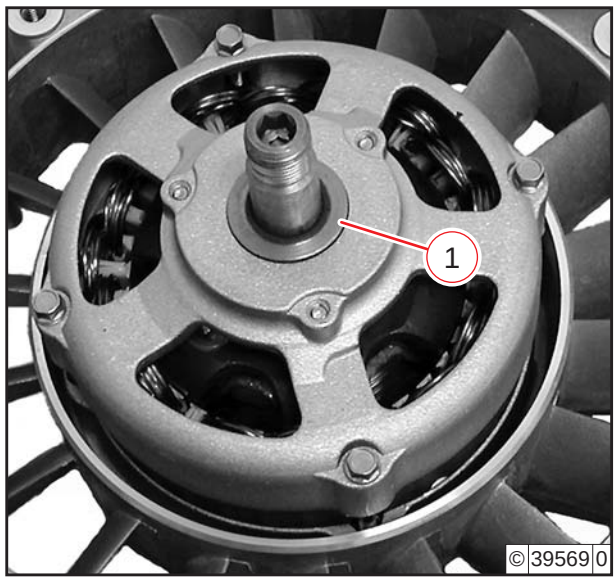


- Remove spacer disc (1).

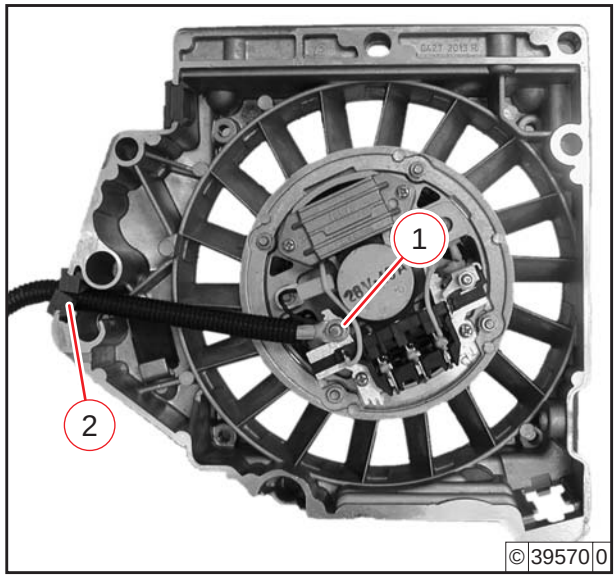


6

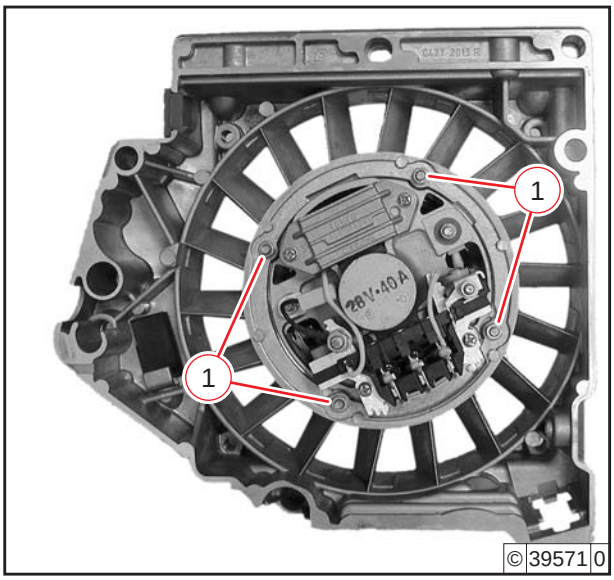
- Remove guide disc (1).



- Unscrew nut (2) and press out rubber muff (1).



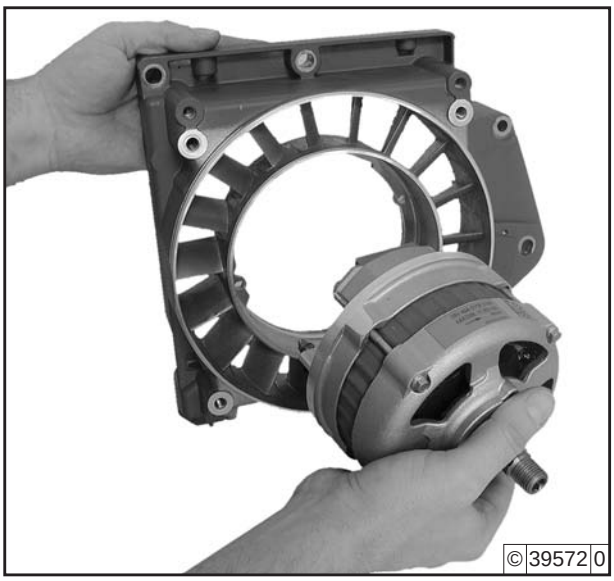
- Unscrew nuts (1) and press out generator.
- Visually inspect components and renew if necessary.



Install generator in cooling blower

- Insert generator and press in to stop.

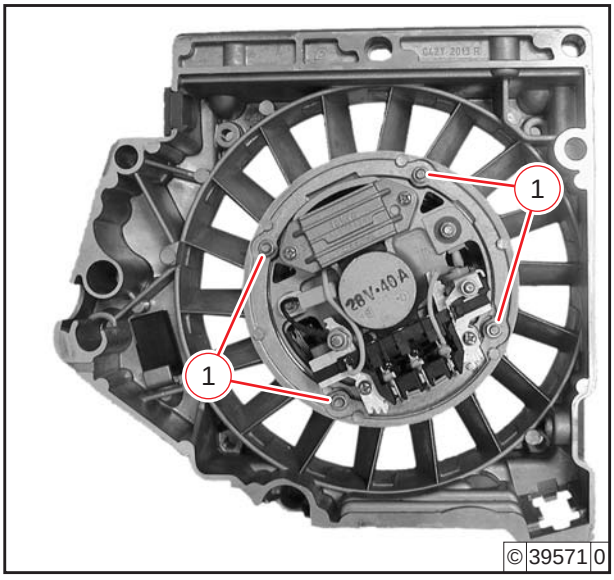
Note
Note installation position of the generator.



- Mount washers and tighten nuts (1) alternately.

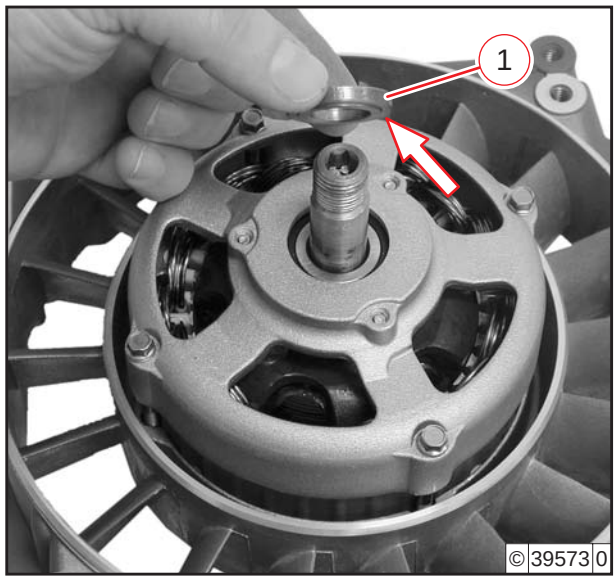
Note
Check the installation position again.

09065



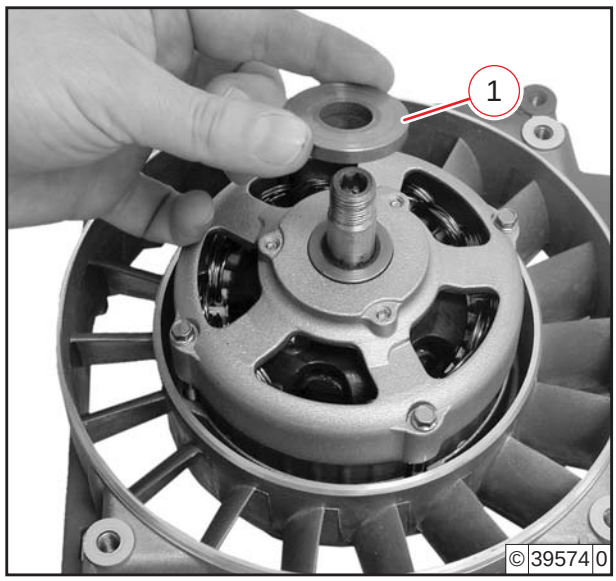
- Mount guide disc (1).

Note
The stepped side (arrow) must face the generator.



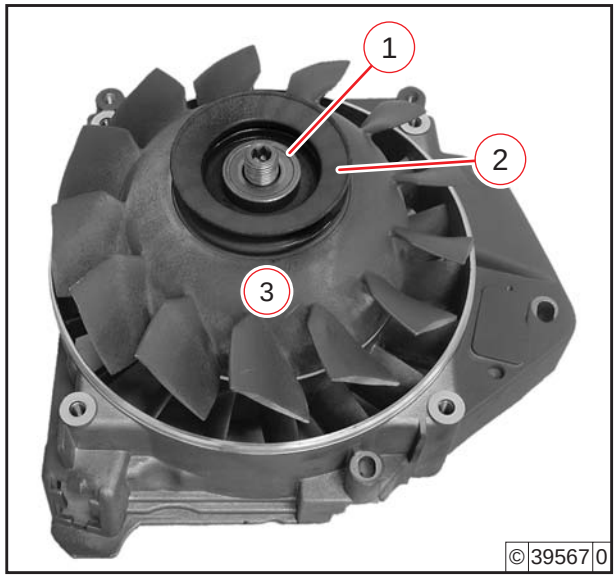
6

- Mount spacer disc (1).



- Mount running wheel (3), V-belt pulley (2) and disc.

Note
Note installation position.



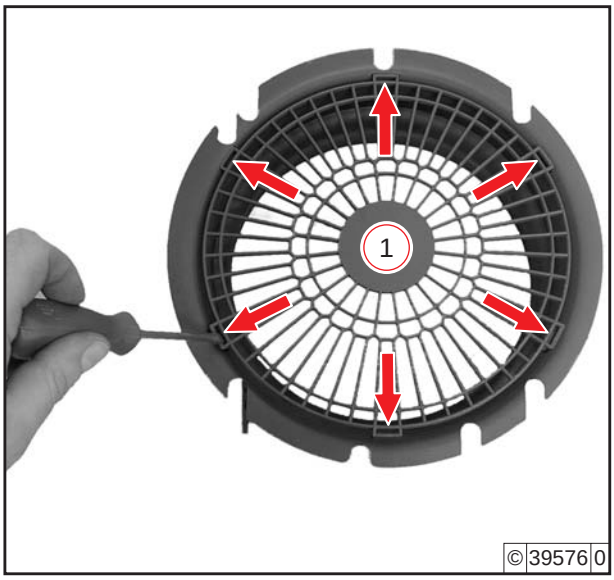
- Tighten nut.

13021

Check gap dimension

- Press out the protective grille (1) carefully from the blower jacket inlet at the fastening points (arrows).

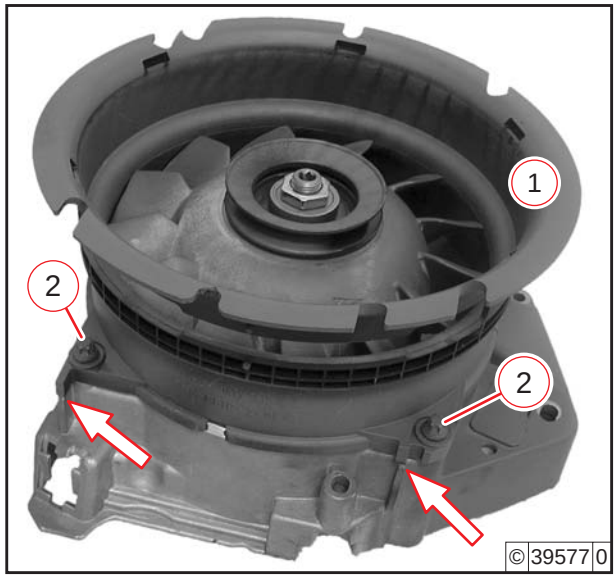
Note
Do not damage the protective grille!



- Mount blower jacket inlet (1) and tighten screws (2).

Note
Note the installation position, the gates (arrows) must be in line.

09067



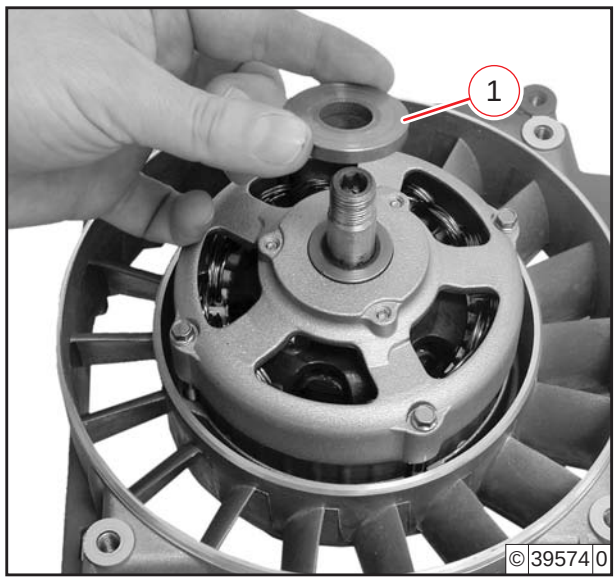
- Measure the gap dimension with a feeler gauge between the running wheel and the blower jacket inlet.

09 91

6

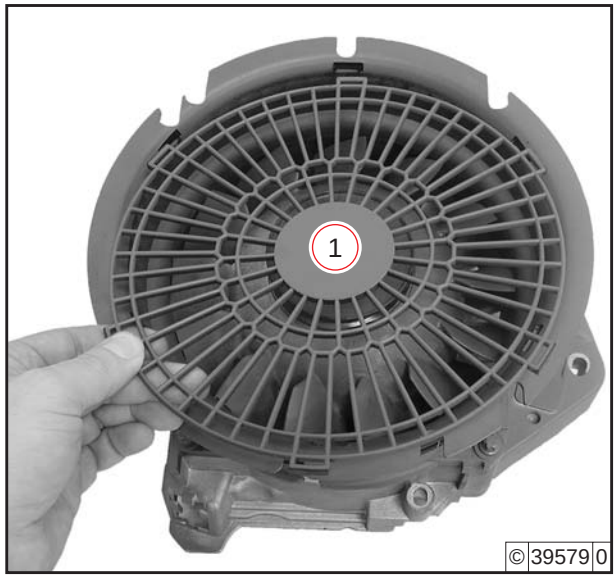
- Compensate gap dimension with the appropriate spacer disc (1).

Note
Spacer discs of 5 to 7 mm are available.



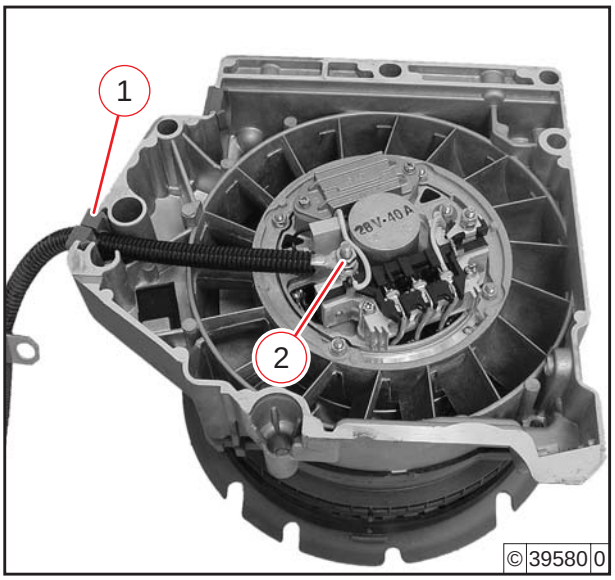
- Press the protective grille (1) carefully into the blower jacket inlet.

Note
Observe the fastening points.



- Insert rubber muff (1) and tighten nut (2).

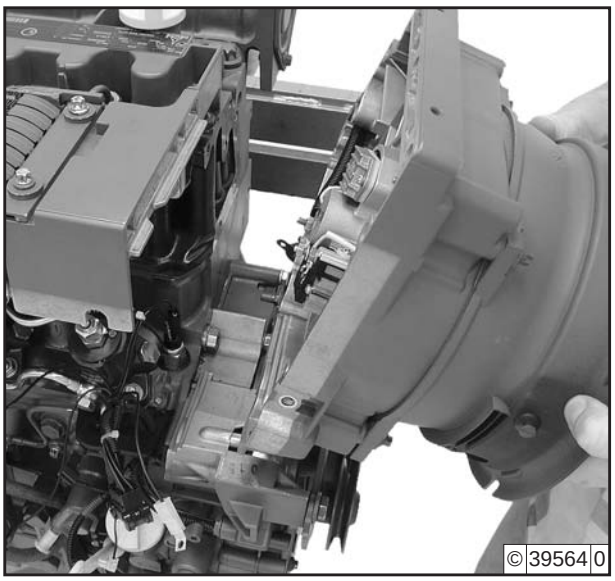
13081



Install generator

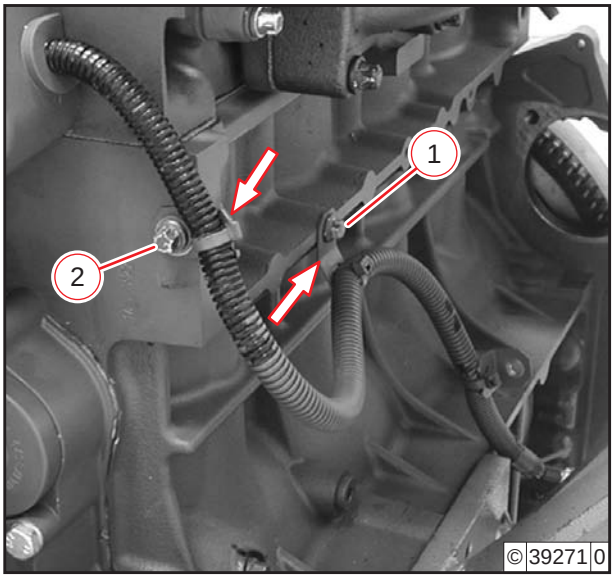
- Mount cooler blower with generator and tighten screws.

09066



- Position cable holders (arrows) and tighten screws.

Note
Note different screw length:
Screw M6 x 12 mm (1)
Screw M8 x 20 mm (2)



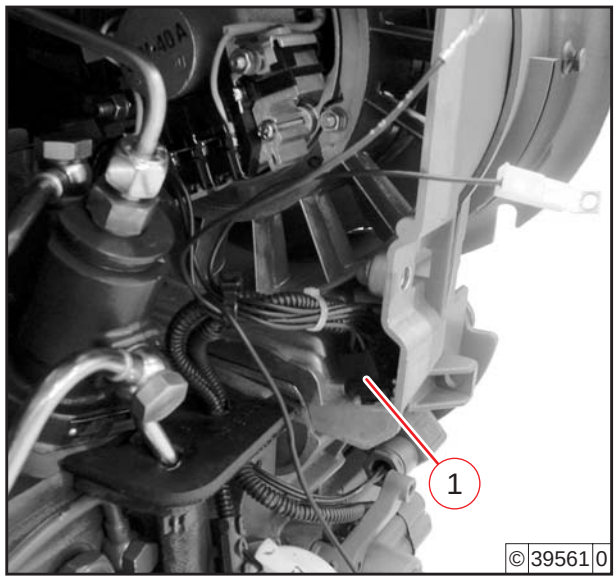
- Tighten screw (1).

13092

- Tighten screw (2).

13092

- Clip in cable plug (1).

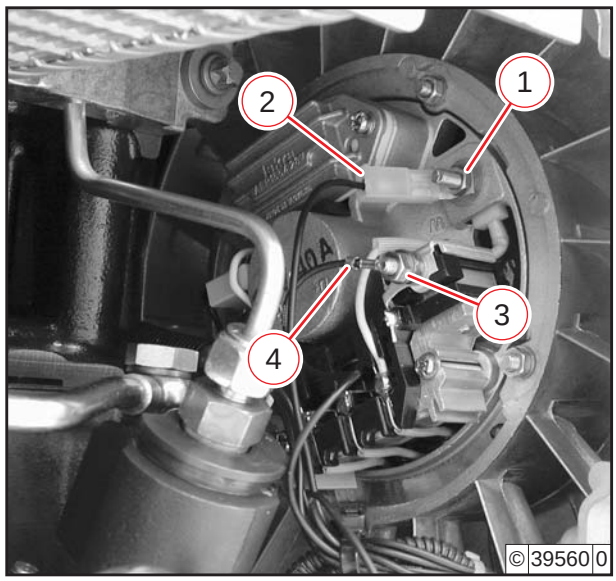


- Plug cable to generator.
  Attach cable "G1.D+" (4) and tighten nut (3).

13082

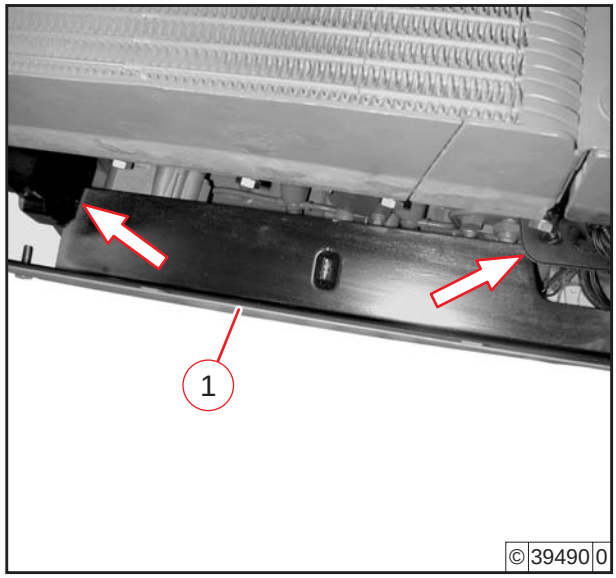
- Attach cable "G1.W" (2) and tighten nut (1).

13083



- Mount air duct cover (1).

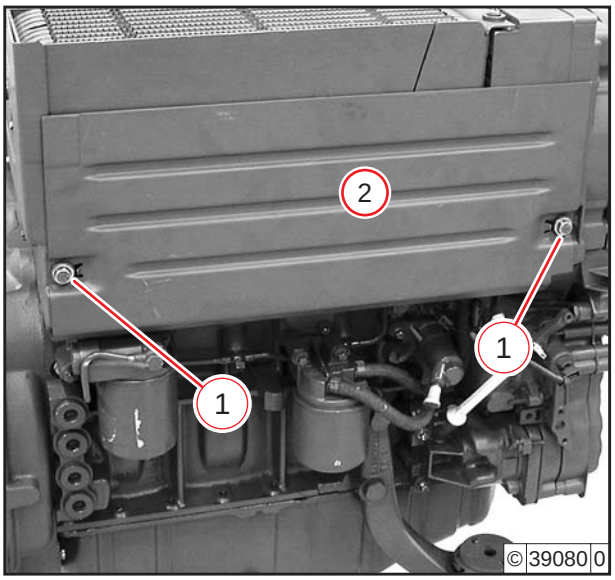
Note
The air duct cover must be under the stand plate and the profile rubber (arrows).



- Fix air duct cover (2).
  Tighten screws (1).

09087

- Install V-belt.
  ➔ Job card **W 12-02-01**.



6

Notes

Remove and install generator and holder (in FM, BFM engines)

Tools
- Commercial tools
8189 - Torx tool kit

References
- W 12-02-01

Note
One variant has been described. The procedure is the same accordingly for other variants.

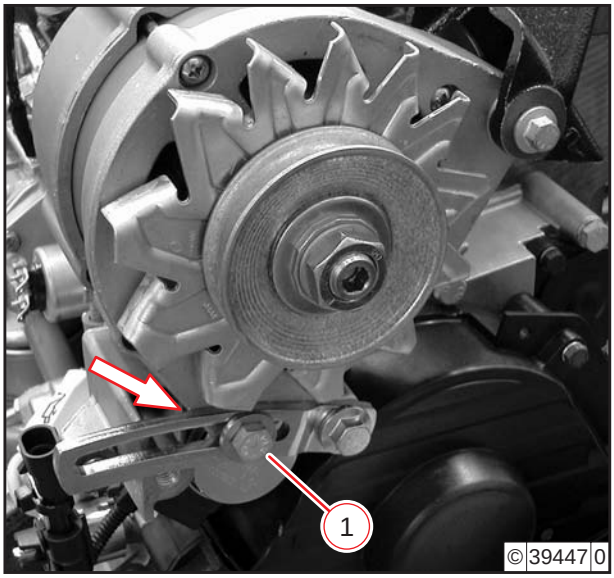
Remove generator

- Remove cable from generator if available.

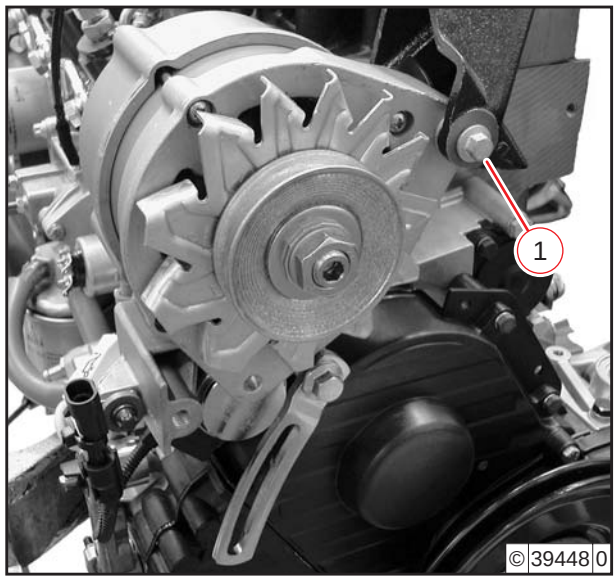
Item	(1)	D+
Item	(2)	B+
Item	(3)	W

- Remove V-belt
  ➔ Job card **W 12-02-01**.

- Unscrew nut (arrow), remove screw (1) and washers.

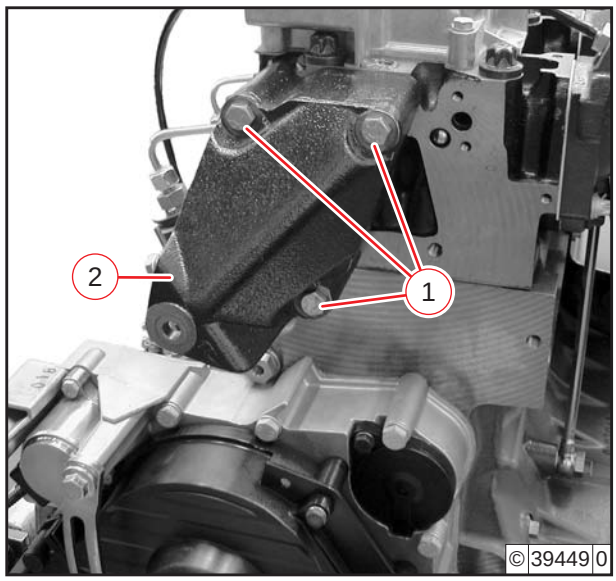


- Unscrew screw (1) and remove generator.

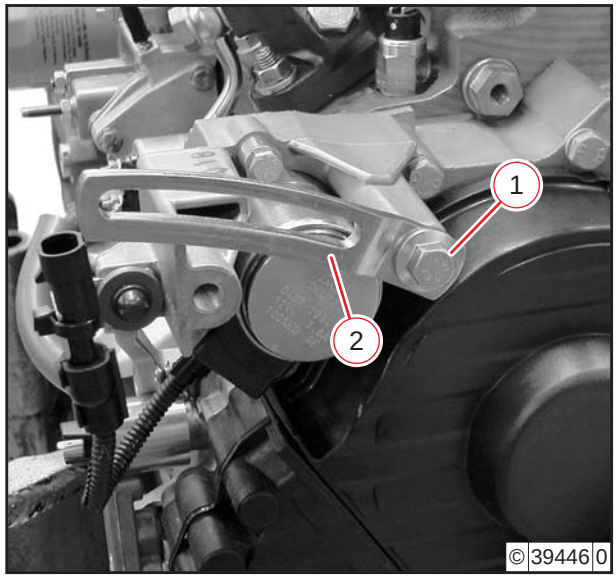


6

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



- Unscrew screw (1) and remove clamping bracket (2).
- Check components for visible signs of damage.

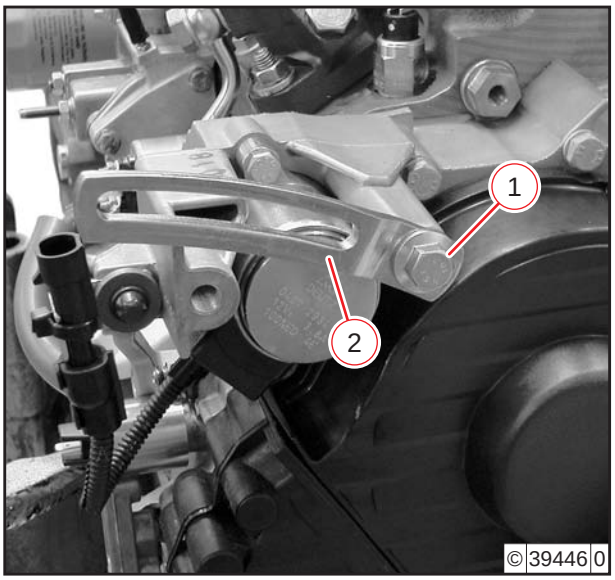


Install generator

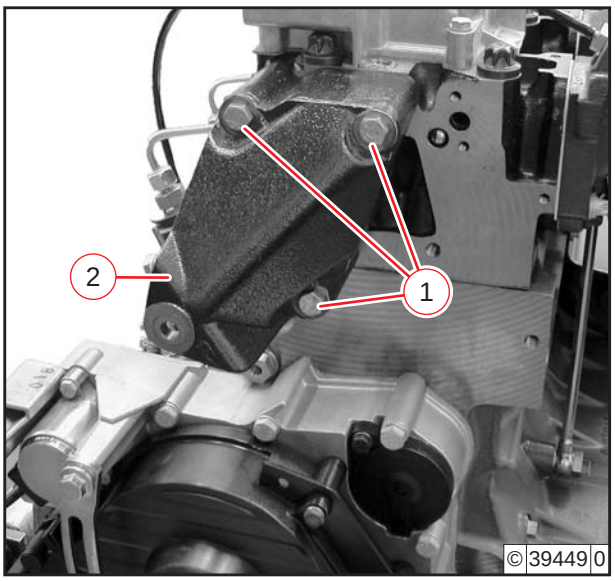
- Mount clamping bracket (2) and tighten screw (1).

Note

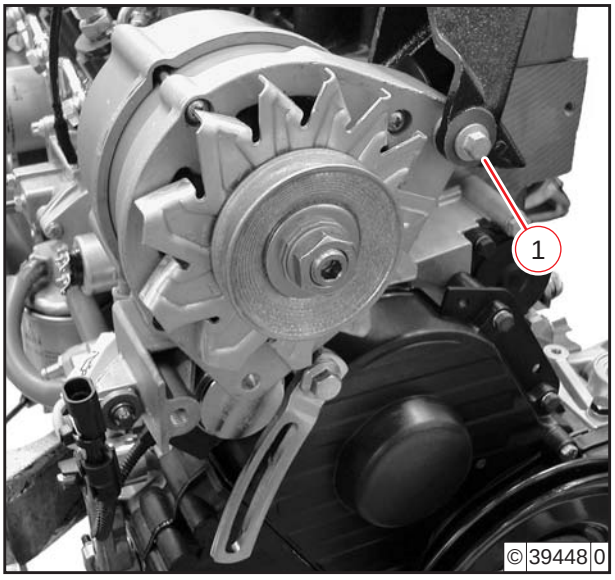
Note installation position of the clamping bracket.



- Mount console (2) and tighten screws (1).

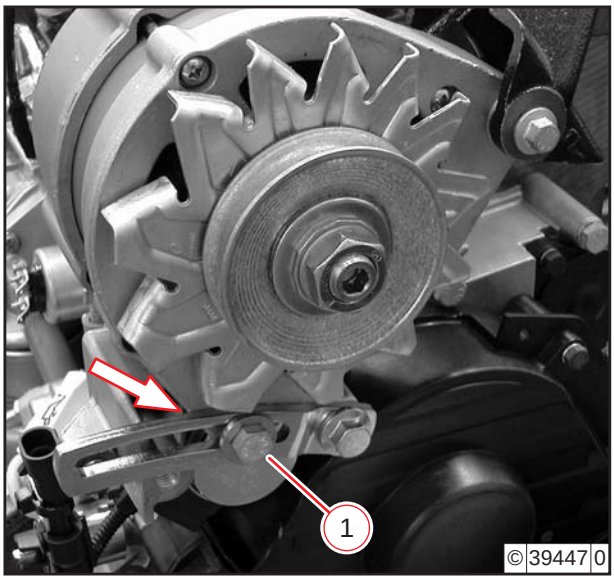


- Insert generator and tighten screw (1).



6

- Insert screw (1) and washers, tighten nut (arrow).
- Install V-belt.
  ➔ Job card **W 12-02-01**.



6

- Plug cable into generator if available.

Item	(1)	D+
Item	(2)	B+
Item	(3)	W

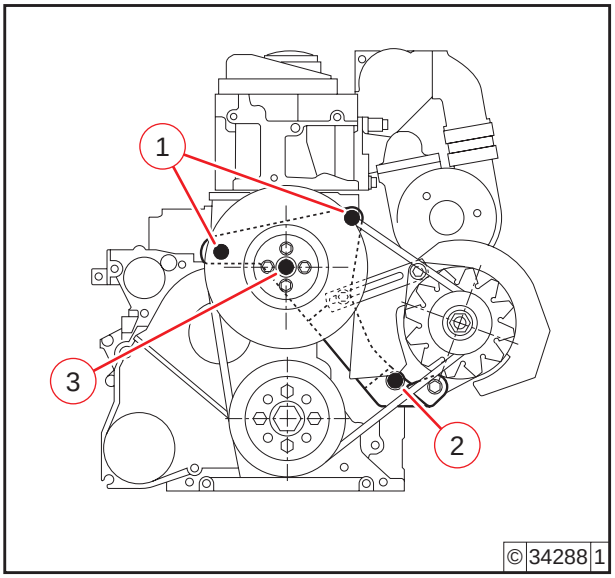
Console fastening with built-up fan drive (unit design)

- Tighten screws (1 and 2).

13010

- Tighten screw (3).

13022



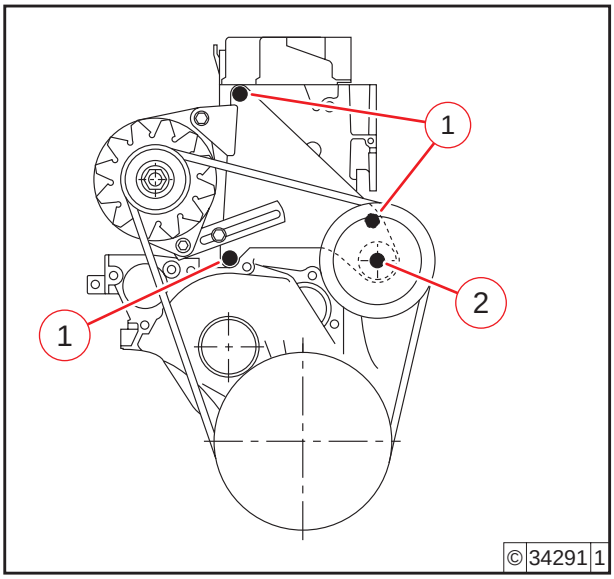
Console fastening with built-up fan drive (building machine design)

- Tighten screws (1).

13010

- Tighten screw (2).

13022



6

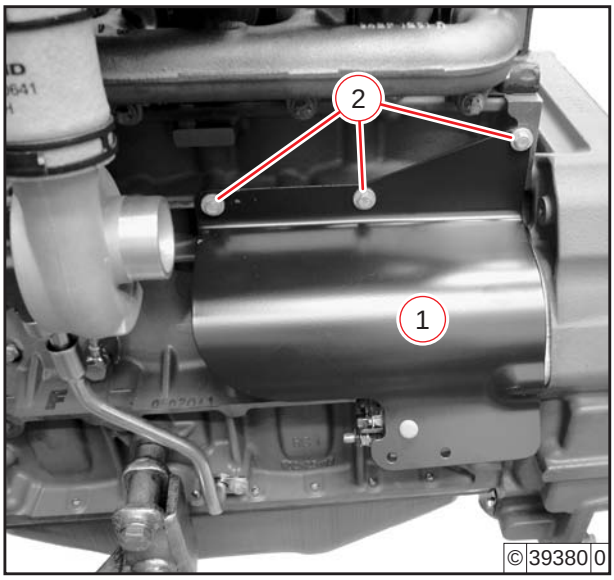
Notes

Remove and install starter

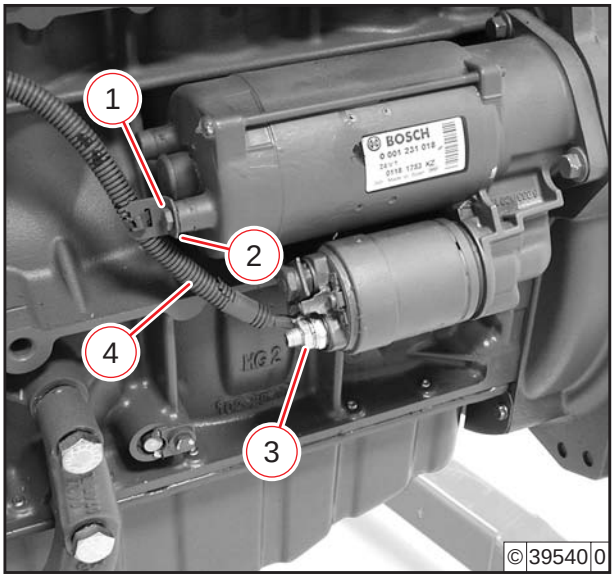
Tools
- Commercial tools

Remove starter

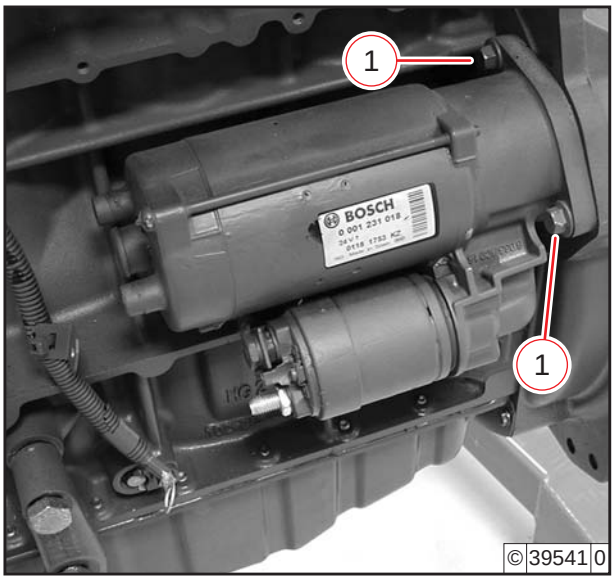
- If available, remove the heat shield (1). Unscrew screws (2).



- Unscrew screw (1) and remove cable holder (2).
- Unscrew nut (3) and remove charging current cable (4).



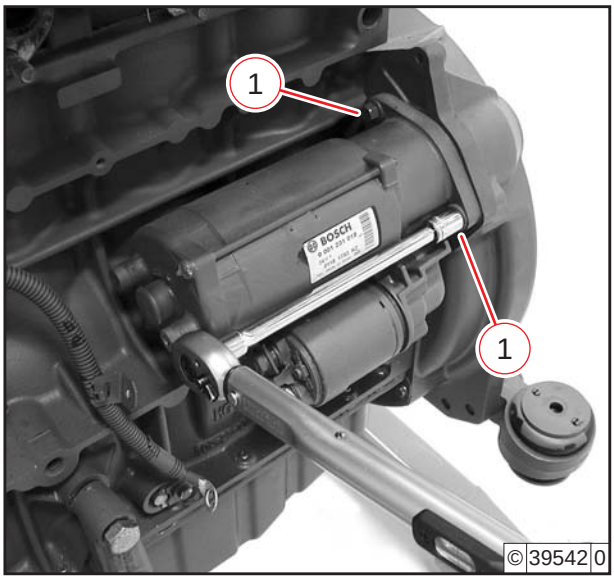
- Unscrew screws (1) and remove starter.



6

- Insert starter and tighten screws (1).

13001

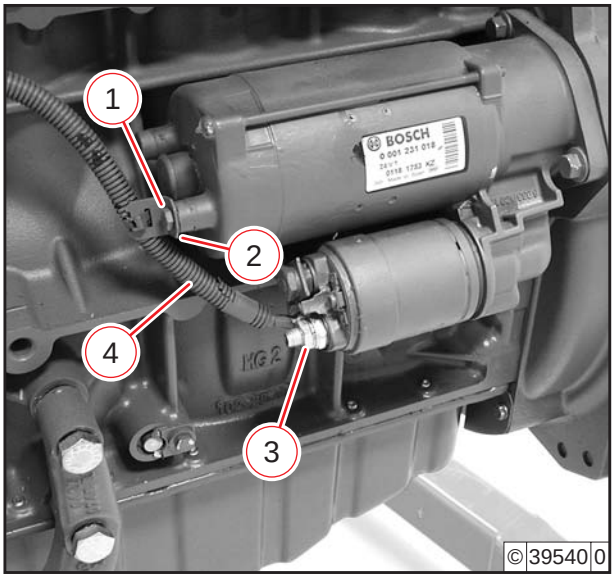


- Connect charging current cable (4) and tighten nut (3).

13071

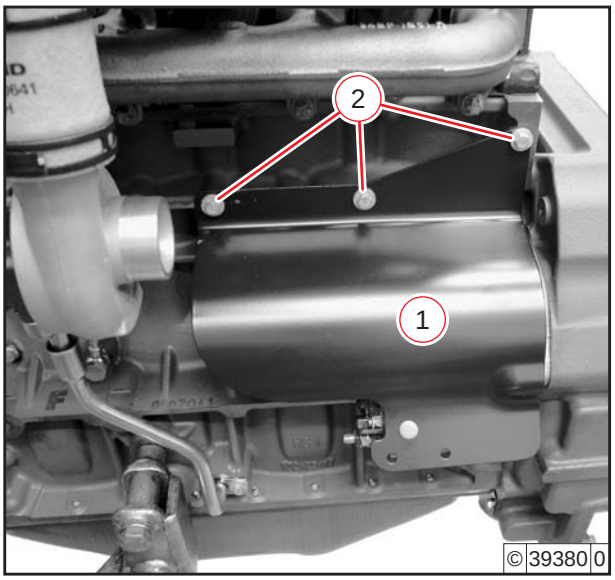
- Position cable holder (2) and tighten screw (1).

13092



- If available, install the heat shield (1).
  Tighten screws (2).

13009



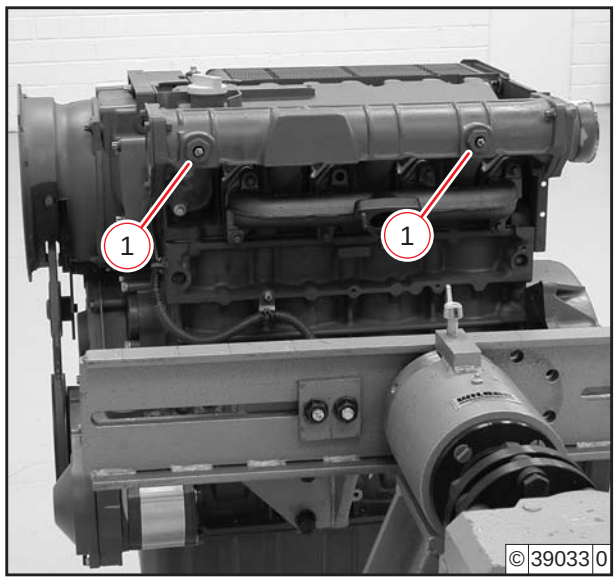
Notes

Remove and install helical heater plug

Tools
- Commercial tools

Remove helical heater plugs

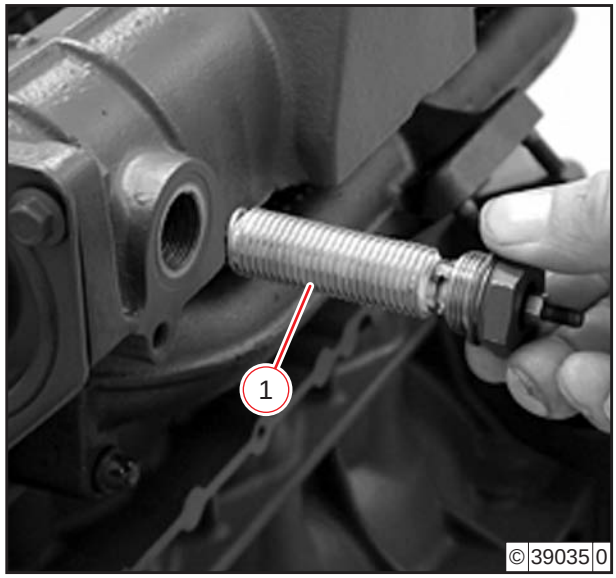
- Unscrew helical heater plugs (1) and remove sealing rings.
- Check components for visible signs of damage.



Install helical heater plugs

- Tighten helical heater plug (1) with new CU sealing ring.

13031



Notes

7 Commercial tools

Please send all tool orders directly to:

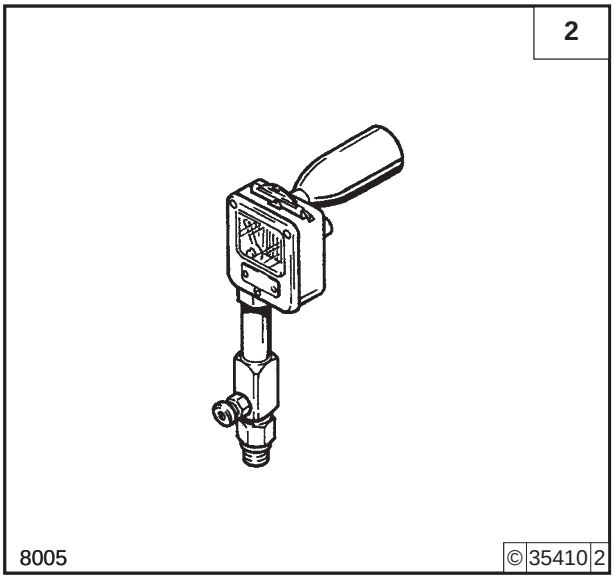
WILBÄR
Wilhelm Bäcker GmbH & Co. KG
Postfach 14 05 80
D -42826 Remscheid
Tel. : +49 (0) 2191 - 9339-0
Fax : +49 (0) 2191 - 9339-200

E-mail: info@wilbaer.de
Web: http://www.deutz-tools.com

Notes

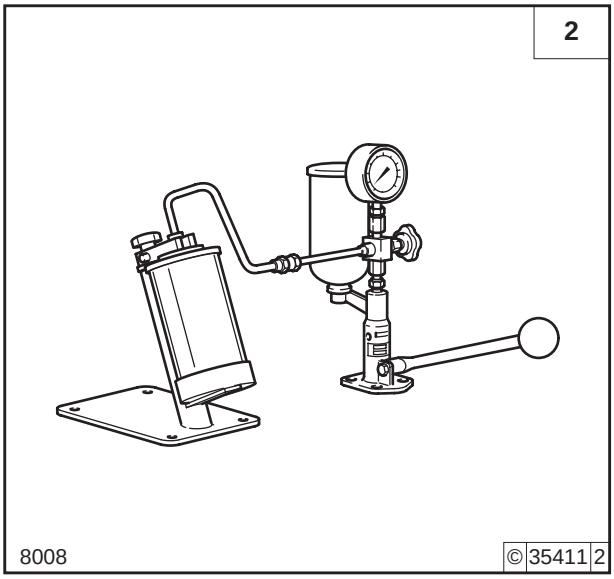
8005 - **Compression tester**

for diesel engines 10-40 bar
Set



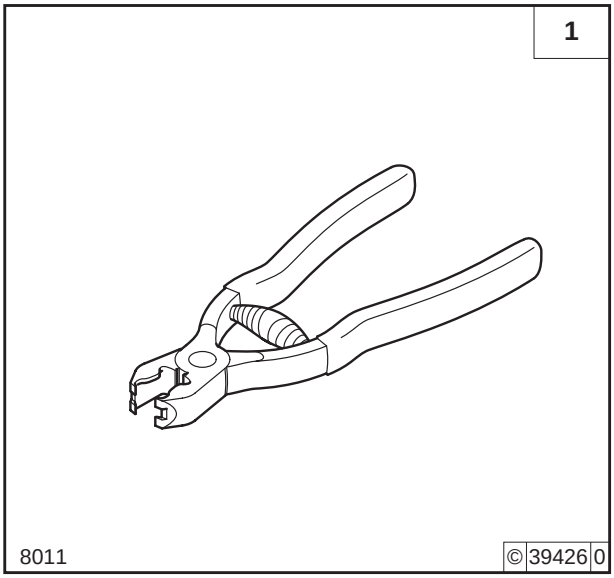
8008 - **Nozzle tester**

with spray mist collector



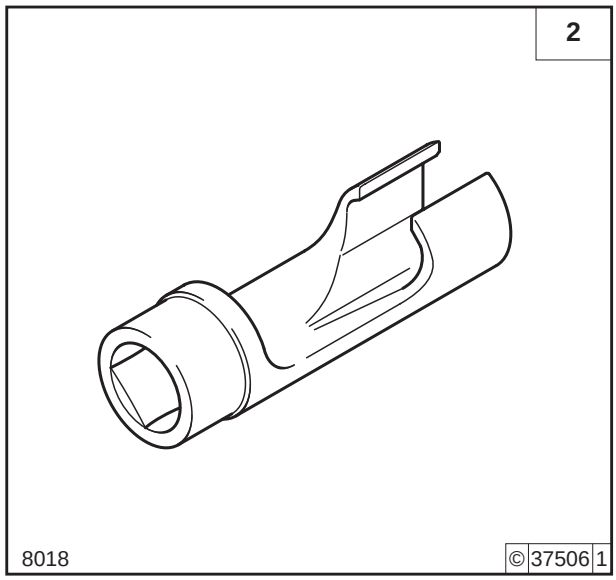
8011 - **Clamping pliers**

for leak fuel lines



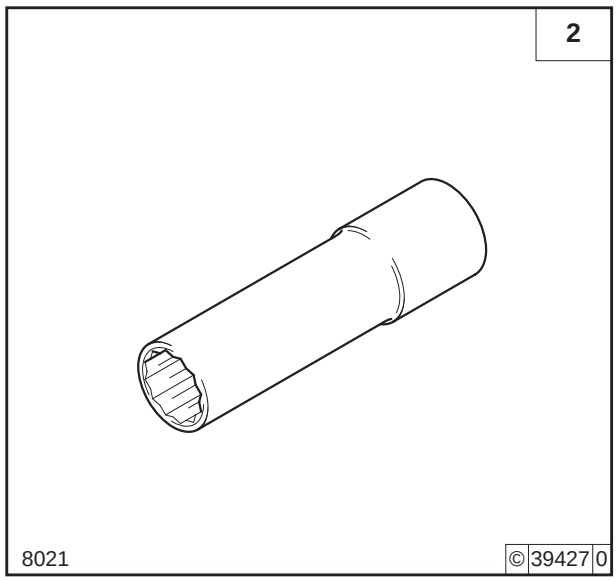
8018 - **Claw wrench**

Size 17 for union nuts of the injection lines, reinforced



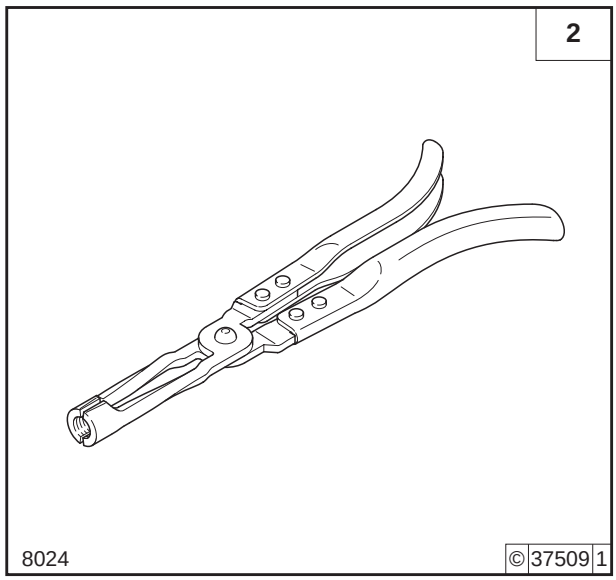
8021 - **Socket size 15**

long, hexagonal ½, for union nut injection valve



8024 - **Assembly pliers**

for valve shaft sealing, for removing the valve shaft seal

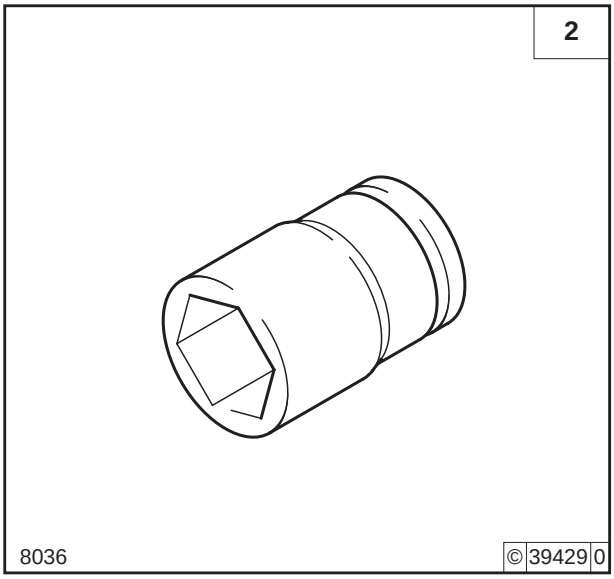


8027 - **Pliers insert**

for solenoid valve

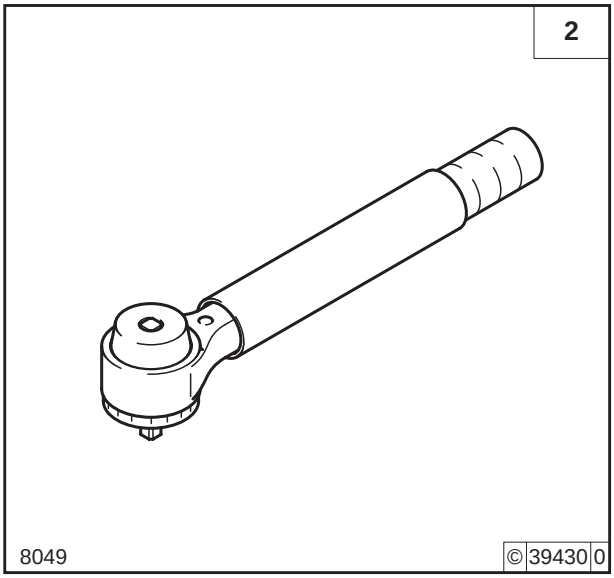
8036 - **Socket**

size 32, set with 8049



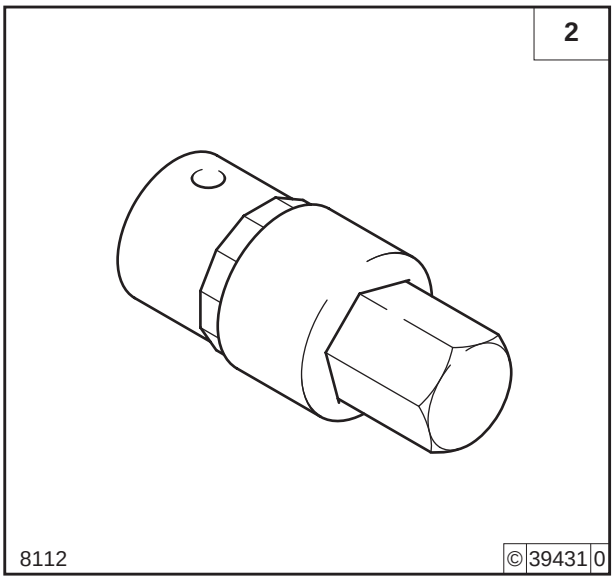
8049 - **Force multiplier**

for center screw on the crankshaft, set with 8036



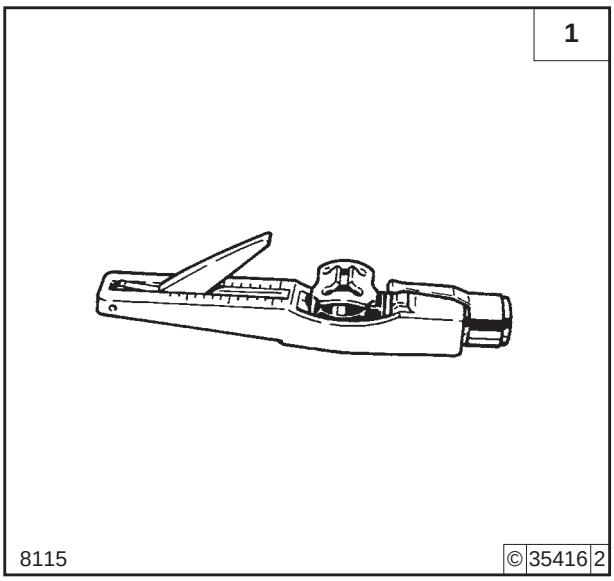
8112 - **Insert**

for screwdriver, 1/2" size 17

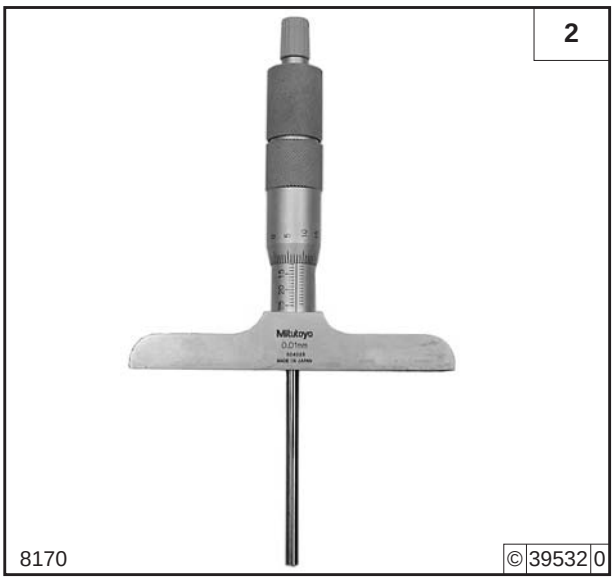


8115 - **V-belt pulley tension measuring appliance**

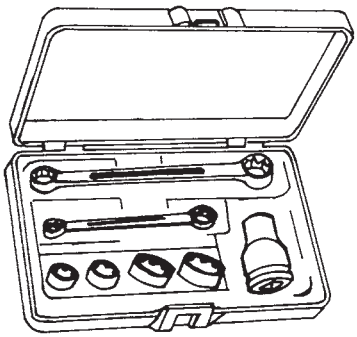
150 to 600 N, test the V-belt pulley tension



8170 - **Depth measuring appliance**

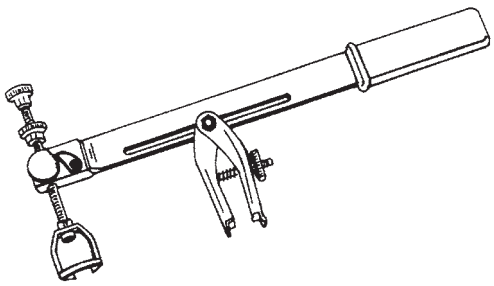


8189 - **Torx tool kit**



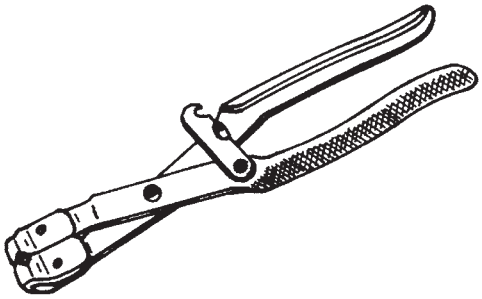
9017 - **Assembly lever**

for valve spring



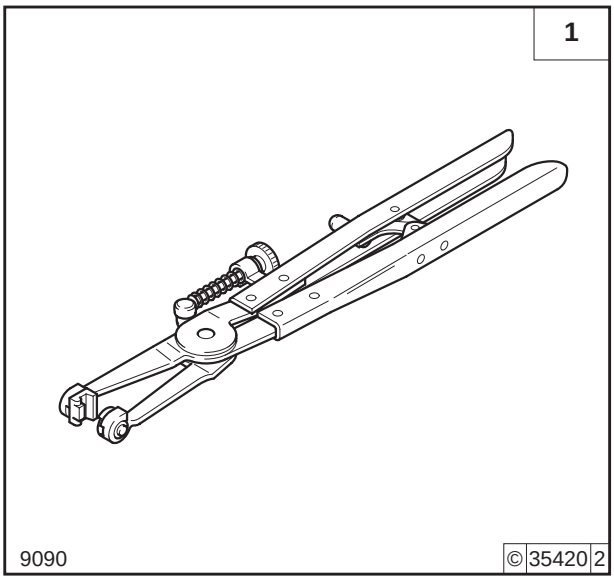
9088 - **Clamping pliers**

for hose clips, 220 mm, spring clamps



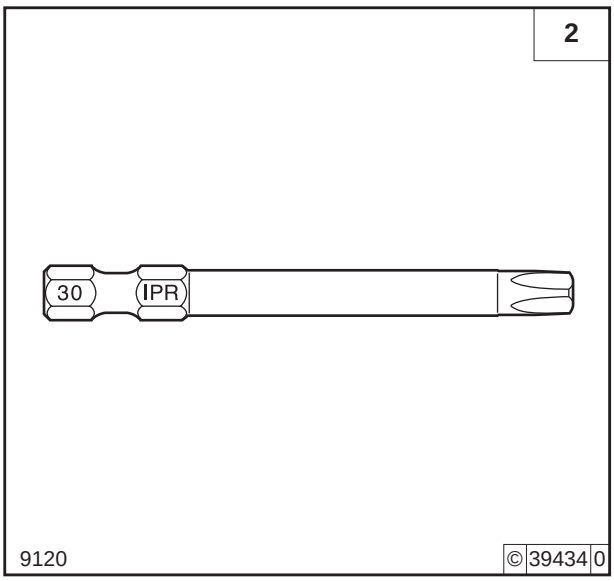
9090 - **Clamping pliers**

for hose clips, 320 mm, clamping spring clamps



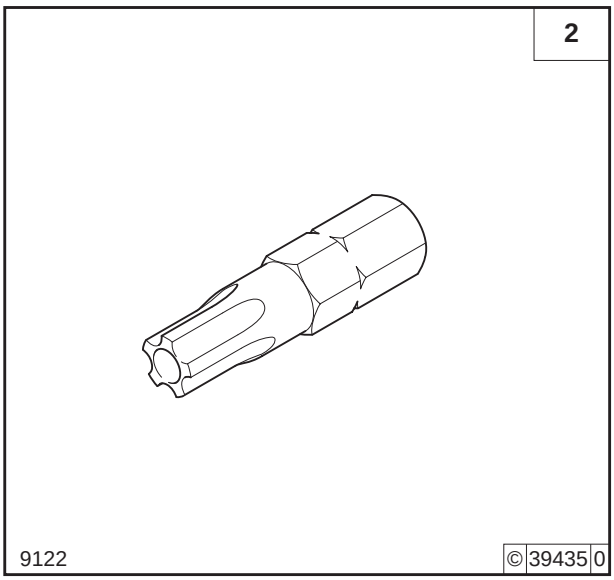
9120 - **Special bit, 70 mm long**

IPR 30, 70 mm long, for secure screwing on regulator



9122 - **Special bit, 25 mm long**

IPR 30, 25mm long, for secure screwing on regulator



8 Special tools

Please send all tool orders directly to:

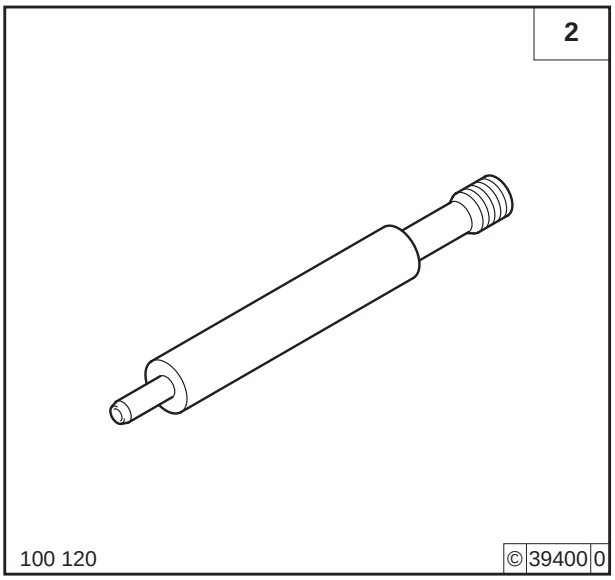
WILBÄR
Wilhelm Bäcker GmbH & Co. KG
Postfach 14 05 80
D -42826 Remscheid
Tel. : +49 (0) 2191 - 9339-0
Fax: +49 (0) 2191 - 9339-200

E-mail: info@wilbaer.de
Web: http://www.deutz-tools.com

Notes

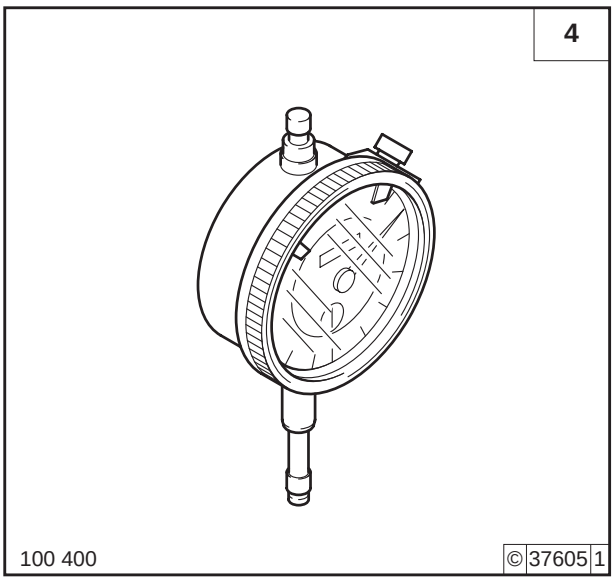
100 120 - **Connecting piece**

for compression tester



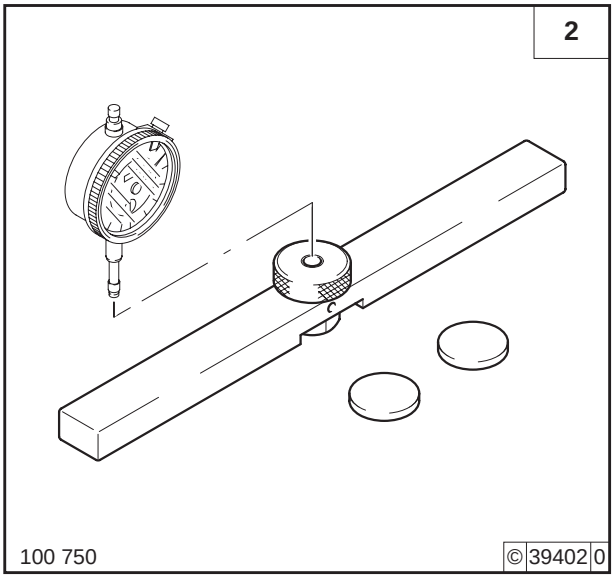
100 400 - **Meter**

in connection with 100 750



100 750 - **Measuring device**

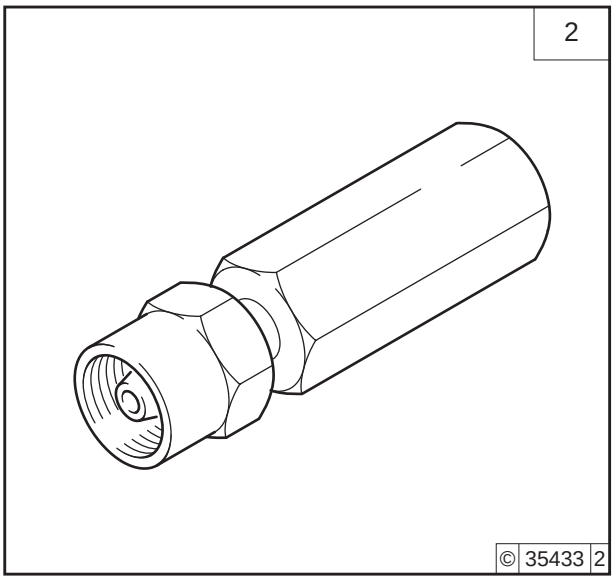
with shim discs for piston overhang and front cover
in connection with 100 400



110 030 - **Extractor**

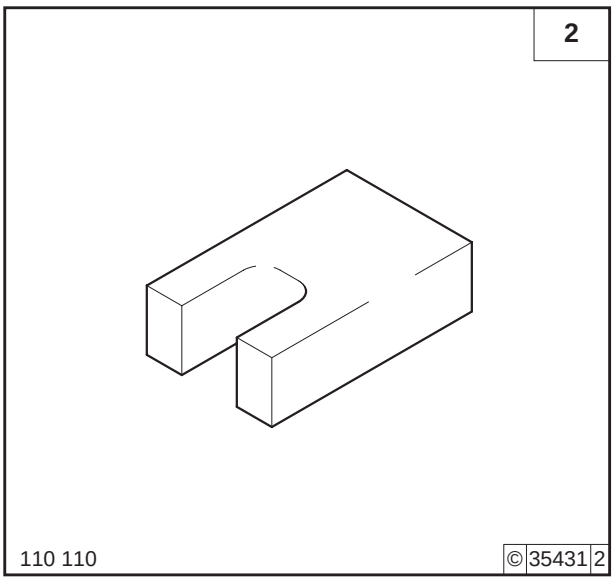
for injection valve

in connection with 150 800



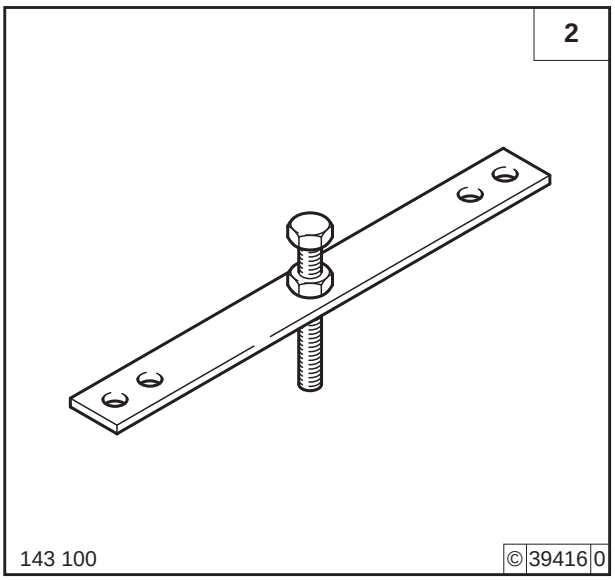
110 110 - **Holder**

for injection valve SW11 to accommodate the injection valve in the vice



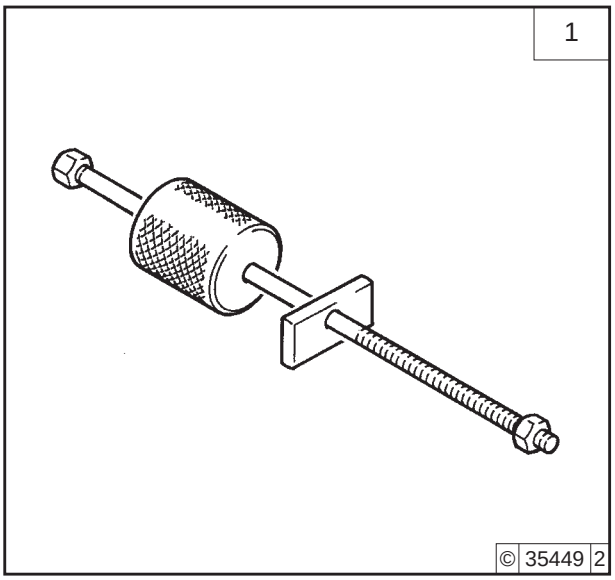
143 100 - **Pressing device**

for flywheel



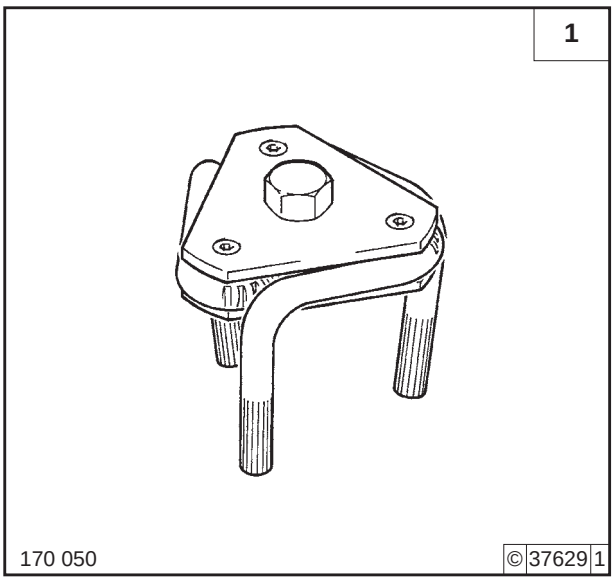
150 800 - **Extraction tool**

e.g. for injection valves



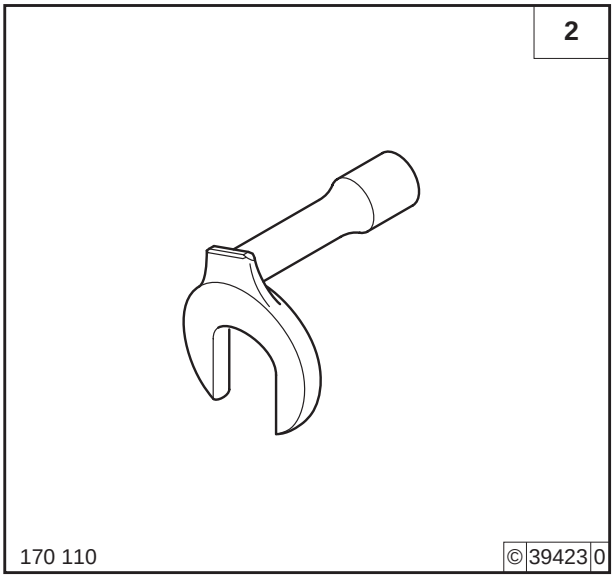
170 050 - **Special wrench**

for filter cartridge, for unscrewing the filter cartridge

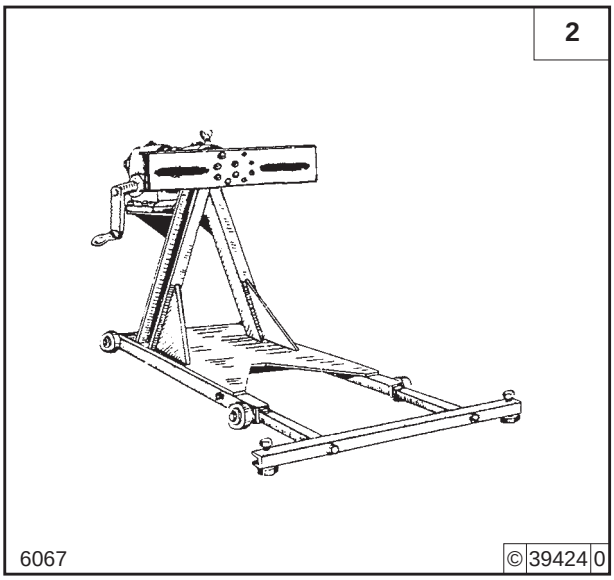


170 110 - **Special wrench**

for oil pressure sensor

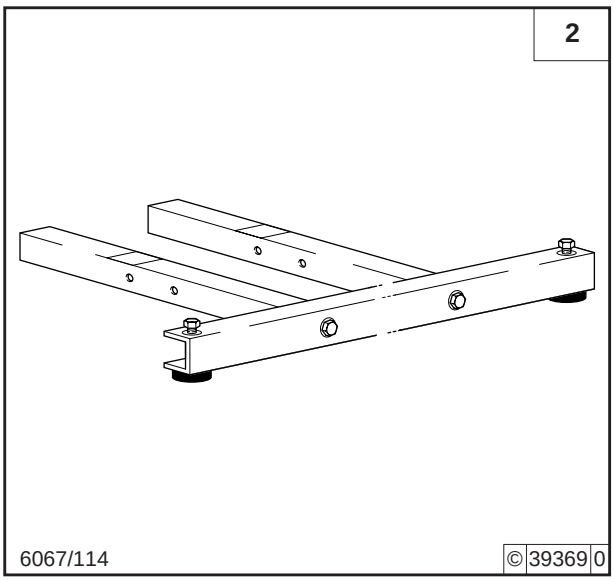


6067 - **Engine assembly block**



8

6067/114 - **Support arm**



6067/115 - **Clamping holder**