Operator's manual en

Diesel engine

D934 A7-25 / D944 A7-25

From serial number 2019 03 0001

LIEBHERR

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NOTICE
Adding special additives and diluting the reducing agent (for example with tap water)!
Legally prescribed emission limits are not observed.
Destruction of the exhaust aftertreatment system!

- ▶ Keep the reducing agent absolutely pure.
- ▶ Make sure that no dirt gets into the reducing agent.
- ▶ Do not fill any operating fluids in the reducing agent tank.
- ▶ Do not fill any reducing agent in the diesel fuel tank.

NOTICE
Diesel fuel filled in the reducing agent tank or vice versa!
Destruction of the diesel engine or the exhaust aftertreatment system.

- ▶ Keep the reducing agent absolutely pure.
- ▶ Do not reuse reducing agent that has been drained.

NOTICE
Operation without reducing agent!
Legally prescribed emission limits are not observed and power is severely limited.
Operator is liable to prosecution.

- ▶ Operate the system with reducing agent.
- ▶ Refill the reducing agent on time.

The reducing agent consumption is based on the use of the vehicle. Refilling is not dependent on maintenance. The reducing agent tank fill level is shown via a tank display in the device cabin. For procedure or information on refilling, see documentation from the device manufacturer.

Filter module

In order to reduce the soot particles in the diesel engine exhaust to a legally permissible level, a filter module is necessary. The filter module filters the soot particles in the exhaust gas flow and stores them. If the temperature of the exhaust gas flow is high enough, the stored soot particles in the filter are removed.

So that the filter module does not become clogged and the exhaust back pressure in the diesel engine does not get too high, the particles stored in the filter must be removed from time to time. This process is called regeneration.

Ash is produced through the running of the engine, which is deposited in the filter. It can only be removed by cleaning.

Passive regeneration

Depending on the design and load of the diesel engine, the exhaust temperature is high enough to remove the soot particles during operation. No intervention is required by the engine or the user. This ideal condition is described as “passive regeneration”.

Active regeneration

If too many soot particles are stored in the filter module, the back pressure in the exhaust gas flow increases. An “active regeneration” of the filter module is required to reduce the particle load.

For active regeneration, a distinction is made between
– automatic regeneration (device in driving condition)

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– Disregarding international and national regulations for environmental protection
– Unauthorized changes to the engine
– Manipulation to the injection system and control system
– Emergency operation with limited safety function is deemed improper use. The manufacturer is not liable for damages due to improper use.

EU type approval expires for:
– Manipulation to the diesel engine
– Manipulation to the injection system and control system
– Manipulation to the exhaust aftertreatment system

The actual scope of delivery of the engine can differ from the relevant information in these operating instructions due to situational adaptations to customer requirements.

2.6 General safety instructions

– Requirements to be met by the target audiences for work. See the “Target audience” chapter.
– To guarantee assistance after an accident: Make sure a second person is in attendance or that the emergency situation is detected and help provided.
– Before any assembly work, make sure that the personnel are familiar with the operating and maintenance manual.
– Only allow personnel undergoing training to work on the diesel engine under the constant supervision of an experienced person
– Check that personnel are conscious of safety and the hazards involved in their work on the following conditions:
  • Observe accident prevention regulations.
  • Observe generally accepted occupational health and safety regulations.
  • Observe the operating and maintenance manual.
– Ensure that the personnel wear safe working clothes.
– Make sure that the following are not worn:
  • Rings
  • Wristwatches
  • Ties
  • Scarves
  • Open jackets
  • Loose clothing
– Make sure that the following equipment is available for assembly and that it is clean, complete and undamaged:
  • Basic tools
  • Necessary devices
  • Necessary special tools
– Replace any damaged tools.
– Keep the workplace clean and tidy.
– Take precautions for any emergency that may occur.
– Keep fire extinguishers and first-aid boxes close by.
– Keep the emergency telephone numbers close by.
– Make sure that the workplace is well lit.
– Only perform assembly work if the diesel engine has been secured.
– Ensure that the diesel engine is not started by unauthorized persons.

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D Front / rear view of lateral transport device

E Lifting traverse lifting point detail view

F Take lifting traverse warning signs, lifting traverse operating instructions into account.

4 Engine lifting traverse lifting point (observe maximum total load)

5 Tolerance for maximum horizontal deviation

▶ Lift the engine: Attach correct lifting traverse **3** to the transport devices **A** provided for this.

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4 Operation

4.1 Preliminary work for the initial commissioning of the engine

- Check engine for proper installation, see documentation from the device manufacturer.
- Provide a suitable engine oil for the engine. (For more information see: 5.11.2 Engine oil, page 132)
- Fill the oil.
- Check oil filter connection.
- Provide coolant with the correct coolant composition. (For more information see: 5.6.4 Checking the concentration of the antifreeze agent in the coolant, page 99)
- Fill the coolant, see documentation from the device manufacturer.
- Check coolant line connections..
- Connect air intake, see documentation from the device manufacturer.
- Connect exhaust aftertreatment system, see documentation from the device manufacturer.
- Connect fuel supply, see documentation from the device manufacturer.
- Provide diesel fuel with the approved fuel specification. (For more information see: 5.11.4 Fuel, page 133)
- Fill the diesel fuel. (For more information see: 5.11.4 Fuel, page 133)
- Ventilate the fuel system. (For more information see: 5.7.8 Ventilating the fuel system, page 107)
- Check fuel prefilter connection, see documentation from the device manufacturer.
- Check fuel fine filter connection.
- Connect electrical power supply, see documentation from the device manufacturer.
- Upload current software update to engine control unit.

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5.3 Diesel engine

5.3.1 Checking the V-ribbed belt

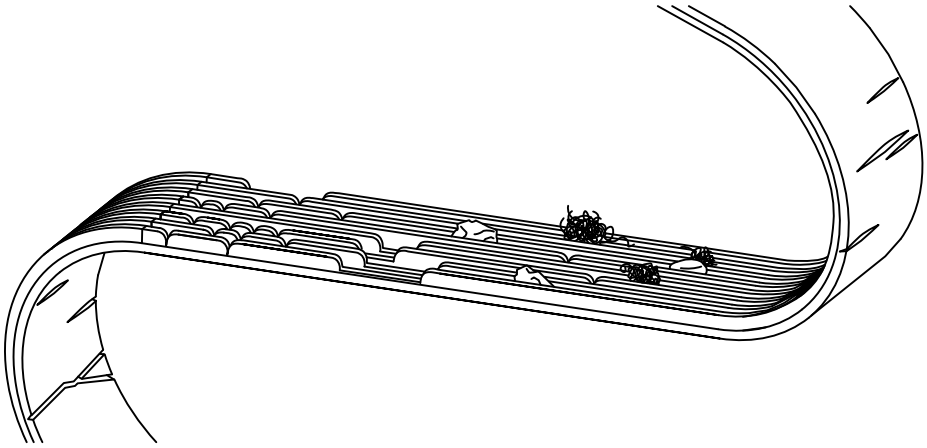

Fig. 74: Damages to V-ribbed belt

Possible damages to the V-ribbed belt are:
– Brittle ribs
– Rubber lumps on the bottom of the belt
– Dirt deposits
– Stone deposits
– Ribs detached from the bottom of the belt
– Transverse cracks on the back
– Transverse cracks in multiple ribs

Checking the air conditioning compressor V-ribbed belt

Make sure that the following prerequisites are met:
❑ Cover is removed (if present). (For more information see: 5.2.2 As needed, page 58)

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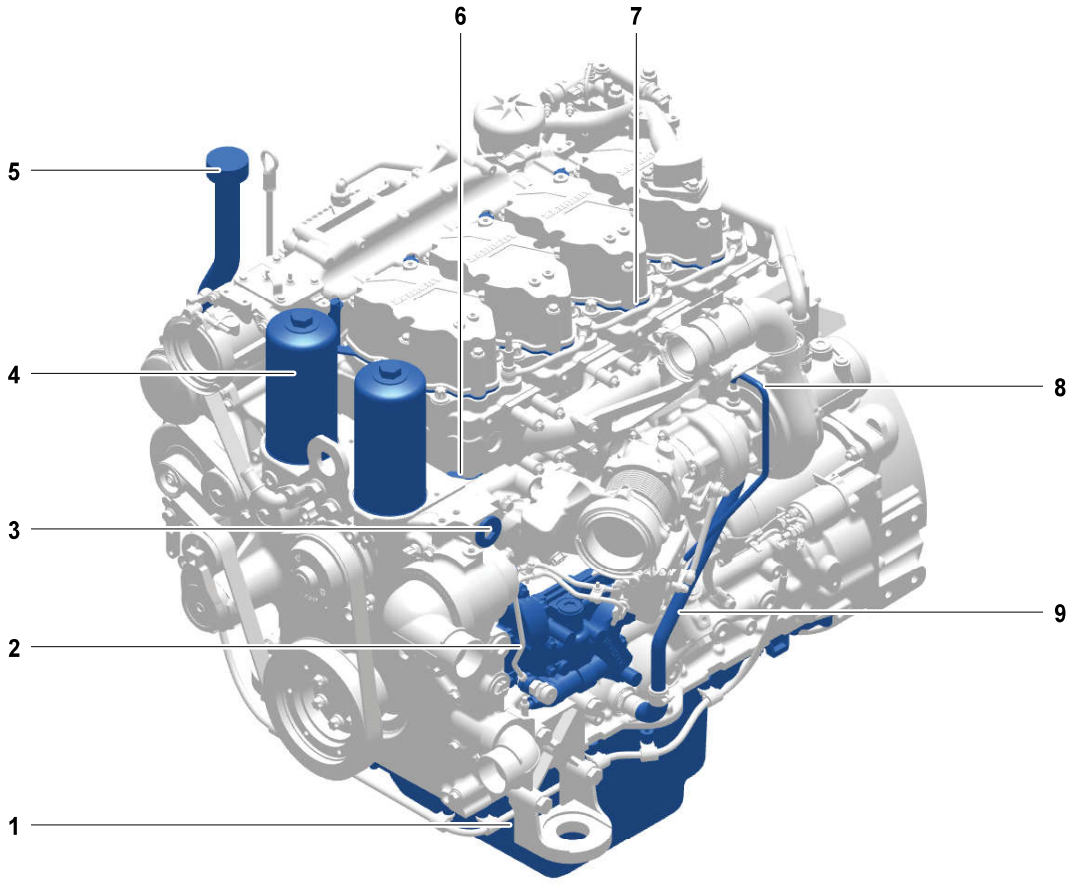

Fig. 82: Checking the ancillary support housing side lubrication system

1 Oil pan
2 Oil cooler
3 Screw plug
4 Oil filter (2x)
5 Oil filler neck (optional)
6 Cylinder head gasket
7 Cylinder head cover seal
8 Oil supply line
9 Oil return line

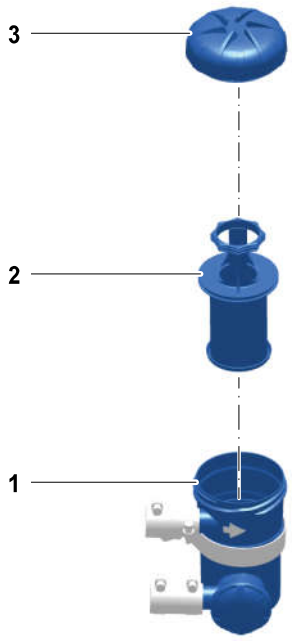

Fig. 94: Replacing the oil separator filter insert

1 Oil separator filter housing
2 Oil separator filter insert
3 Housing cover

▶ Remove housing cover **3**.

▶ Remove oil separator filter insert **2**.

Installing the oil separator filter insert

WARNING
Hot components on the engine
Serious burns possible.

▶ Let the engine cool down before any potentially hot components are touched. The engine must be cooled down to below 50 °C.

▶ Wear heat-resistant safety gloves and heat-resistant protective work gloves.

CAUTION
When opening the lines of the engine oil system, possible lubricant contact with the environment, eyes, mouth or skin.
Damage to health and environmental damage possible.

▶ Wear chemical safety gloves, chemical safety goggles, chemical work clothing and chemical safety shoes.

▶ Make sure that no lubricant gets into the environment.

▶ Observe national and international guidelines for disposal.

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▶ Tighten the lock nut **3** according to the tensioning instruction.

▶ Check the setting again.

▶ Repeat the process for all cylinders.

When the valves have been checked and set:

▶ Install cylinder head covers with inspected, intact seals.

Removing the turning device from the flywheel housing

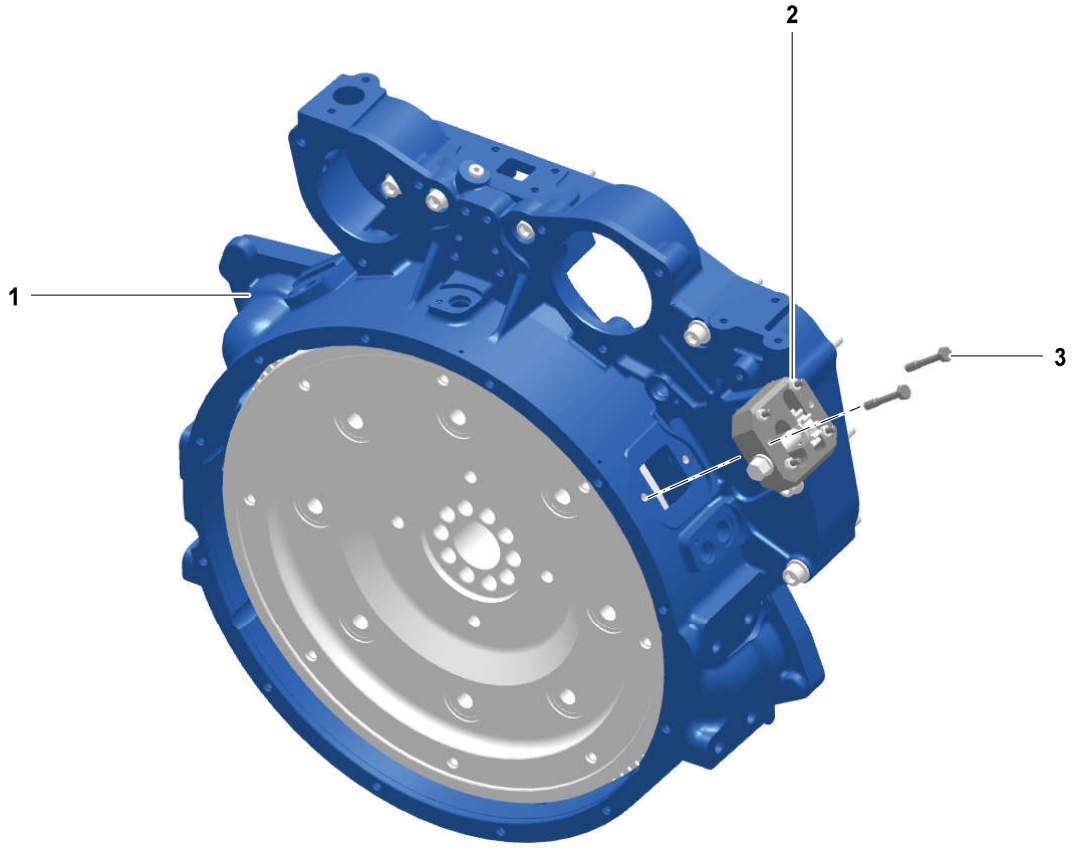

Fig. 108: Removing the turning device from the flywheel housing

1 Flywheel housing
2 Turning device
3 External hex bolt (3x)

▶ Unscrew external hex bolt **3**.

▶ Remove turning device **2** from flywheel housing **1**.

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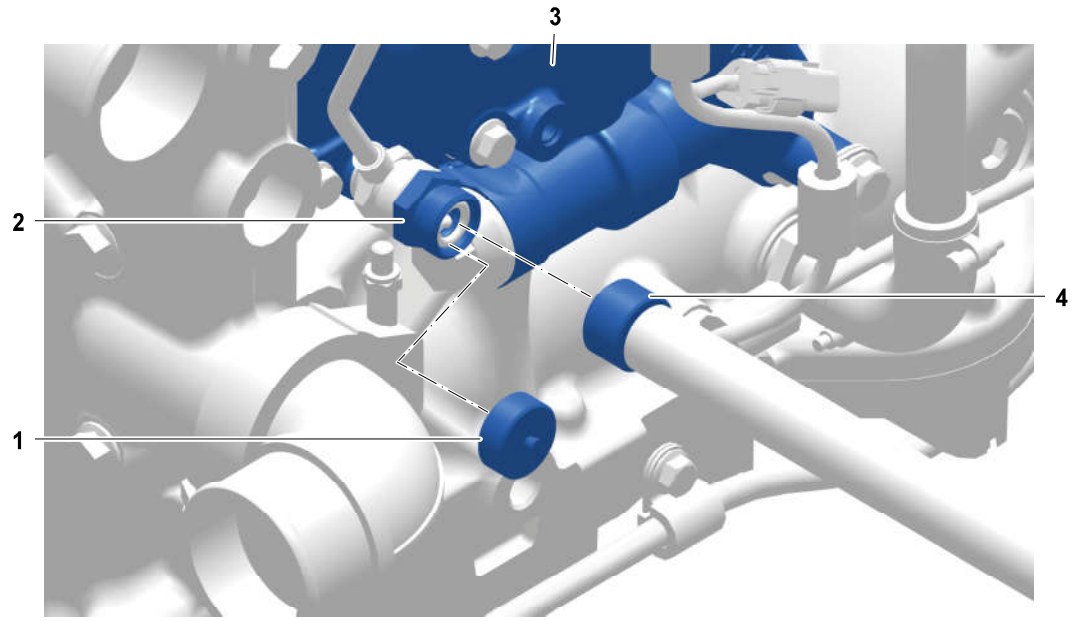

Fig. 118: Draining the coolant on the engine

1	Protecting cap	**3**	Oil cooler
2	Drain valve	**4**	Drain hose

- ▶ Release the end cover on the device side compensation tank.
  - ▷ Excess pressure escapes from the cooling system.
- ▶ Put a collection container under the drain valve **2**.
- ▶ Unscrew protecting cap **1**.
- ▶ Screw drain hose **4** onto drain valve **2**.
  - ▷ Coolant runs out.

When the coolant has drained completely:
- ▶ Tighten protecting cap **1**.

Filling the coolant

- ▶ Fill the coolant via the device side filler neck. (For more information see: Correcting the concentration of the antifreeze agent, page 99)
- ▶ Fill cooling system up to maximum.
- ▶ Place the sealing cap on the compensation tank and close it.
- ▶ Start the engine.
- ▶ Let the engine warm up.
  - ▷ Coolant temperature > 80 °C.
- ▶ Turn off the engine. (For more information see: 4.3 Turning off the engine, page 54)
- ▶ Let the engine cool down.
- ▶ Check coolant level. (For more information see: 5.6.2 Checking the coolant level, page 98)

If the coolant level is too low or too high:
- ▶ Correct the coolant level, see documentation from the device manufacturer.

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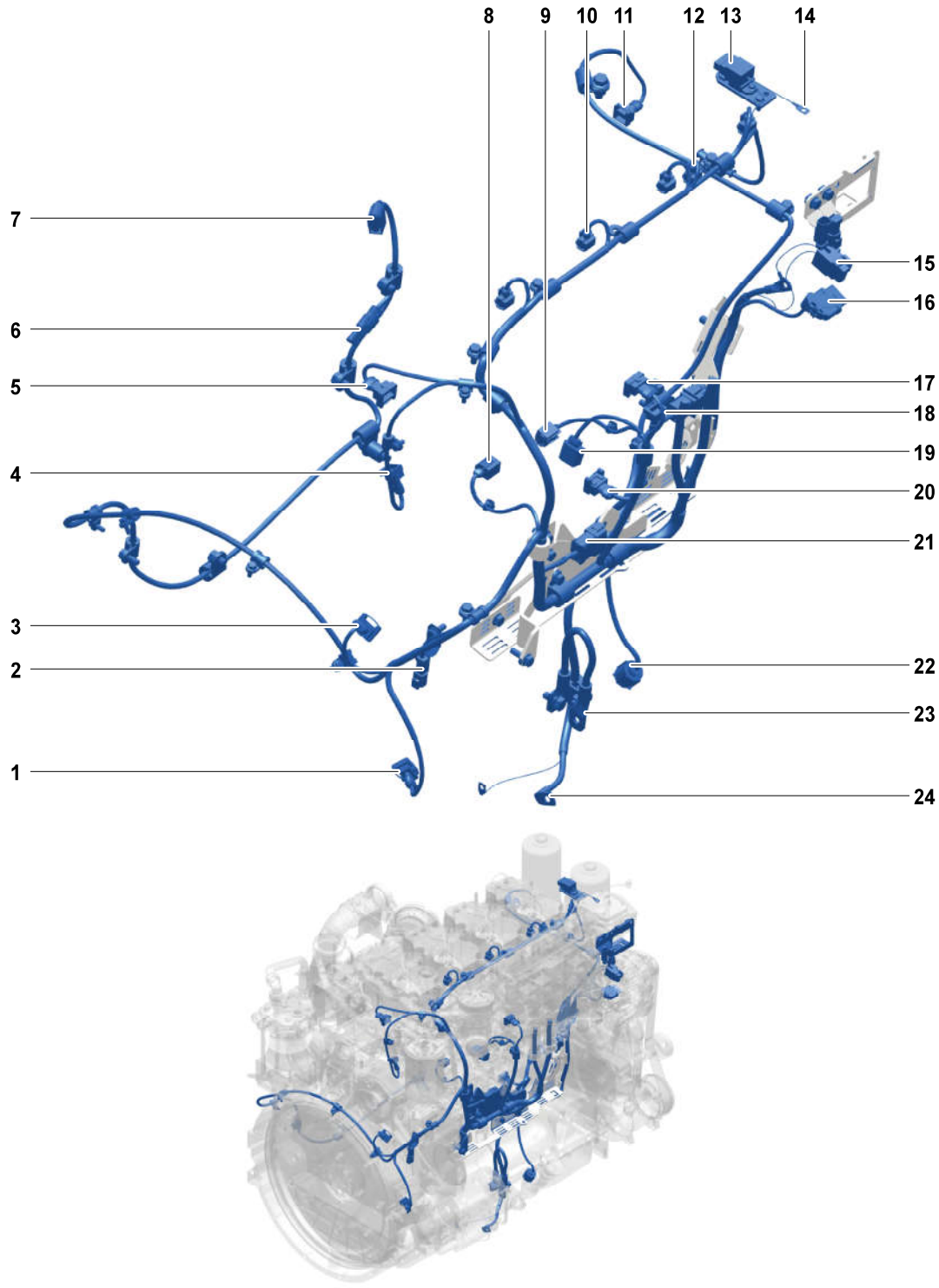

Fig. 125: Cable harness (example application)

1 Speed sensor -B711
2 Interface for splitter box temperature sensor (optional) -X720
3 Phase sensor -B713
4 Wastegate control valve -Y705
See next page for continuation of the image legend

13 Heating flange back measurement -E703
14 Heating flange -E703
15 Alternator back measurement -F705.X
16 Alternator -G700

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3 Profile clamp (2x)
4 Hinge bracket (2x)
7 Temperature sensor/pressure sensor/ differential pressure line/screw fitting (13x)
8 NO_x sensor/NH_3 sensor (1x)

Number	Part	Tightening torque
1	Profile clamp **1**	23 $^{\pm 2}$ Nm
2	Profile clamp **2**	18 $^{+2/-1}$ Nm
3	Profile clamp **3**	23 $^{\pm 2}$ Nm
4	Hinge bracket **4**	21 $^{\pm 1}$ Nm
5	Bracket clip **5**	23 $^{\pm 2}$ Nm
6	Reduction agent injector **6**	5 $^{\pm 0.5}$ Nm
7	Temperature sensor/pressure sensor/differential pressure line/ screw fitting **7**	35 $^{+5}$ Nm
8	NO_x sensor/NH_3 sensor **8**	50 $^{\pm 10}$ Nm

Tab. 29: Tightening torques

▶ Check component for tight fit.

If a component is loose:
▶ Tighten component with torque according to the tensioning instruction.

5.10.3 Cleaning the SCR filter module

Replacing the filter module

The filter module replacement is based on an exchange principle. That means that during an upcoming maintenance interval, a cleaned replacement (AT) filter module is ordered and installed.

The filter module replacement is monitored by a diagnostics system. 4500h after the last filter module replacement, a warning appears on the device display that the filter module must be replaced. If this is not performed, after 6000h, the AWL lamp or MIL lamp appears or an error is permanently displayed, and a power limitation automatically takes place.

4500h since the last filter module replacement	6000h since the last filter module replacement
Warning (P242F) is shown in the device display when the ignition is switched on	Permanent error (P13E2)
	AWL lamp  illuminates.
	Low power limitation

Tab. 30: Monitoring of the filter module replacement maintenance interval

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- ▶ Check the tightening torque of the hinge brackets according to the tensioning instruction. (For more information see: 5.10.2 Checking components, page 120)
- ▶ Check the exhaust aftertreatment assembly for leaks.

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7 Tools and devices

7.1 Tools

7.1.1 Special tool

Graphic representation	Description	Required number	Identification number
	Turning device	1	0524045
	Turning device	1	10118801
	Turning device	1	10116805
	Drain hose	1	12690422
	Drain hose 90°	1	12690423

Tab. 40: Special tool

7.1.2 Operating material

Use the following locking agent, sealant and greases for repair and maintenance work. Refer to the respective work description for the application.

Locking agent		
Designation	**Identification number**	**Quantity**

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Tightening torques valid for the following screw coatings:
– PHR (phosphated/black)
– flZn (zinc flake coating/gray)
– 480H (galvanized according to DIN 50979/zinc flake coating according to ISO10683/silver)

Standard thread	Nm	Nm
Strength class	8.8	10.9
M4	2.2	3.3
M5	4.5	7
M6	8	12
M7	13	19
M8	19	28
M10	38	55
M12	65	95
M14	104	150
M16	158	234
M18	230	326
M20	320	450

Tab. 50: Tightening torques for metric standard thread

Standard thread	Nm	Nm
Strength class	8.8	10.9
M 8 x 1	20	29
M 9 x 1	29	42
M 10 x 1	40	59
M 10 x 1.25	39	57
M 12 x 1.25	69	102
M 12 x 1.5	67	99
M 14 x 1.5	109	160
M 16 x 1.5	165	240
M 18 x 1.5	245	350
M 18 x 2	238	335
M 20 x 1.5	340	480

Tab. 51: Tightening torques for metric fine thread

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8.1.2 For locking screws and banjo bolts

Banjo bolts according to DIN 7643.

Locking screws according to DIN 910.

Locking screws according to DIN 908.

With copper seal according to DIN 7603: