

Workshop Manual Audi A1 2011 ➤

TDI injection and glow plug system (4-cyl. 2.0 ltr. 4-valve common rail)

Engine ID	CFH B	CFH D							
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Edition 11.2013



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List of Workshop Manual Repair Groups

Repair Group

23 - Mixture preparation - injection

28 - Glow plug system



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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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23 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

(ARL003681; Edition 11.2013)

Overview

- ◆ ⇒ [“1.1 Safety precautions”, page 1](#)
- ◆ ⇒ [“1.2 Safety precautions for vehicles with start/stop system”, page 1](#)
- ◆ ⇒ [“1.3 Rules for cleanliness and instructions for working on fuel system”, page 2](#)
- ◆ ⇒ [“1.4 To avoid any risk of injuries to persons and/or damage to the injection and glow plug system, always observe the following safety precautions:”, page 3](#)
- ◆ ⇒ [“1.5 Checking vacuum system”, page 3](#)

1.1 Safety precautions

Note the following if testers and measuring instruments have to be used during a road test:



WARNING

Accidents can be caused if the driver is distracted by test equipment while road-testing, or if test equipment is not properly secured.

Persons sitting in the front passenger's seat could be injured if the airbag is triggered in an accident.

- *The use of test equipment while driving causes distraction.*
- *There is an increased risk of injury if test equipment is not secured.*
- ◆ *Test equipment must always be secured on the rear seat with a strap and operated from the rear seat by a second person.*

1.2 Safety precautions for vehicles with start/stop system



WARNING

Risk of injury due to automatic engine start on vehicles with start/stop system.

- ◆ *On vehicles with activated start/stop system (this is indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- ◆ *Therefore it is important to ensure that the start/stop system is deactivated when performing repairs (switch off ignition, if required switch on ignition again).*

1.3 Rules for cleanliness and instructions for working on fuel system



Caution

The high-pressure pump has very close tolerances and must not be allowed to run without fuel. To prevent this and to enable the engine to start quickly after parts have been renewed, it is important to observe the following:

- ◆ *If components of the fuel system between the fuel tank and the high-pressure pump are removed or renewed, the fuel system must be bled ⇒ [page 13](#) .*
- ◆ *If the high-pressure pump is removed or renewed, the first fuel filling operation must be performed before the engine is started for the first time ⇒ [page 28](#) .*

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General instructions:

- Clean tools and workbench etc. before working on the injection system.
- Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- When removing components, plug all open connections immediately with suitable clean sealing caps.
- Do not remove sealing caps from components until immediately prior to installation. Keep components that are to be re-used in new, sealable plastic bags.
- Before installing, check the injectors and their surroundings visually; they must be undamaged and clean. Make sure the injector bores in the cylinder head are clean. Wipe out if necessary using a clean cloth, taking care not to cause damage. Do not use sharp objects of any kind.
- If the high-pressure fuel lines are to be re-used, you must mark them before removal. High-pressure pipes must always be re-installed on the same cylinder.
- Take care not to damage the injectors when removing the old copper seals.
- Check all new O-rings for damage before installing. Lubricate O-rings with engine oil or assembly oil before installing.
- Position high-pressure pipes so they are free of stress. Tighten all unions lightly to start with before tightening to final torque.
- Never attempt to bend high-pressure fuel lines to shape.
- When working on any parts of the high-pressure fuel system, tools may only be used for loosening and tightening pipe unions. All other components must always be removed and installed by hand without using tools or other equipment.
- Press the fuel return hoses onto the injectors by hand from above so that they engage audibly on each injector (do not press in the release pins when doing this). Then press down the release pin after connecting the return line. Check that the fuel return hoses are seated securely and sealed properly by pulling them by hand from above.
- Do not dismantle individual common rail components. If there is a fault, the complete components must be renewed.

- When the engine is running, do not perform any repairs to the common rail system.
- Do not bleed the common rail system by unfastening high-pressure components after the engine has been started.
- All cable ties which are released or cut open when removing must be refitted in the same position when installing.
- When the fuel system is open: Do not work with compressed air if this can be avoided. Do not move the vehicle unless absolutely necessary.
- Also ensure that no diesel fuel comes into contact with the coolant hoses. Should this occur, the hoses must be cleaned immediately. Damaged hoses must be renewed.

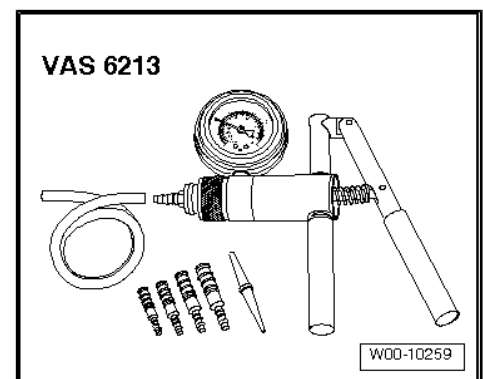
1.4 To avoid any risk of injuries to persons and/or damage to the injection and glow plug system, always observe the following safety precautions:

- ◆ Persons wearing a pacemaker should not lean over the engine compartment while the engine is running as the injectors use high voltage pulses.
- ◆ Do not open any fuel line connections while the engine is running.
- ◆ Always switch off the ignition before connecting or disconnecting injection and glow plug system wiring or tester cables.
- ◆ Always switch off the ignition before cleaning the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The event memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.

1.5 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-



Procedure

- Check all vacuum lines in the complete vacuum system for:
 - ◆ Cracks
 - ◆ Traces of animal bites
 - ◆ Kinked or crushed lines



- ◆ Lines porous or leaking
 - Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
 - If a fault is stored in the event memory, check all vacuum lines leading to the corresponding component, and also check the remaining vacuum lines leading to other components.
 - If it is not possible to build up a vacuum with the hand vacuum pump - VAS 6213- or if the vacuum pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

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2 Overview of fitting locations

Engine compartment

1 - Fuel temperature sender - G81-

- ☐ In fuel supply line

2 - Radiator outlet coolant temperature sender - G83-

- ☐ Removing and installing
⇒ Rep. gr. 19

3 - Pressure differential sender - G505-

- ☐ Exploded view
⇒ [page 57](#)

4 - Fuel pressure sender - G247-

- ☐ Exploded view
⇒ [page 31](#)

5 - Hall sender - G40-

- ☐ (Camshaft position sensor)
- ☐ Exploded view
⇒ [page 65](#)

6 - Injector, cylinder 1 - N30-

- ☐ Exploded view
⇒ ["8.1 Injectors - exploded view", page 31](#)

7 - Injector, cylinder 2 - N31-

- ☐ Exploded view
⇒ ["8.1 Injectors - exploded view", page 31](#)

8 - Injector, cylinder 3 - N32-

- ☐ Exploded view
⇒ ["8.1 Injectors - exploded view", page 31](#)

9 - Injector, cylinder 4 - N33-

- ☐ Exploded view ⇒ ["8.1 Injectors - exploded view", page 31](#)

10 - Brake light switch - F- / brake pedal switch - F63-

- ☐ Fitting location ⇒ [page 9](#)
- ☐ Removing and installing ⇒ Rep. gr. 45

11 - Air mass meter - G70-

- ☐ Exploded view ⇒ ["5.1 Air cleaner - exploded view", page 14](#)

12 - Accelerator position sender - G79- and accelerator position sender 2 - G185-

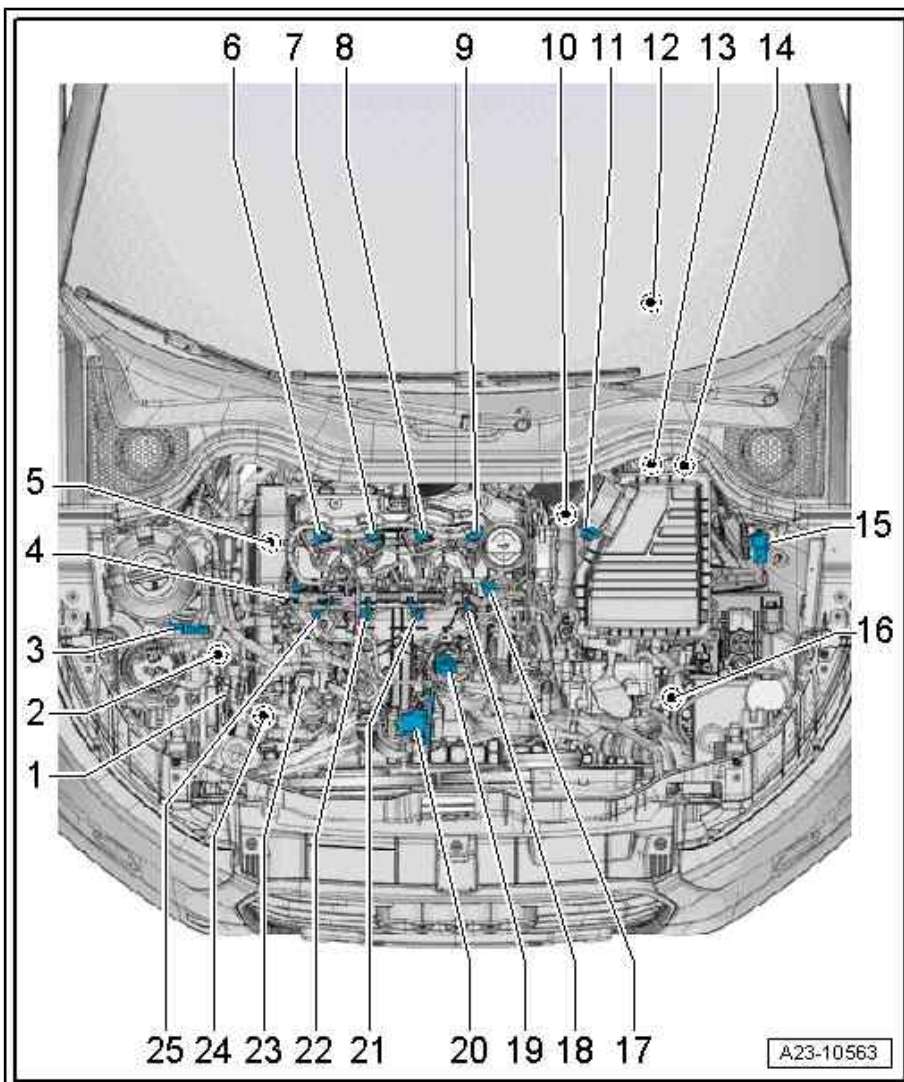
- ☐ Fitting location ⇒ [page 9](#)

13 - Clutch position sender - G476-

- ☐ For vehicles with manual gearbox
- ☐ Fitting location ⇒ [page 9](#)

14 - Engine control unit - J623-

- ☐ Fitting location ⇒ [page 8](#)



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15 - Charge pressure control solenoid valve - N75-

16 - Gearbox neutral position sender - G701-

- ☐ For vehicles with manual gearbox
- ☐ Fitting location ⇒ [page 9](#)

17 - Fuel pressure regulating valve - N276-

- ☐ Exploded view ⇒ [page 31](#)

18 - Glow plug 4 - Q13-

- ☐ Exploded view ⇒ [page 65](#)

19 - Exhaust gas recirculation cooler change-over valve - N345-

20 - Throttle valve module - J338-

- ☐ With throttle valve potentiometer - G69-
- ☐ Exploded view ⇒ [page 20](#)

21 - Glow plug 3 - Q12-

- ☐ Exploded view ⇒ [page 65](#)

22 - Glow plug 2 - Q11-

- ☐ Exploded view ⇒ [page 65](#)

23 - Fuel metering valve - N290-

24 - Charge pressure sender - G31- / intake air temperature sender - G42-

- ☐ Removing and installing ⇒ Rep. gr. 21

25 - Glow plug 1 - Q10-

- ☐ Exploded view ⇒ [page 65](#)

Engine (gearbox end)



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1 - Engine speed sender - G28-

- ☐ Exploded view
⇒ [page 65](#)

2 - Coolant temperature sender - G62-

- ☐ Removing and installing
⇒ Rep. gr. 19

3 - Position sender for charge pressure positioner - G581-

4 - Oil pressure switch - F1-

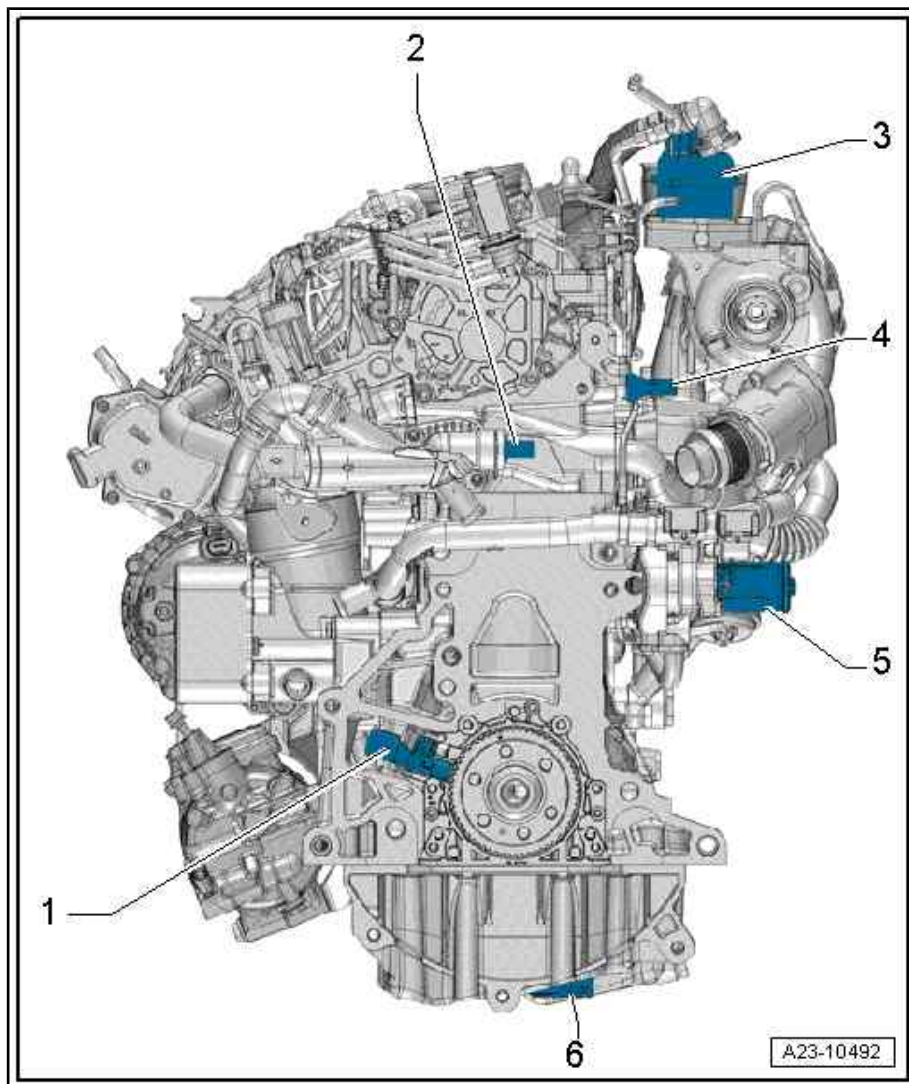
- ☐ Removing and installing
⇒ Rep. gr. 17

5 - Exhaust gas recirculation valve - N18- / exhaust gas recirculation potentiometer - G212-

- ☐ Removing and installing
⇒ Rep. gr. 21

6 - Oil level and oil temperature sender - G266-

- ☐ Removing and installing
⇒ Rep. gr. 17



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1 - Exhaust gas temperature sender 4 - G648-

- ☐ Exploded view
⇒ [page 57](#)

2 - Exhaust gas temperature sender 1 - G235-

- ☐ Exploded view
⇒ [page 57](#)

3 - Exhaust gas temperature sender 3 - G495-

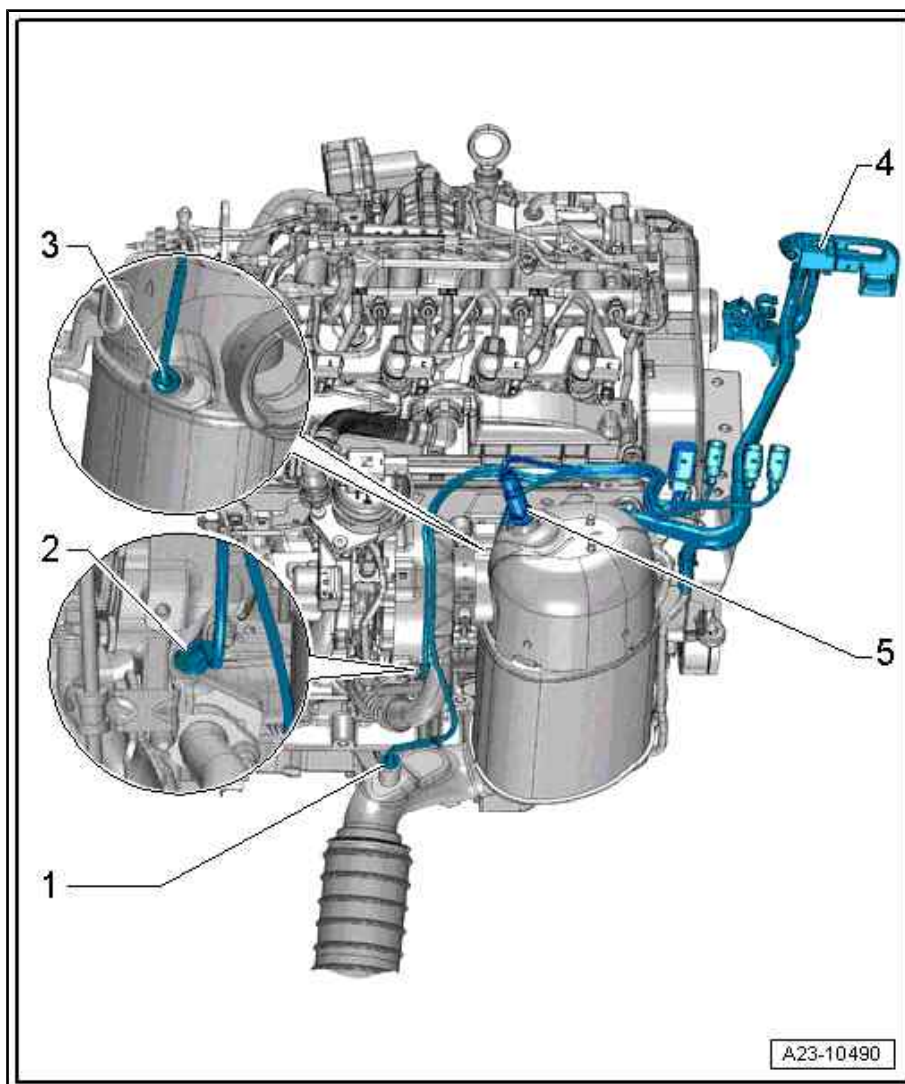
- ☐ Exploded view
⇒ [page 57](#)

4 - Pressure differential sender - G505-

- ☐ Exploded view
⇒ [page 57](#)

5 - Lambda probe - G39- with Lambda probe heater - Z19-

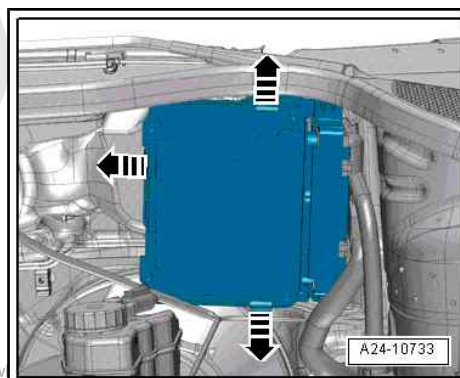
- ☐ Exploded view
⇒ [page 57](#)



A23-10490

Fitting location of engine control unit - J623-

- ◆ At plenum chamber partition panel (left-side)

Removing and installing ⇒ [page 61](#)


A24-10733

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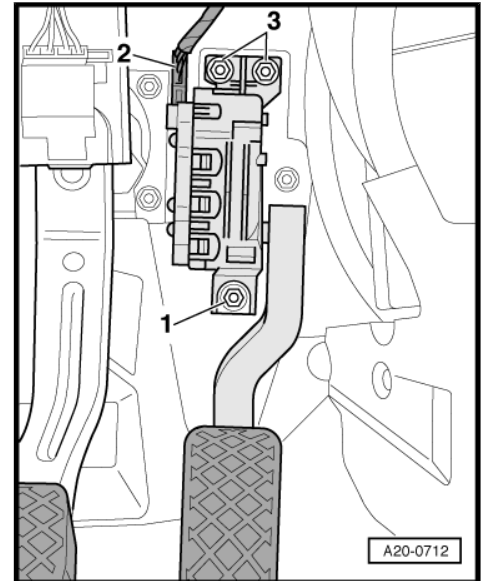
Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

- ◆ In accelerator pedal module



The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Removing and installing ⇒ Rep. gr. 20

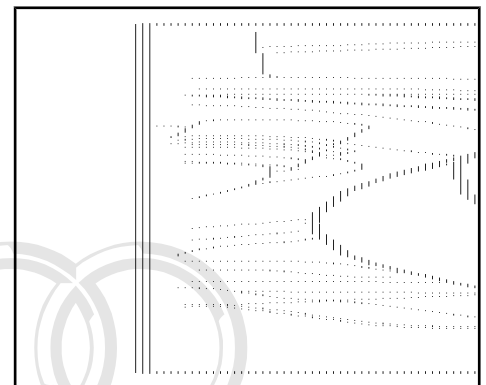


Fitting location of brake light switch - F- / brake pedal switch - F63-

- ◆ On brake master cylinder

C - Brake light switch - F- / brake pedal switch - F63-

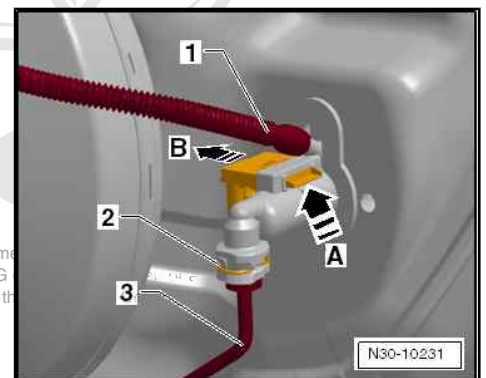
Removing and installing ⇒ Rep. gr. 45



Fitting location of clutch position sender - G476-

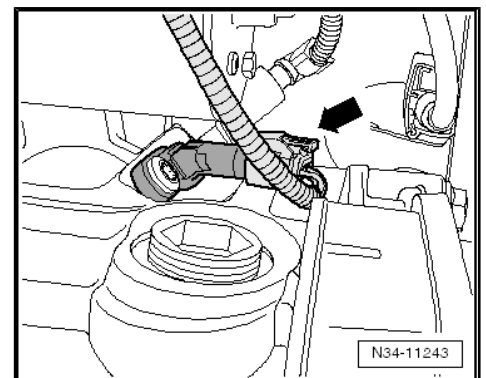
- ◆ On clutch master cylinder, next to brake servo

Removing and installing ⇒ Rep. gr. 30



Fitting location of gearbox neutral position sender - G701-

- ◆ At front of manual gearbox -arrow-

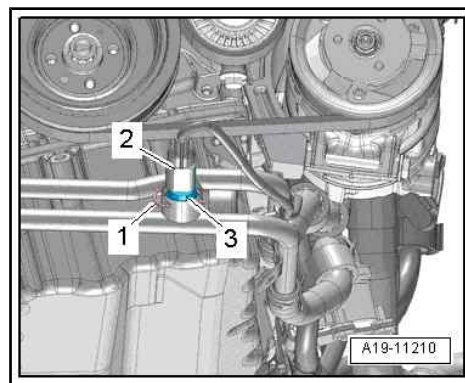


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Fitting location of radiator outlet coolant temperature sender - G83-

- ◆ -Item 3- in connection at coolant pipes (right-side)



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3 System layout



Caution

Risk of malfunctions caused by dirt.

The high-pressure fuel pump has very close tolerances and must not be allowed to run without fuel. To prevent this and to enable the engine to start quickly after parts have been renewed, it is important to observe the following:



Note

The high-pressure pump will be damaged if the first fuel filling operation is not performed.

1 - Fuel metering valve - N290-

2 - High-pressure pump

- ☐ Exploded view
⇒ ["7.1 High-pressure pump - exploded view", page 24](#)

3 - Fuel pressure sender - G247-

- ☐ Exploded view
⇒ ["8.1 Injectors - exploded view", page 31](#)

4 - Fuel rail

- ☐ Exploded view
⇒ [page 31](#)

5 - Fuel pressure regulating valve - N276-

- ☐ Exploded view
⇒ [page 31](#)

6 - Injector

- ☐ Piezo injector
- ☐ Exploded view
⇒ [page 31](#)

7 - Fuel return hose

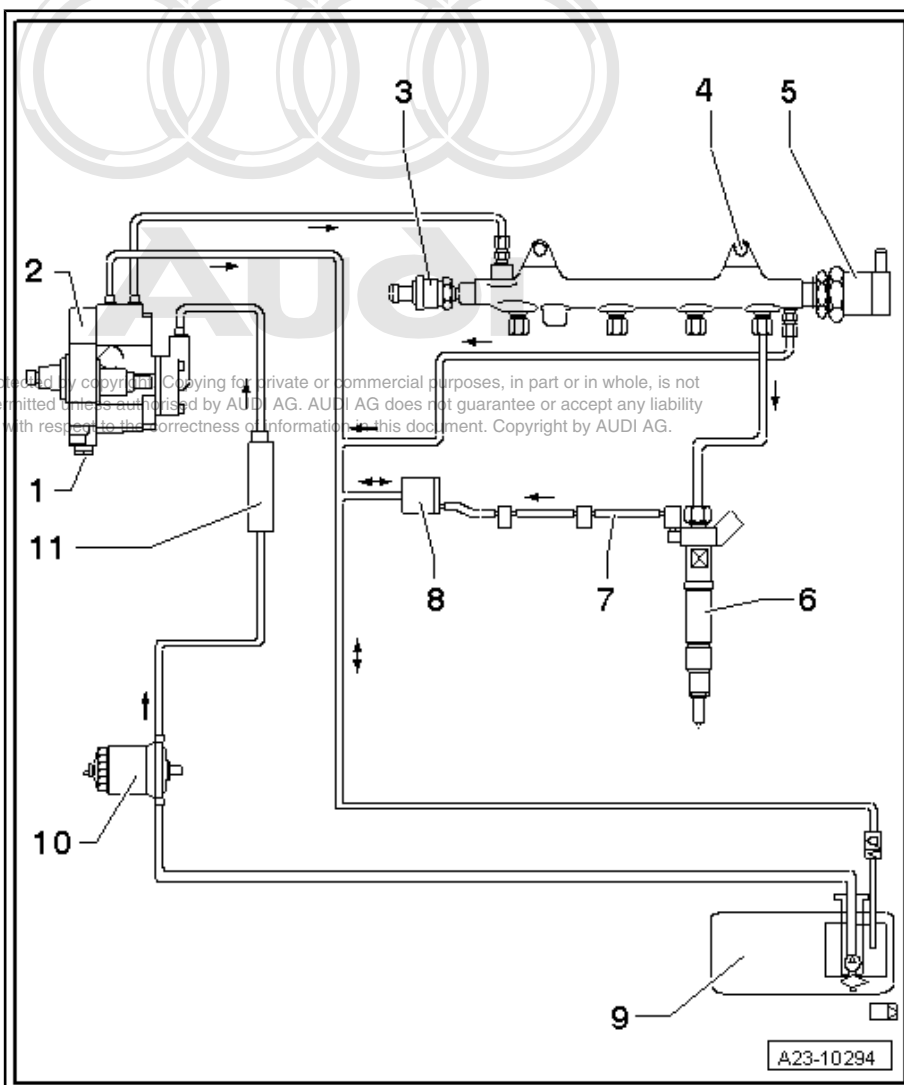
- ☐ Do not dismantle

8 - Pressure retention valve

- ☐ Maintains a residual pressure of approx. 1 bar in fuel return hoses (for control function)
- ☐ Cannot be renewed separately; if defective, renew fuel return hoses

9 - Fuel tank

- ☐ With fuel system pressurisation pump - G6-





10 - Not fitted

11 - Fuel filter

☐ Exploded view ⇒ Rep. gr. 20



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4 Filling and bleeding fuel system

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester



Caution

- ◆ *If components of the fuel system between the fuel tank and the high-pressure pump are removed or renewed, the fuel system must be bled.*

Proceed as follows to fill fuel system with fuel:

- Connect a ⇒ Vehicle diagnostic tester.
- Switch on ignition.
- Select “Engine electronics” in vehicle self-diagnosis.
- Select “Guided Functions”.
- Then select “Activate fuel pump”.
- Select “120 seconds”.
- The fuel pump starts running.
- The fuel pump must run for approx. 2 minutes to ensure that the fuel system is filled sufficiently with fuel.



Note

To repeat basic setting, switch ignition off and on once. Then start basic setting again.

- Start engine after filling fuel system.
- Run engine at moderate speed for several minutes and then switch off.
- Check fuel system for leaks.
- Erase entry in event memory using ⇒ Vehicle diagnostic tester.
- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

- Interrogate event memory again.

5 Air cleaner

Overview

- ◆ ⇒ [“5.1 Air cleaner - exploded view”, page 14](#)
- ◆ ⇒ [“5.2 Removing and installing engine cover panel”, page 15](#)
- ◆ ⇒ [“5.3 Removing and installing air filter element”, page 15](#)
- ◆ ⇒ [“5.4 Removing and installing air cleaner housing”, page 17](#)
- ◆ ⇒ [“5.5 Removing and installing air mass meter G70”, page 19](#)

5.1 Air cleaner - exploded view

1 - Connection

2 - Air duct

- ☐ To lock carrier
- ☐ Clean out salt deposits, dirt and leaves, etc.

3 - Air cleaner (bottom section)

- ☐ Clean out salt deposits, dirt and leaves, etc.

4 - Air filter element

- ☐ Use genuine air filter element ⇒ Electronic parts catalogue
- ☐ Change intervals ⇒ Maintenance tables
- ☐ Removing and installing ⇒ [page 15](#)

5 - Air cleaner (top section)

- ☐ Clean out salt deposits, dirt and leaves, etc.

6 - O-ring

- ☐ Renew if damaged
- ☐ Use lubricant when installing

7 - Air pipe

- ☐ To turbocharger

8 - Bolt

- ☐ 9 Nm

9 - Air mass meter - G70-

- ☐ Removing and installing ⇒ [page 19](#)

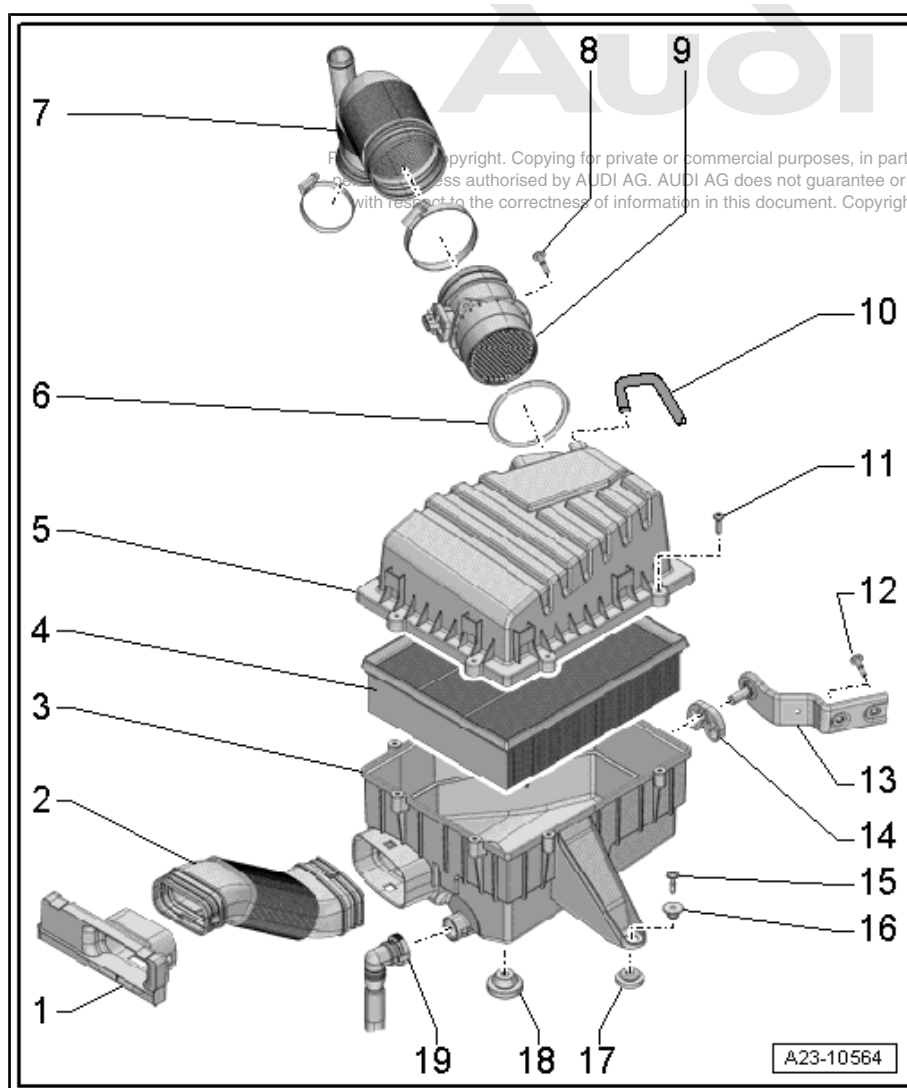
10 - Breather hose

11 - Bolt

- ☐ 1.5 Nm

12 - Bolt

- ☐ 9 Nm



13 - Bracket

- ☐ For air cleaner (bottom section)
- ☐ Lug on bracket must not be deformed
- ☐ Lug on bracket must be fully inserted in rubber buffer

14 - Rubber buffer

- ☐ Clipped onto air cleaner (bottom section)

15 - Bolt

- ☐ 9 Nm

16 - Sleeve

17 - Grommet

18 - Rubber buffer

19 - Water drain hose

- ☐ Clean

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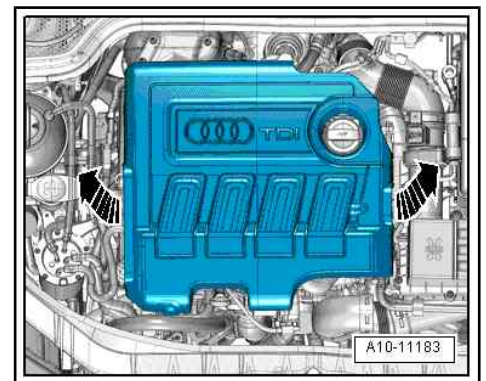
5.2 Removing and installing engine cover panel

Removing

- Carefully pull engine cover panel off retaining pins one after the other -arrows-. Do not jerk engine cover panel away, and do not try to pull on one side only.

Installing

- To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.
- Observe oil filler neck when positioning engine cover panel.
- Press engine cover panel with both hands into the rubber grommets at the rear and then into the grommets at the front.



5.3 Removing and installing air filter element

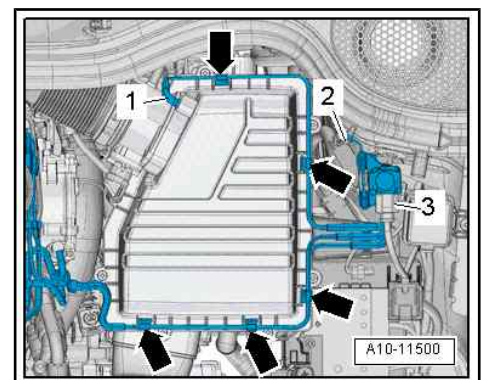
Removing

- Detach breather hose -1-.
- Unclip bracket -arrows- from air cleaner housing (with vacuum hoses attached).



Note

Disregard -items 2, 3-.

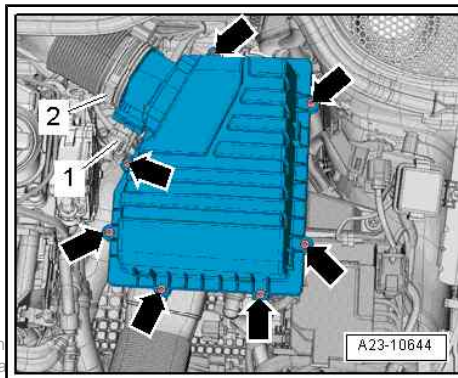


- Unplug electrical connector -1-.
- Release hose clip -2- and detach air hose.
- Unscrew bolts -arrows- and detach air cleaner (top section).
- Detach air filter element.

Installing

- Tightening torque
⇒ ["5.1 Air cleaner - exploded view", page 14](#)

To ensure that the air mass meter -G70- functions properly, it is important to observe the following notes and instructions.

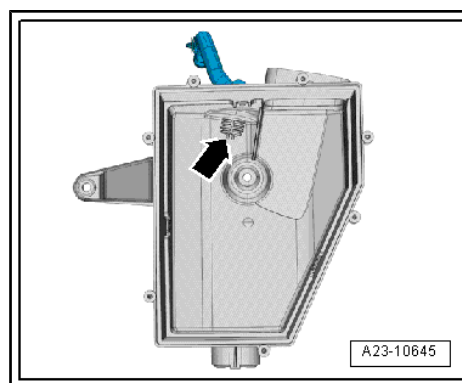


Note

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element.*
- ◆ *The air cleaner housing MUST be clean.*
- ◆ *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- ◆ *Use a silicone-free lubricant when installing the air hoses.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To prevent malfunctions, cover critical parts of the engine air intake (air mass meter, air pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ *Observe environmental requirements for disposal.*

- Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections) using a vacuum cleaner.
- Blow out water drain -arrow- with compressed air.
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
- When installing air filter element, check that it is properly centred in retainer in air cleaner (bottom section).
- Carefully fit top section of air cleaner onto bottom section, without using any force.
- Make sure that air hose is securely fitted on air cleaner (top section).

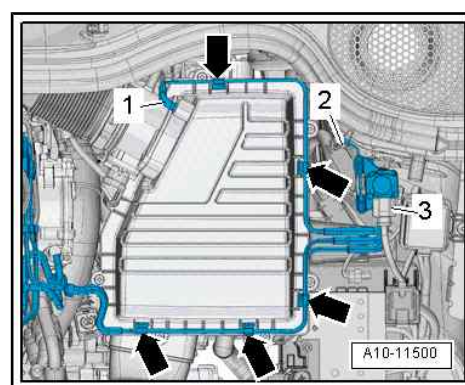
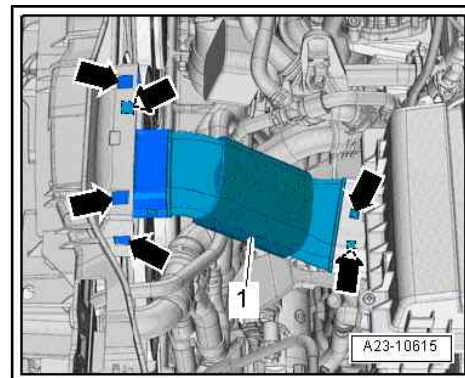
The remaining installation steps are carried out in the reverse sequence.



5.4 Removing and installing air cleaner housing

Removing

- Pull off engine cover panel ⇒ [page 15](#) .
- Release fasteners -arrows- and detach air pipe -1-.
- Detach breather hose -1-.
- Unplug electrical connector -3-.
- Remove bolt -2-.
- Move clear vacuum hoses -arrows- and lay turbocharger air recirculation valve - N249- on top of engine.



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- Unplug electrical connector -1- from air mass meter - G70- .
- Release hose clip -2- and detach air hose.
- Move water drain hose clear -arrow-.
- Unscrew bolt -3- and detach air cleaner housing.

Installing

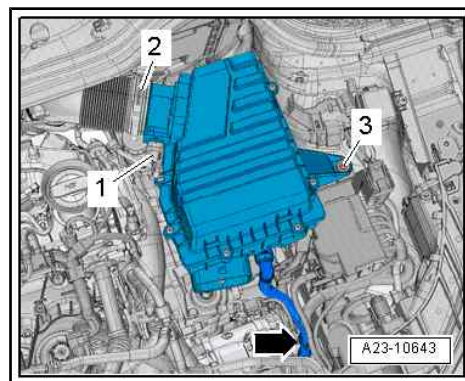
- Tightening torque
⇒ ["5.1 Air cleaner - exploded view", page 14](#)



Note

- ◆ *The air cleaner housing MUST be clean.*
- ◆ *To prevent malfunctions, cover critical parts of the engine air intake (air mass meter, air pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- ◆ *Use a silicone-free lubricant when installing the air hoses.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- Check for salt residue, dirt and leaves in air hose (engine intake side).
- Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
- Press release tabs and disconnect water drain hose
⇒ [Item 19 \(page 15\)](#) .
- Clean dirt and leaves out of connection and hose.

The remaining installation steps are carried out in the reverse sequence.



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5.5 Removing and installing air mass meter - G70-

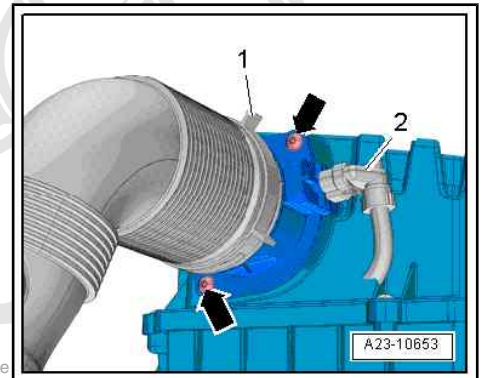
Removing

- Pull off engine cover panel ⇒ [page 15](#) .
- Unplug electrical connector -1-.
- Release hose clip -2- and detach air hose.
- Unscrew bolts -arrows- and carefully pull air mass meter - G70- out of guide in air cleaner housing.

Installing

- Tightening torque
⇒ ["5.1 Air cleaner - exploded view", page 14](#)

To ensure that the air mass meter -G70- functions properly, it is important to observe the following notes and instructions.



Note

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always renew O-ring for air mass meter if damaged (air leak).*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

The remaining installation steps are carried out in the reverse sequence.

6 Intake manifold

Overview

- ◆ ⇒ [“6.1 Intake manifold - exploded view”, page 20](#)
- ◆ ⇒ [“6.2 Removing and installing throttle valve module J338”, page 21](#)
- ◆ ⇒ [“6.3 Removing and installing intake manifold”, page 21](#)

6.1 Intake manifold - exploded view

1 - Guide tube

- ☐ For oil dipstick

2 - Seal

- ☐ Renew

3 - Gaskets

- ☐ Renew

4 - Bolt

- ☐ Tighten in diagonal sequence, working from centre outwards
- ☐ 8 Nm

5 - Fuel return line

6 - Bolt

- ☐ 9 Nm

7 - Bolt

- ☐ 9 Nm

8 - Intake manifold

- ☐ With intake manifold flap motor - V157- and intake manifold flap potentiometer - G336-
- ☐ Do not dismantle
- ☐ Removing and installing ⇒ [page 21](#)

9 - Bracket

- ☐ For exhaust gas recirculation cooler change-over valve - N345-

10 - Bolt

- ☐ 9 Nm

11 - Exhaust gas recirculation cooler change-over valve - N345-

12 - Gasket

- ☐ Renew

13 - Bolt

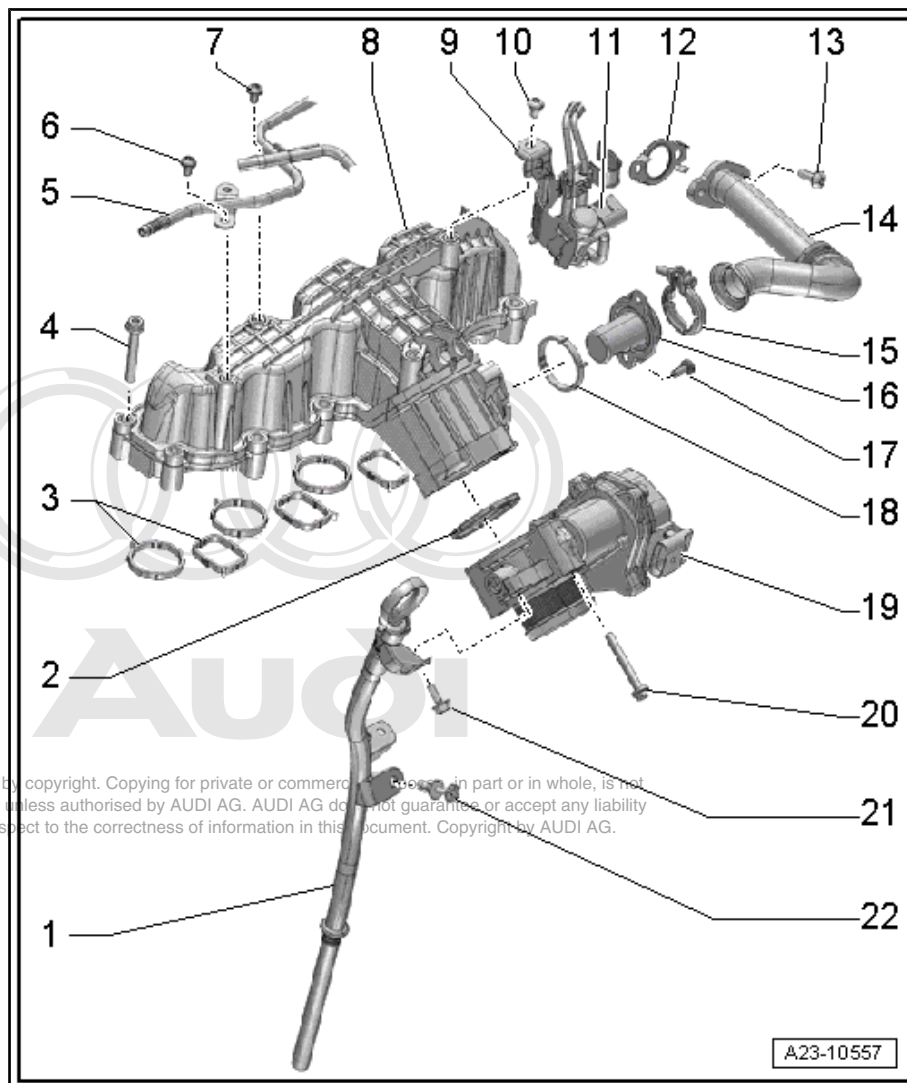
- ☐ Tightening torque ⇒ Rep. gr. 26

14 - Pipe for exhaust gas recirculation

- ☐ To exhaust gas recirculation cooler

15 - Screw-type clip

- ☐ Tightening torque ⇒ Rep. gr. 26



16 - Connection

- ☐ For exhaust gas recirculation

17 - Bolt

- ☐ 8 Nm

18 - Seal

- ☐ Renew

19 - Throttle valve module - J338-

- ☐ With throttle valve potentiometer - G69-
- ☐ Removing and installing ⇒ [page 21](#)

20 - Bolt

- ☐ 8 Nm

21 - Bolt

- ☐ Tightening torque ⇒ Rep. gr. 17

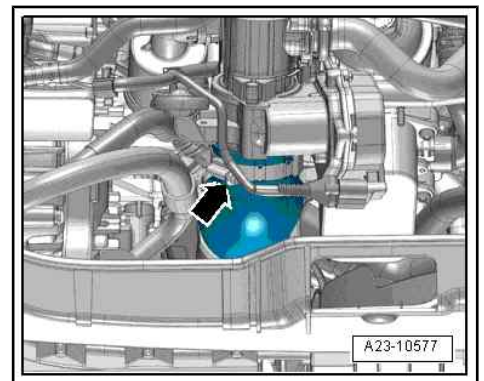
22 - Clip

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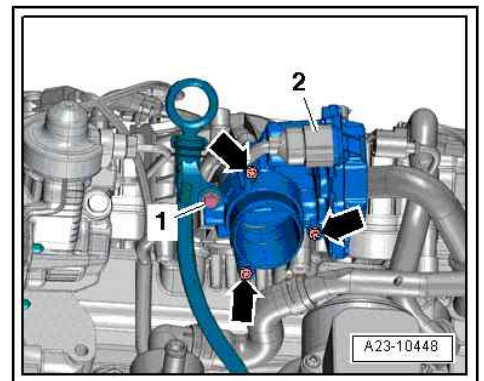
6.2 Removing and installing throttle valve module - J338-

Removing

- Pull off engine cover panel ⇒ [page 15](#) .
- Loosen hose clip -arrow-.



- Unplug electrical connector -2-.
- Remove bolt -1- for dipstick guide tube.
- Remove bolts -arrows- and detach throttle valve module - J338- from air hose.



Installing

Installation is carried out in the reverse order; note the following:

Tightening torques

- ⇒ ["6.1 Intake manifold - exploded view", page 20](#) .
- ⇒ Rep. gr. 17 .



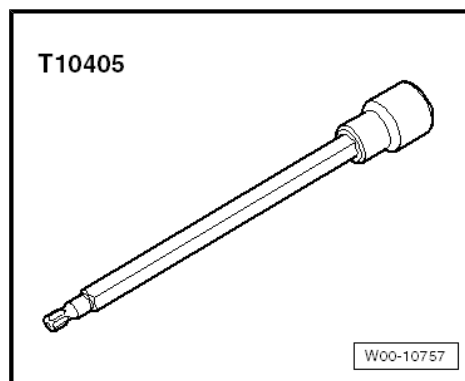
Note

Fit new O-ring.

6.3 Removing and installing intake manifold

Special tools and workshop equipment required

- ◆ Socket Torx T30 - T10405-



Removing



Caution

Risk of malfunctions caused by dirt.

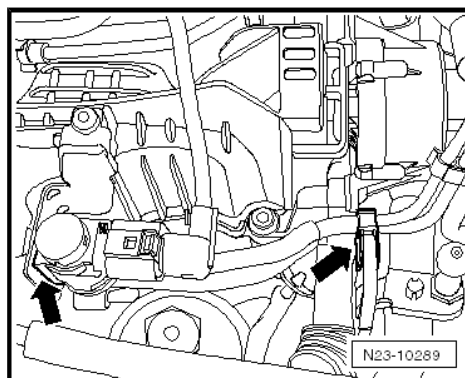
- ◆ **Observe**
⇒ *"1.3 Rules for cleanliness and instructions for working on fuel system", page 2.*

- Pull off engine cover panel ⇒ [page 15](#) .
- Remove fuel rail ⇒ [page 54](#) .
- Take exhaust gas recirculation cooler change-over valve - N345- -left arrow- out of bracket and move clear to one side.

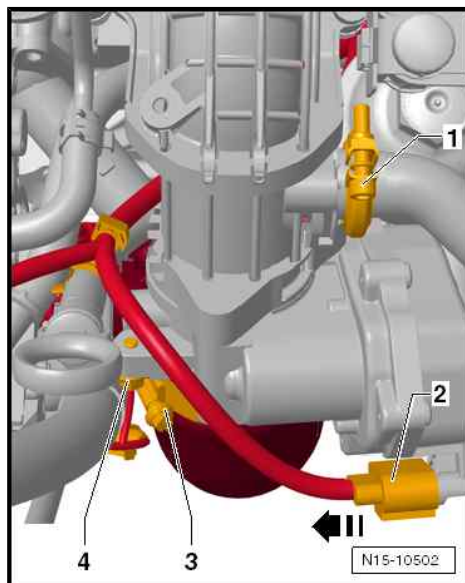


Note

Disregard -arrow- on right-side of illustration.



- Unplug electrical connector -2- at throttle valve module - J338- -arrow-.
- Remove bolt -4- for dipstick guide tube.
- Release screw-type clip -1- and detach exhaust gas recirculation pipe.
- Loosen hose clip -3-.
- Move clear vacuum hose.



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- Unscrew intake manifold bolts -arrows- in diagonal sequence starting from outside and working inwards using bit XZN 8 - T40159- .
- Carefully take out intake manifold.

Installing

Installation is carried out in the reverse order; note the following:

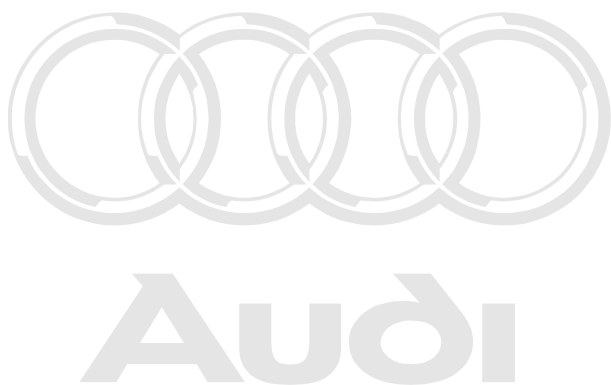
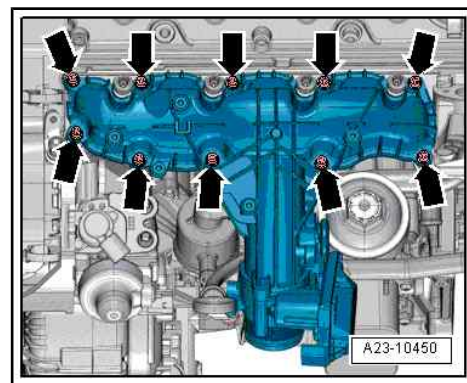
- Tightening torque
⇒ ["6.1 Intake manifold - exploded view", page 20](#)



Note

Renew seals and/or gaskets.

- Install air hose ⇒ Rep. gr. 21 .
- Install fuel rail ⇒ [page 54](#) .



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7 High-pressure pump

Overview

- ◆ ⇒ [“7.1 High-pressure pump - exploded view”, page 24](#)
- ◆ ⇒ [“7.2 Removing and installing high-pressure pump”, page 25](#)
- ◆ ⇒ [“7.3 Performing first fuel filling operation after installing high-pressure pump”, page 28](#)
- ◆ ⇒ [“7.4 Checking fuel system for leaks”, page 29](#)

7.1 High-pressure pump - exploded view

1 - Bracket for ancillaries

- ☐ Removing and installing
⇒ Rep. gr. 13

2 - Bolt

- ☐ 2x
- ☐ Renew
- ☐ 20 Nm + 180° further

3 - Hub

- ☐ Use counterhold tool - T10051- when loosening and tightening
- ☐ To remove, use puller - T40064-

4 - High-pressure pump

5 - Bolt

- ☐ 3x
- ☐ Renew
- ☐ 20 Nm

6 - Nut

- ☐ 95 Nm

7 - Bolt

- ☐ Renew
- ☐ 20 Nm + 45° further

8 - High-pressure pump

- ☐ With fuel metering valve - N290- (do not open)
- ☐ After renewing, first fuel filling operation MUST be performed (it is important not to allow pump to run while it is still empty) ⇒ [page 28](#)

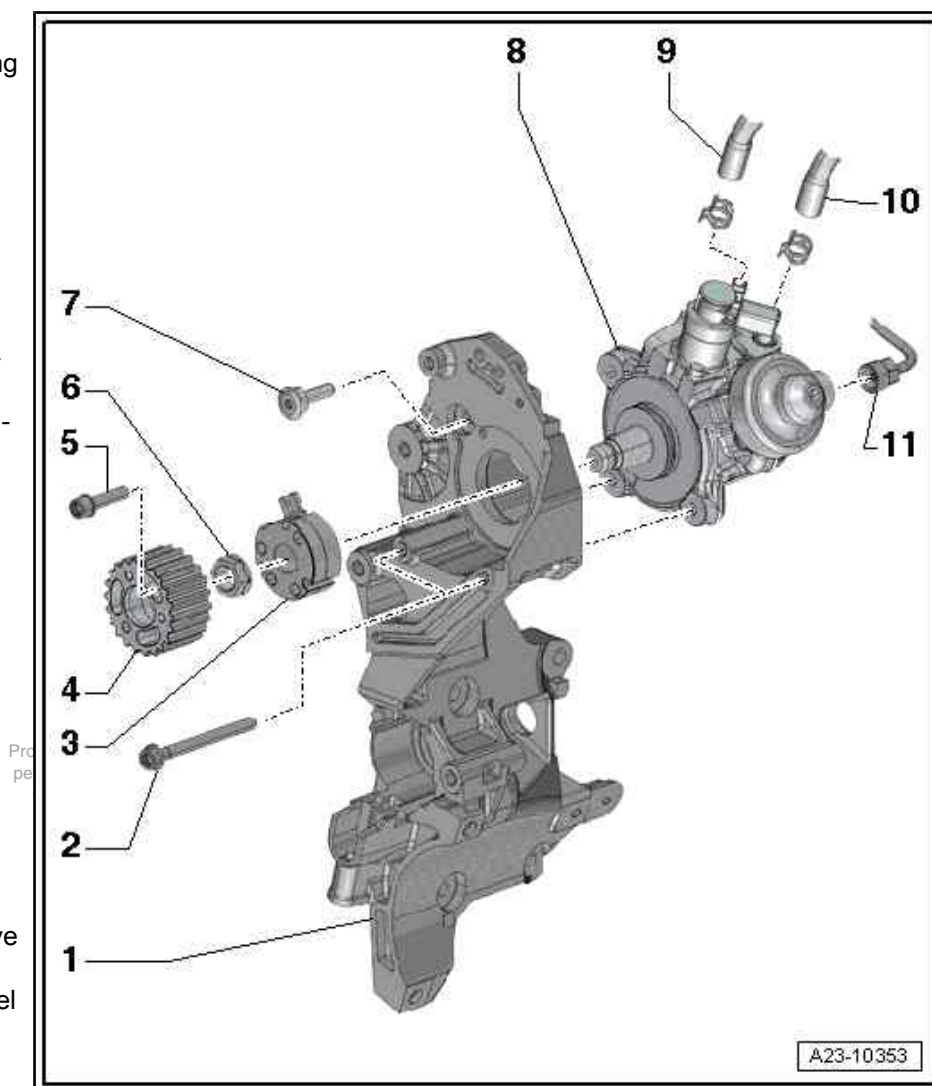
- ☐ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see “Guided Functions” in ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 25](#)

9 - Fuel supply hose

10 - Fuel return hose

11 - High-pressure pipes

- ☐ Between high-pressure pump and fuel rail



- ☐ Do not interchange



Note

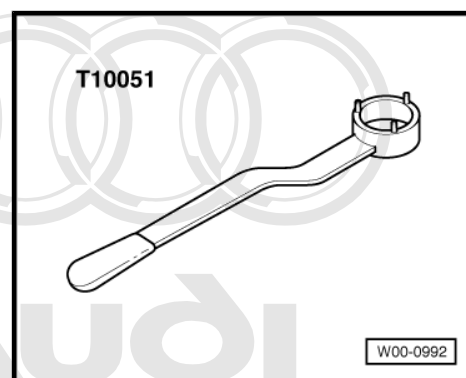
- ◆ *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- ◆ *The high-pressure pipes can be re-used after performing the following checks:*
- ◆ *Check taper seats of high-pressure pipes for deformation and cracks.*
- ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- ◆ *Corroded pipes must not be used again.*

- ☐ Install free of stress
- ☐ 25 Nm

7.2 Removing and installing high-pressure pump

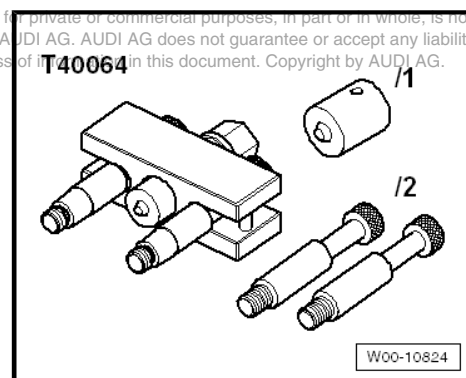
Special tools and workshop equipment required

- ◆ Counterhold tool - T10051-



- ◆ Puller - T40064-

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Removing



Caution

Risk of malfunctions caused by dirt.

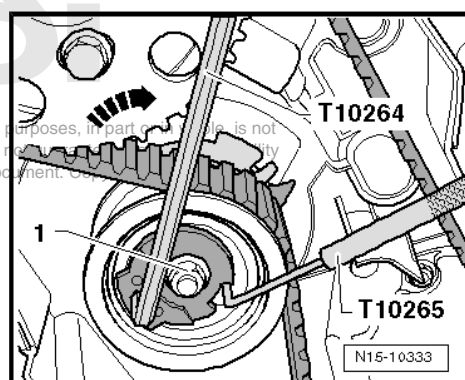
- ◆ **Observe**
⇒ ***"1.3 Rules for cleanliness and instructions for working on fuel system", page 2.***

Running when dry causes irreparable damage to high-pressure pump.

- ◆ *The high-pressure pump must first be filled with fuel before the engine is started. The high-pressure pump must not be allowed to run while still empty. First fuel filling*
⇒ ***page 28***

- Detach toothed belt from idler roller and high-pressure pump
⇒ Rep. gr. 15 ; Removing and installing toothed belt .

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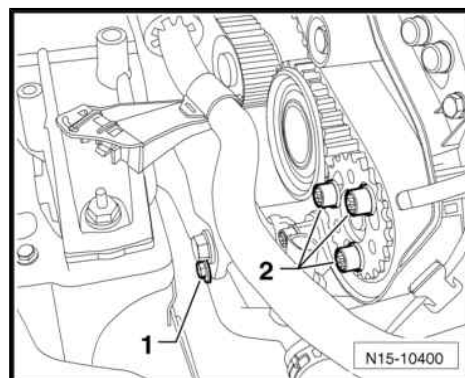


- Remove bolts -2- and detach toothed belt sprocket from high-pressure pump.

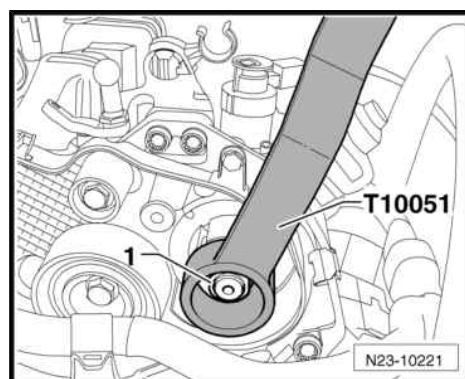


Note

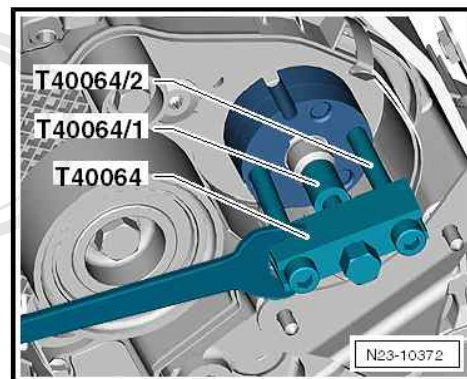
Disregard -item 1-.



- Counterhold using counterhold tool - T10051- and remove nut -1- at hub of high-pressure pump.



- Apply puller - T40064- with thrust piece - T40064/1- and pin - T40064/2- as shown in illustration and pull hub off high-pressure pump. If necessary, counterhold using an open-end spanner (24 mm).



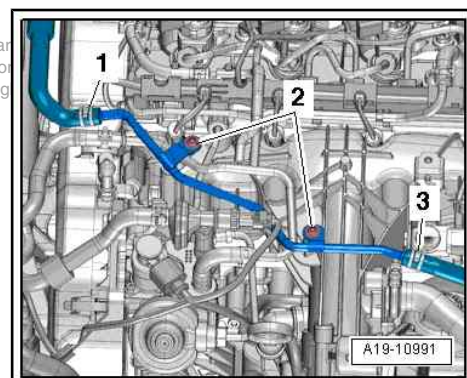
- Remove bolts -2- and place coolant return line to one side.

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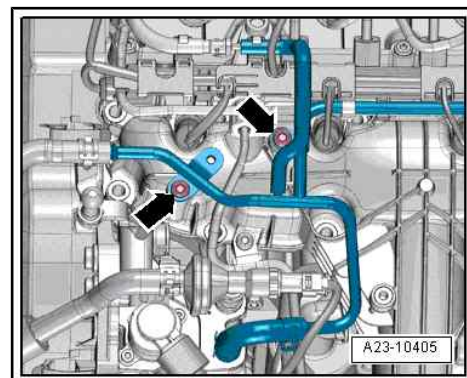


Note

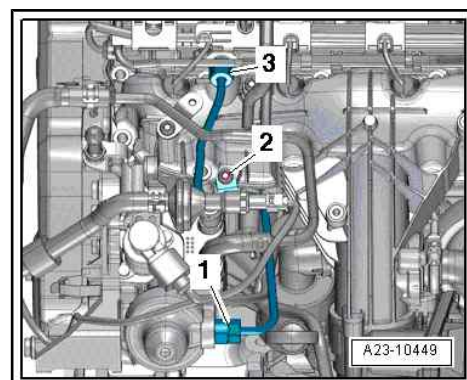
Disregard -items 1, 3-.



- Remove bolts -arrows- and place fuel return line to one side.



- Remove bolt -2- and union nuts -1 and 3- and detach high-pressure pipe.

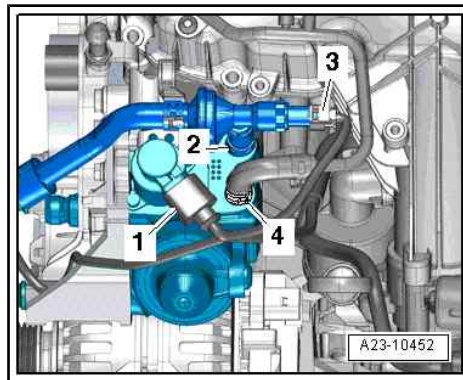


- Unplug electrical connector -1-.
- Detach fuel supply hose -2- and fuel return hose -4-.



Note

Disregard -item 3-.

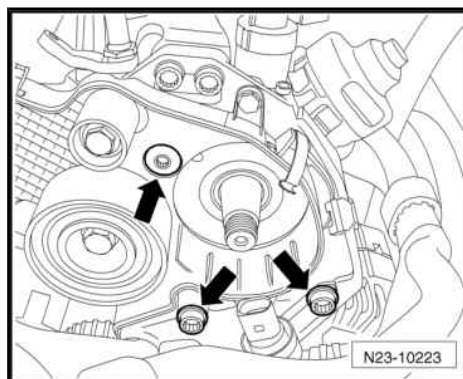


- Remove bolts -arrows- for high-pressure pump.
- Carefully take out high-pressure pump.

Installing

Installation is carried out in the reverse order; note the following:

- Tightening torques
⇒ ["7.1 High-pressure pump - exploded view", page 24](#)
- Install toothed belt ⇒ Rep. gr. 15 .
- Install high-pressure pipe ⇒ [page 43](#) .



Caution

Running when dry causes irreparable damage to high-pressure pump.

- ◆ *The high-pressure pump must first be filled with fuel before the engine is started. The high-pressure pump must not be allowed to run while still empty. First fuel filling
⇒ [page 28](#)*

After renewing high-pressure pump and/or fuel pressure regulating valve - N276- , adaption must be performed. The adaption procedure is described in the Guided Fault Finding or Guided Functions; use ⇒ Vehicle diagnostic tester.

7.3 Performing first fuel filling operation after installing high-pressure pump

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester



Caution

Running when dry causes irreparable damage to high-pressure pump.

- ◆ *The high-pressure pump must first be filled with fuel before the engine is started. The high-pressure pump must not be allowed to run while still empty.*

**Note**

- ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *Only remove sealing plugs immediately prior to installation of fuel lines.*
- ◆ *There must be sufficient fuel in the tank.*

Proceed as follows to fill high-pressure pump with fuel.

- Connect a ⇒ Vehicle diagnostic tester.
- Switch on ignition.
- Select “Engine electronics” in vehicle self-diagnosis.
- Select “Guided Functions”.
- Then select “Activate fuel pump”.
- Select “120 seconds”.
- The fuel pump starts running.
- The fuel pump must run for approx. 2 minutes to ensure that the fuel system is filled sufficiently with fuel.
- Start engine after filling fuel system.
- Run engine at moderate speed for several minutes and then switch off.
- Check fuel system for leaks.
- Erase entry in event memory ⇒ Vehicle diagnostic tester.
- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



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**Note**

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

- Interrogate event memory again.

7.4 Checking fuel system for leaks

- Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.
- Check the entire fuel system for leaks.

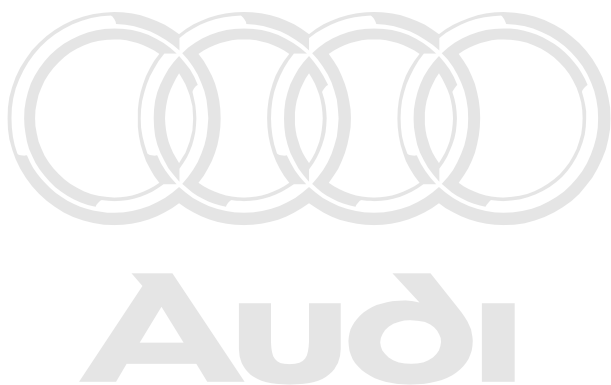
Renew affected component if leakage still occurs after tightening to correct torque.

- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.



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8 Injectors

Overview

- ◆ ⇒ [“8.1 Injectors - exploded view”, page 31](#)
- ◆ ⇒ [“8.2 Checking injectors”, page 34](#)
- ◆ ⇒ [“8.3 Performing adaption of injector delivery calibration values”, page 34](#)
- ◆ ⇒ [“8.4 Checking return flow rate of injectors with engine running”, page 35](#)
- ◆ ⇒ [“8.5 Checking for injectors sticking open”, page 37](#)
- ◆ ⇒ [“8.6 Removing and installing injectors”, page 39](#)

8.1 Injectors - exploded view



Caution

When installing a new base engine, it is essential that the clamping pieces for the injectors are tightened to the specified torque ⇒ [page 31](#) after installing the high-pressure pipes. The clamping pieces are only secured hand-tight at the factory so the injectors can be aligned during installation. If these instructions are not observed, the engine could be damaged.

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1 - Seal

- ☐ For injector
- ☐ In cylinder head cover
- ☐ Renew if leaking ⇒ Rep. gr. 15

2 - Copper seal

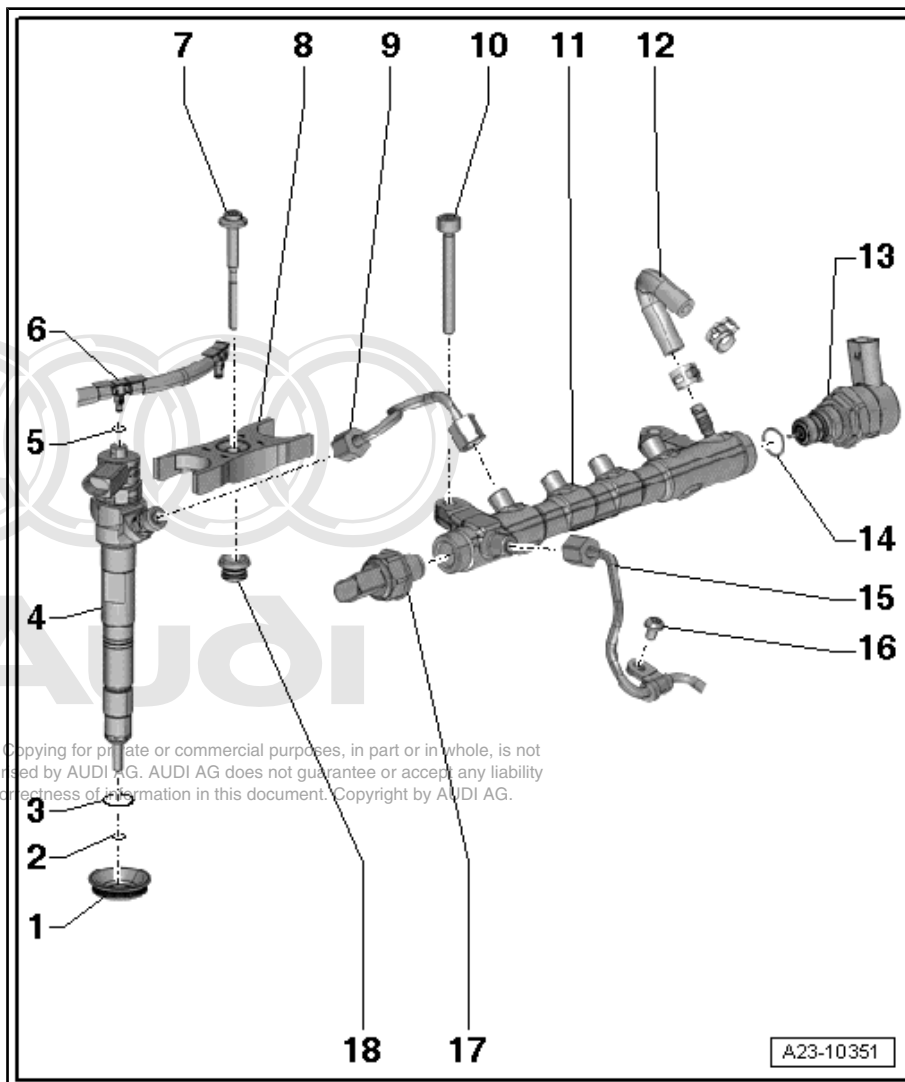
- ☐ Always renew copper seal when removing and installing

3 - O-ring

- ☐ Renew

4 - Injector

- ☐ Use a coloured pen to mark allocation of injectors to corresponding clamping piece and high-pressure pipe, and to corresponding cylinder for re-installation; pay attention to markings when installing
- ☐ Always renew copper seal when removing and installing
- ☐ To remove carbon deposits from the injector sealing surface, clean the injector bore in the cylinder head with cleaning kit - VAS 6811- (it is important to do this to avoid leaks)
- ☐ Removing and installing ⇒ [page 39](#)



5 - O-ring

- ☐ Renew

6 - Fuel return line

- ☐ To fuel tank
- ☐ Must not be kinked, damaged or clogged
- ☐ Do not dismantle
- ☐ After replacement, engine must be run at idling speed for approx. 2 minutes to bleed fuel system. Then check fuel return lines for leaks

7 - Bolt

- ☐ Renew
- ☐ Tighten initially to 2 Nm, then screw on union nuts for high-pressure pipes hand-tight and align injectors
- ☐ Then tighten to final torque (9 Nm + 180°)

8 - Clamping piece



Caution

*Risk of damage to engine.
When installing a new base engine, it is essential that the clamping pieces for the injectors are tightened to the specified torque **⇒ Item 7 (page 32)** after installing the high-pressure pipes. The clamping pieces are only secured hand-tight at the factory so the injectors can be aligned during installation.*



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- ☐ Use a coloured pen to mark injectors and corresponding clamping piece and cylinder for re-installation; pay attention to markings when installing
- ☐ The clamping pieces can be re-used when installing new injectors
- ☐ Each clamping piece secures two injectors

9 - High-pressure pipe

- ☐ Between fuel rail and injectors



Note

- ◆ *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- ◆ *The high-pressure pipes can be re-used after performing the following checks:*
- ◆ *Check taper seats of high-pressure pipes for deformation and cracks.*
- ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- ◆ *Corroded pipes must not be used again.*

- ☐ Install free of stress
- ☐ 25 Nm

10 - Bolt

- ☐ 22 Nm

11 - Fuel rail

- ☐ Removing and installing **⇒ page 54**

12 - Fuel return hose

13 - Fuel pressure regulating valve - N276-

- ☐ Always renew after removing
- ☐ Removing and installing **⇒ page 50**
- ☐ 80 Nm
- ☐ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see "Guided Functions" in **⇒ Vehicle diagnostic tester**

14 - O-ring

- ☐ Renew

15 - High-pressure pipe

- ☐ Between high-pressure pump and fuel rail

**Note**

- ◆ *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- ◆ *The high-pressure pipes can be re-used after performing the following checks:*
- ◆ *Check taper seats of high-pressure pipes for deformation and cracks.*
- ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- ◆ *Corroded pipes must not be used again.*

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- ☐ 25 Nm

16 - Bolt

- ☐ 8 Nm

17 - Fuel pressure sender - G247-

- ☐ Removing and installing ⇒ [page 51](#)
- ☐ 100 Nm

18 - Grommet

- ☐ In cylinder head cover

8.2 Checking injectors

There are two different tests for checking the operation of the injectors.

- Checking adaption of "Injector delivery calibration values"
⇒ [page 34](#)
- Checking return flow rate of injectors with engine running
⇒ [page 35](#)

8.3 Performing adaption of injector delivery calibration values

The "Injector delivery calibration values" function serves to correct the injection rates for each cylinder of a common rail system individually across the entire operating range.

The 7-digit adaption values -1- (details in illustration are only an example) are marked separately on each injector. The values may consist of letters and/or numbers.

Injector (view from above)

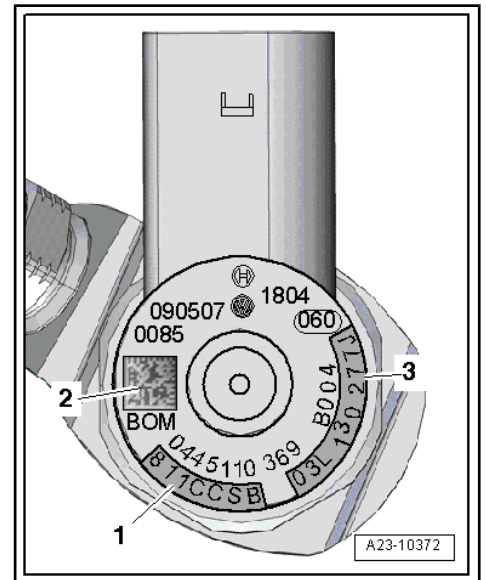
- 1 - Checksum
- 2 - Data matrix code
- 3 - Part number

When a new injector is installed, the adaption value must be written into the engine control unit.

When a new engine control unit is installed, the "Adaption values for injectors" must be written into the new control unit.

Additionally, check that the "injector delivery calibration values" are correctly entered for all the other injectors. Do NOT attempt to re-enter these values if the correct values are already stored in the engine control unit.

The adaption procedure is described in the "Guided Fault Finding". (The procedure is also described under "Guided Functions".) Use ⇒ Vehicle diagnostic tester



8.4 Checking return flow rate of injectors with engine running

A - Checking return flow rate of all injectors

Special tools and workshop equipment required

- ◆ Fuel-resistant measuring container



Caution

Risk of malfunctions caused by dirt.

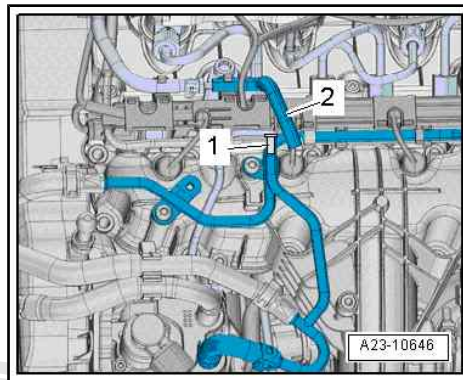
◆ Observe

⇒ **"1.3 Rules for cleanliness and instructions for working on fuel system", page 2**.

- Pull off engine cover panel ⇒ [page 15](#).
- Disconnect hose connection at fuel line.

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- Seal off the open return connection with a plug -1-.
- Hold end of fuel return hose -2- (lengthen if necessary) in a measuring container to measure the total return flow rate.
- Start engine and let it idle for 2 minutes.
 - Specification for 2 minutes: 0 ml to 50 ml
- If specification is attained, increase engine speed to 2000 ... 2500 rpm for approx. 2 minutes and then check return flow rate again.
 - Specification for 2 minutes: less than 250 ml


Note

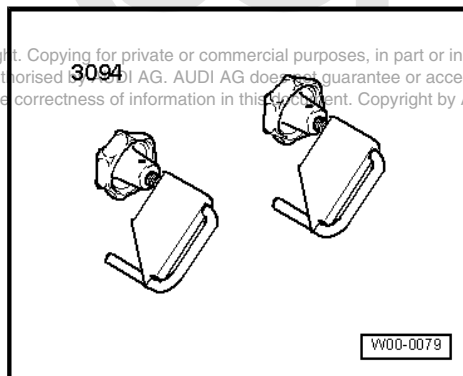
1000 ml = 1 litre

If specification is exceeded, this indicates that one or more injectors are defective. Check return flow rate from each injector individually.

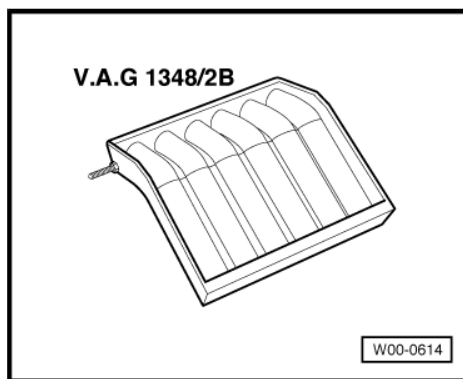
B - Checking return flow rate of individual injectors
Special tools and workshop equipment required

- ◆ Hose clamps, up to 25 mm - 3094-

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- ◆ Injection rate comparison meter - V.A.G 1348/2 B-

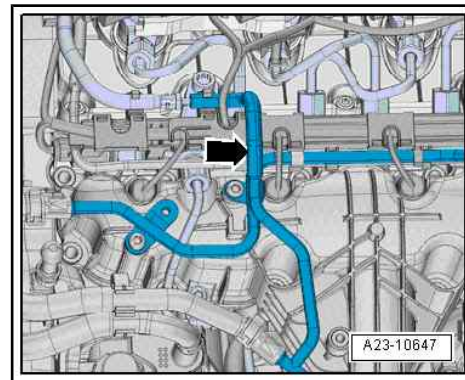


- ◆ 4 lengths of hose (made up in the workshop) to fit return line connections on injectors

Each injector normally has a relatively low return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

- Clean all return line connections (e.g. with commercial cleaning solution etc.) before removing.
- Dry all components after cleaning.

- Clamp off fuel return hose -arrow- using hose clamp up to 25 mm - 3094- .



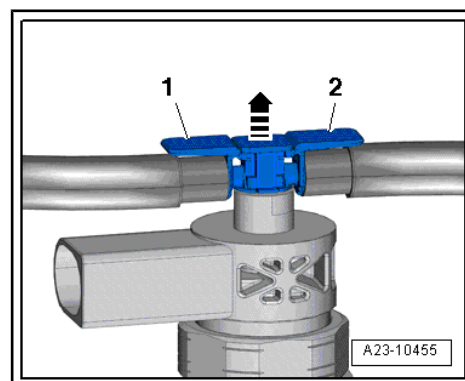
- Pull return line connections off injectors; to do so, press tabs -1- and -2- down and at the same time pull release pin upwards -arrow-.



Note

No dirt must be allowed to get into the disconnected return lines or the open connections on the injectors.

- Connect hoses onto return line connections of all 4 injectors.
- Run the 4 hoses into injection rate comparison meter - V.A.G 1348/2 B- .
- Start engine and let it idle for several minutes.



Caution

Risk of damage to injectors when return lines are disconnected.

- ◆ ***Do NOT press the accelerator during this test; the engine must only run at idling speed.***

- When the engine is warm and running at idling speed, the return flow rates at each of the 4 return lines must not differ by more than a small amount.
- If one injector has a significantly higher return flow rate than the others it must be renewed ⇒ [page 39](#) .

Installing fuel return lines

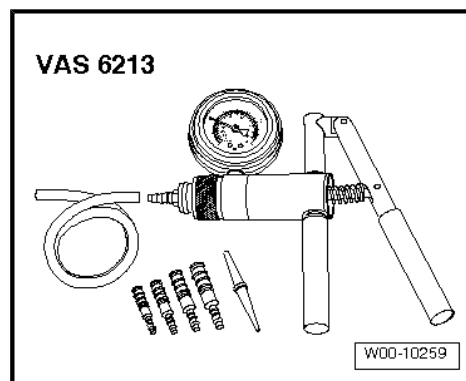
- Push return line connections carefully onto injectors. The catch should engage audibly. Then press release pin down carefully.
- Check fuel system for leaks ⇒ [page 29](#) .

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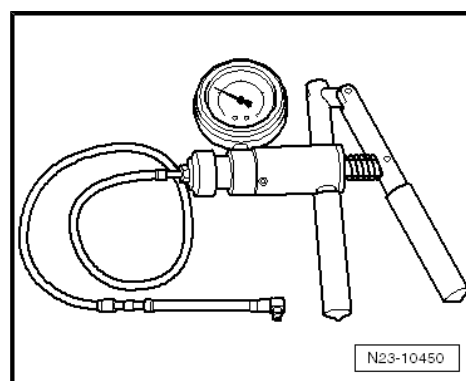
8.5 Checking for injectors sticking open

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-



- ◆ Use a return line to make an -adapter-.



Caution

Risk of malfunctions caused by dirt.

- ◆ **Observe**
⇒ ***"1.3 Rules for cleanliness and instructions for working on fuel system", page 2***.

- Erase entry in event memory ⇒ Vehicle diagnostic tester.
- Pull off engine cover panel ⇒ [page 15](#).
- Clean all connections (with commercial cleaning solution or similar) before removing.



Note

- ◆ *Make sure all parts are clean; no dirt must be allowed to enter the fuel system.*
- ◆ *Check all cylinders in turn.*
- Dry all components after cleaning.

Start with cylinder No. 1.

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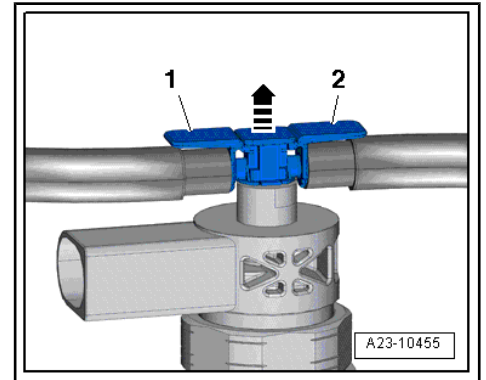
- Pull return line connections off injectors; to do so, press tabs -1- and -2- down and at the same time pull release pin upwards -arrow-.
- Connect adapter to return line connection of injector to be tested after adapter has been cleaned and blown out.
- Generate a vacuum of -500 mbar using the hand vacuum pump - VAS 6213- .

If the vacuum reading remains the same for 30 seconds, the injector is OK.

If the injector is faulty, the vacuum reading will fall back to 0 bar within 2 to 3 seconds.

Repeat test if necessary; note drop in vacuum reading on hand vacuum pump - VAS 6213- .

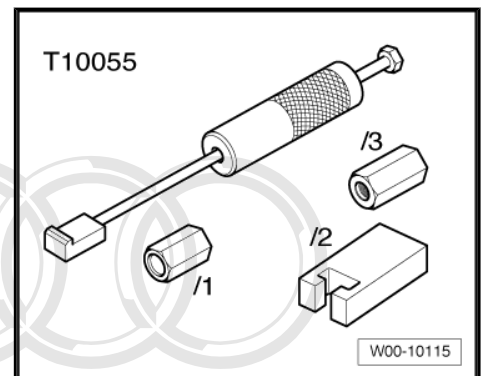
- Renew faulty injectors ⇒ [page 39](#) .



8.6 Removing and installing injectors

Special tools and workshop equipment required

- ◆ Cleaning kit - VAS 6811-
- ◆ Puller - T10055-



- ◆ Assembly sleeve - T10377-



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- ◆ Puller - T10415-

Removing



Caution

Risk of malfunctions caused by dirt.

- ◆ **Observe**

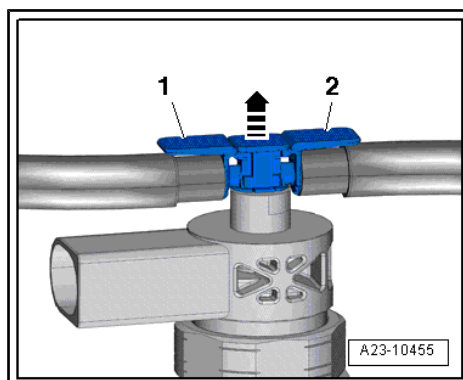
⇒ ***"1.3 Rules for cleanliness and instructions for working on fuel system", page 2*** .

- Pull off engine cover panel ⇒ [page 15](#) .

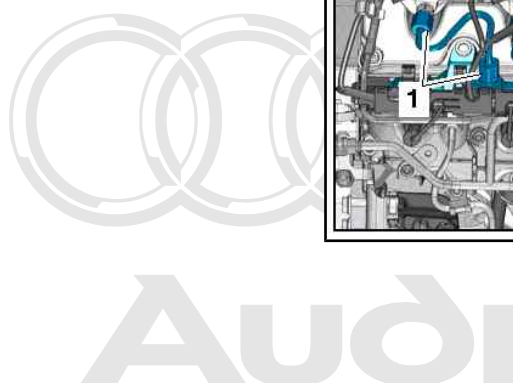
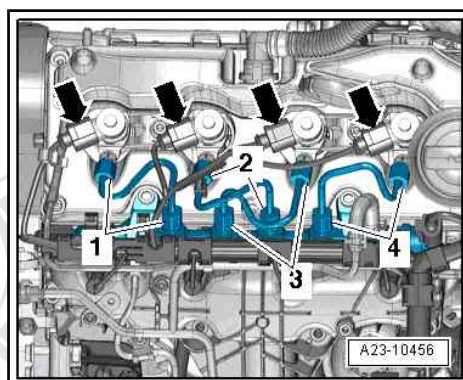

Caution

- ◆ *Mark cylinder numbers on injector units. They must always be re-installed on the same cylinders.*
- ◆ *Plug open connections with suitable sealing caps immediately.*

- Pull return line connections off injectors; to do so, press tabs -1- and -2- down and at the same time pull release pin upwards -arrow-.



- Unplug electrical connectors -arrows- at injectors.
- Unscrew union nuts on corresponding high-pressure pipe (-1 to 4-) and detach corresponding high-pressure pipe.
- Unscrew bolt -1- for clamping piece.



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- Apply puller - T10055- with puller - T10415- as shown in illustration, and pull out injectors upwards.



Note

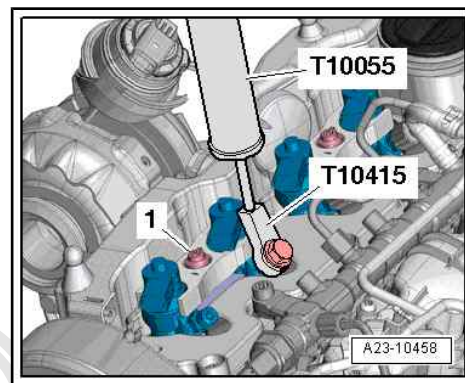
To avoid damaging the sealing lip, rotate the injector while pulling it out.

- After removal, lay injectors on a clean cloth.

Important instructions for installing injectors:

When installing injectors, the following components must be renewed:

- ◆ Bolt for clamping piece
- ◆ Copper seal
- ◆ O-ring for injector bore
- ◆ O-ring for fuel return line connection



Note

- ◆ *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- ◆ *The high-pressure pipes can be re-used after performing the following checks:*
 - ◆ *Check taper seats of high-pressure pipes for deformation and cracks.*
 - ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
 - ◆ *Corroded pipes must not be used again.*

If a used injector is being re-installed:

- Spray tip of injector nozzle with rust-releasing spray. Wait approx. 5 minutes and wipe off soot particles and oil with a cloth.
- To remove the old copper seal from the injector, clamp the seal carefully in a vice so that it is just held between the jaws without turning. Then carefully pull and twist the injector out of the copper seal by hand.
- Clean off deposits under the copper seal using a suitable scraper.

Continued (same procedure for used and new injectors):

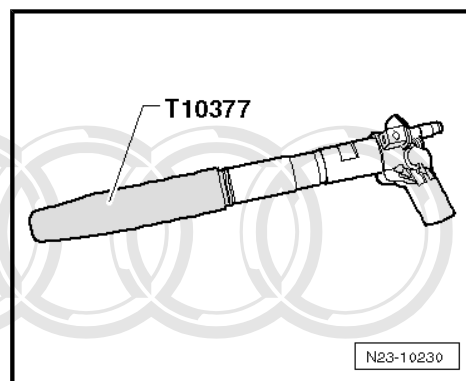


Caution

Risk of damage to injector sealing surface.

- ◆ *To remove carbon deposits from the injector sealing surface, clean the injector bore in the cylinder head using the cleaning kit - VAS 6811- or a cloth soaked in engine oil.*

- Renew seal for injector using assembly sleeve - T10377- .
- Install injectors.
- Slide clamping piece onto injectors; observe installation position.
- Always insert 2 injectors with clamping piece carefully into bores in cylinder head.
- Hand-tighten union nuts on high-pressure pipes. Make sure that connections are not under tension.
- Tighten clamping piece to specified torque.
- Tightening torque for clamping piece:
⇒ ["8.1 Injectors - exploded view", page 31](#)
- Press return line connections carefully over seals and onto injectors (check seal for damage before connecting return line). The catch should engage audibly. Then press release pin down carefully.



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When one or more injectors have been renewed, the "Injector delivery calibration values" for the new injectors must be programmed in the engine control unit.

Additionally, check that the "Injector delivery calibration values" are correctly entered for all the other injectors. Do NOT attempt to re-enter these values if the correct values are already stored in the engine control unit.

Bleeding fuel system and checking for leaks



Note

The fuel system is self-bleeding; do not open the high-pressure connections.

- Run engine at idling speed for several minutes and then switch off.
- Switch off ignition.
- Check the complete fuel system including all 4 return line connections for leaks.

Renew affected component if leakage still occurs after tightening to correct torque.



Note

The return lines can only be renewed as a complete unit.

- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

9 Senders and sensors

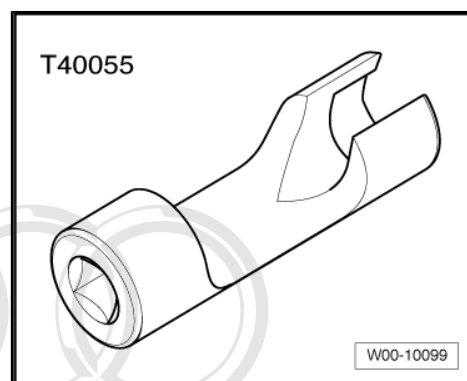
Overview

- ◆ ⇒ [“9.1 Removing and installing high-pressure pipe”, page 43](#)
- ◆ ⇒ [“9.2 Checking fuel pressure regulating valve N276 ”, page 45](#)
- ◆ ⇒ [“9.3 Checking fuel pressure \(low pressure\)”, page 46](#)
- ◆ ⇒ [“9.4 Checking fuel pump delivery rate”, page 48](#)
- ◆ ⇒ [“9.5 Removing and installing fuel pressure regulating valve N276 ”, page 50](#)
- ◆ ⇒ [“9.6 Removing and installing fuel pressure sender G247 ”, page 51](#)
- ◆ ⇒ [“9.7 Removing and installing fuel rail”, page 54](#)

9.1 Removing and installing high-pressure pipe

Special tools and workshop equipment required

- ◆ Socket - T40055-



Removing

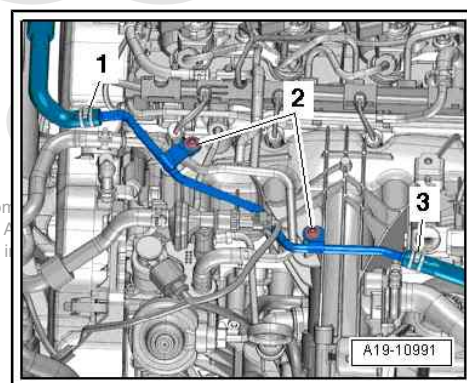
- Pull off engine cover panel ⇒ [page 15](#) .
- Remove bolts -2- and place coolant return line to one side.



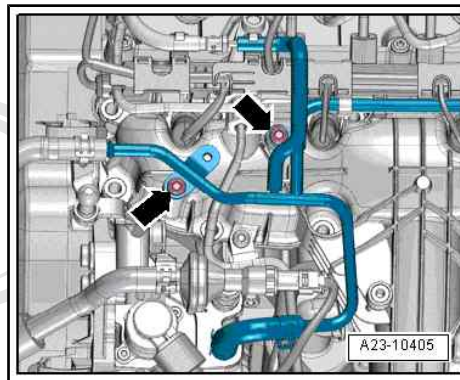
Note

Disregard -items 1, 3-.

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- Remove bolts -arrows- and place fuel return line to one side.



- Remove bolt -2- and union nuts -1 and 3- and detach high-pressure pipe.

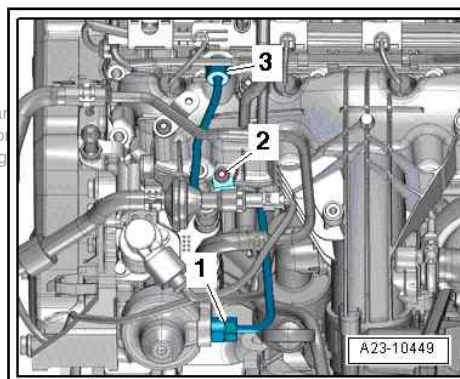
Installing

- Tightening torque = 8.1 Injectors - exploded view, page 31



Note

- ◆ Note identification marks for cylinder allocation when re-installing high-pressure pipes.
- ◆ The high-pressure pipes can be re-used after performing the following checks:
- ◆ Check taper seats of high-pressure pipes for deformation and cracks.
- ◆ The bore of the pipe must not be distorted, restricted or otherwise damaged.
- ◆ Corroded pipes must not be used again.

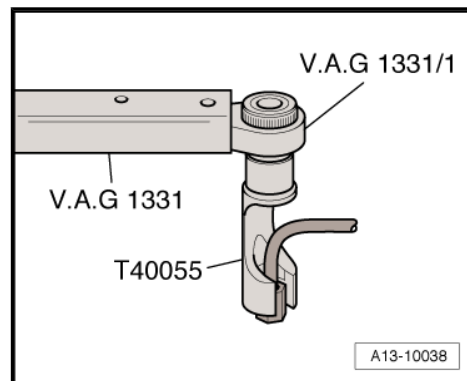


Caution

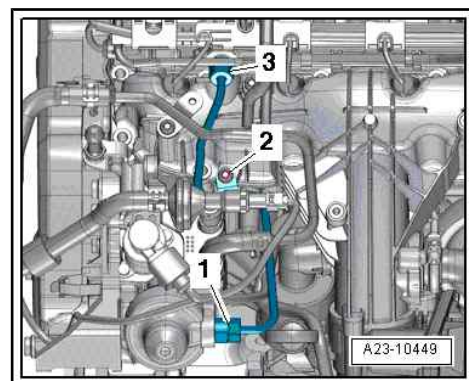
The fuel rail and the clamping pieces can be slackened so that the injector pipes are not installed under tension. If necessary, move the fuel rail slightly and turn the corresponding injector slightly. Never bend the pipes or subject them to tension. Bending the pipes would ultimately cause them to fracture.

- Use vacuum cleaner to remove dirt from taper seat at fuel rail.
- Clean fuel pipe and end of pipe using cleaning solution and dry with compressed air.
- Lubricate threads of union nuts with fuel.
- Hand-tighten union nuts on high-pressure pipes (ensure that pipes are not under tension).

- To tighten unions of high-pressure pipes to fuel rail and injectors, use torque wrench - V.A.G 1331- with socket - T40055- .



- Tighten high-pressure pipe -2- between high-pressure pump and fuel rail first at high-pressure pump -4- and then at fuel rail -1-.
- Tighten bolt -3- for bracket for high-pressure fuel pipe.
- Check fuel system for leaks ⇒ [page 29](#) .



9.2 Checking fuel pressure regulating valve - N276-

Special tools and workshop equipment required

- ◆ Fuel-resistant measuring container



Caution

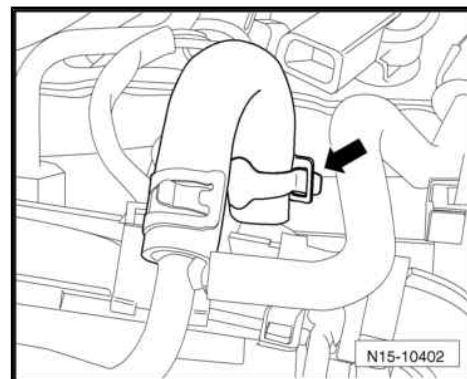
Risk of malfunctions caused by dirt.



Observe

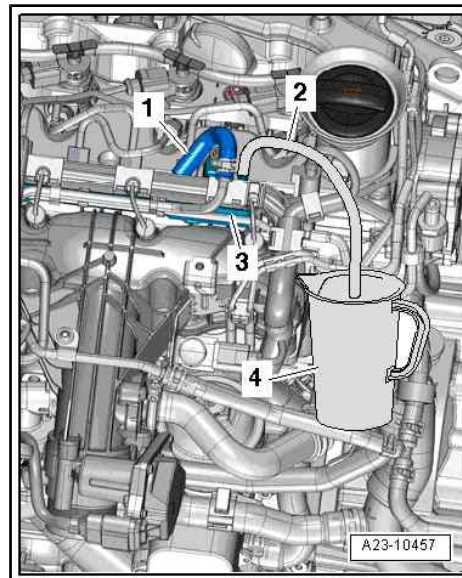
⇒ ***"1.3 Rules for cleanliness and instructions for working on fuel system", page 2*** .

- Pull off engine cover panel ⇒ [page 15](#) .
- Release hose clip -arrow- and detach fuel return hose from fuel rail.
- Seal off open return line connection with a plug.



- Connect test hose -2- to return line connection of fuel rail -3-.
- Hold end of test hose into measuring container -4- to measure return flow rate.
- Start engine and let it idle for 30 seconds.
- Specification: 90 ... 110 ml in 30 seconds

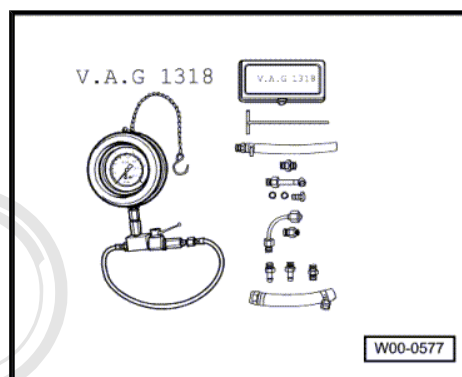
If specification is not obtained, fuel pressure regulating valve - N276- is defective.



9.3 Checking fuel pressure (low pressure)

Special tools and workshop equipment required

- ◆ K-Jetronic pressure tester - V.A.G 1318-



Test conditions:

- Battery voltage at least 12.5 V.
- Fuel filter OK.
- Fuel tank at least 1/2 full.
- Ignition off.

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Checking residual pressure

- Pull off engine cover panel ⇒ [page 15](#) .



Caution

Risk of malfunctions caused by dirt.

- ◆ **Observe**

⇒ ***"1.3 Rules for cleanliness and instructions for working on fuel system", page 2*** .

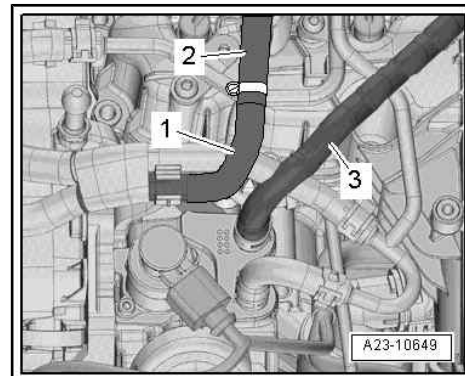
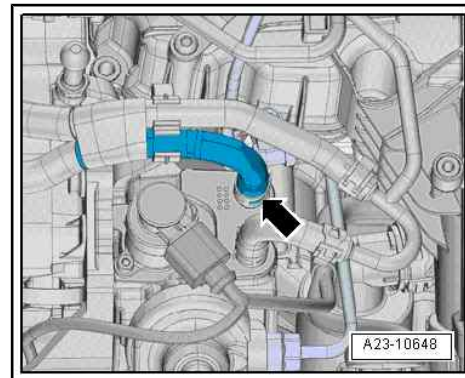


WARNING

Risk of injury - fuel system operates under pressure.

- ◆ *Wrap a clean cloth around the connection before opening the fuel system. Then release pressure by carefully loosening the connection.*

- Release hose clip and detach fuel supply line -arrow- from high-pressure pump.
- Connect K-Jetronic pressure tester - V.A.G 1318- to fuel supply line -1- with suitable adapter -2-.
- Connect second hose -3- (from K-Jetronic pressure tester - V.A.G 1318-) to open connection on high-pressure pump, as shown in illustration.



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Note

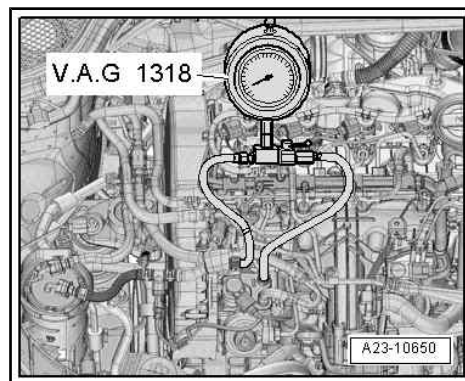
In this way the K-Jetronic pressure tester - V.A.G 1318- is connected into the fuel supply line.

- Connect a ⇒ Vehicle diagnostic tester.
- Switch on ignition.
- Select "Engine electronics" in vehicle self-diagnosis.
- Then select "Basic setting".
- Select "Checking fuel system pressurisation pump" from the list.
- Press "Start" key: The fuel pump will start running.
- Let fuel pump run until maximum fuel pressure has built up.
- Specification: at least 3.5 bar

If specification is not obtained:

- ◆ Leak at union between K-Jetronic pressure tester - V.A.G 1318- and fuel line.
- ◆ Leak in pressure tester.
- ◆ Leak in fuel lines and their connections.
- ◆ Fuel filter is blocked.

- Check delivery rate of fuel pump ⇒ [page 48](#)



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Note

Check fuel system for leaks.

9.4 Checking fuel pump delivery rate

Special tools and workshop equipment required

- ◆ Measuring container (fuel-resistant)

Test conditions:

- Battery voltage at least 12.5 Volt.
- Fuel filter OK.
- Fuel tank at least 1/2 full.
- Ignition switched off

Checking fuel delivery rate

- Pull off engine cover panel ⇒ [page 15](#) .



Caution

Risk of malfunctions caused by dirt.

- ◆ **Observe**
⇒ **"1.3 Rules for cleanliness and instructions for working on fuel system", page 2** .

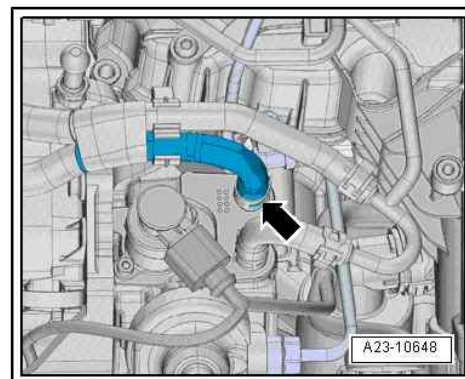


WARNING

Risk of injury - fuel system operates under pressure.

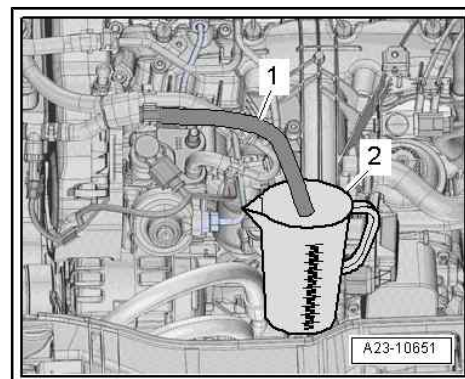
- ◆ **Wrap a clean cloth around the connection before opening the fuel system. Then release pressure by carefully loosening the connection.**

- Release hose clip and detach fuel supply line -arrow- from high-pressure pump.



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- Hold fuel supply line -1- into a measuring container -2-.
- Connect a ⇒ Vehicle diagnostic tester.
- Switch on ignition.
- Select "Engine electronics" in vehicle self-diagnosis.
- Then select "Basic setting".
- Select "Checking fuel system pressurisation pump" from the list.
- Press "Start" key: The fuel pump will start running.
- Let fuel pump run for 15 seconds and exit activation function.
- Specification in 15 seconds: at least 600 ml



If minimum delivery rate is not reached, check for the following causes:

- ◆ Fuel pump was not running for 15 seconds
- ◆ Fuel lines have been crushed
- ◆ Fuel filter is blocked
- ◆ Fuel pumps defective: Checking ⇒ Rep. gr. 20



Note

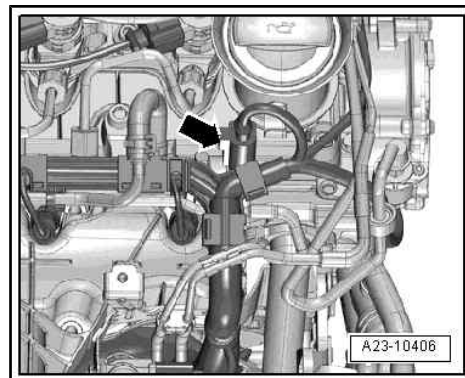
Check fuel system for leaks.

9.5 Removing and installing fuel pressure regulating valve - N276-



Note

- ◆ *The fuel pressure regulating valve - N276- -2- is located in the fuel rail. It maintains a constant pressure in the fuel rail and the injector pipes (high-pressure fuel circuit).*
- ◆ *If the pressure in the high-pressure fuel circuit is too high, the regulating valve opens to allow some of the fuel to flow back from the fuel rail to the fuel tank via a return line.*
- ◆ *If the pressure in the high-pressure fuel circuit is too low, the fuel pressure regulating valve - N276- closes and seals off the high-pressure section of the system from the low-pressure section.*
- ◆ *Fuel pressure regulating valve - N276- must always be renewed after it has been removed.*



Removing



Caution

Risk of malfunctions caused by dirt.

- ◆ **Observe**
⇒ ***"1.3 Rules for cleanliness and instructions for working on fuel system", page 2***.

- Remove fuel rail ⇒ [page 54](#).
- Before removal, clean area around thread for fuel pressure regulating valve - N276- using commercial cleaning solution or similar (no dirt must enter opening in fuel rail).

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Note

Clean carefully; cleaning solution must not enter the electrical connector.

- Dry off fuel pressure regulating valve - N276-.
- Slacken union nut (counterhold at hexagon flats on housing). Then unscrew and remove by hand.
- Extract dirt from opening in fuel rail (thread and sealing surface) using a vacuum cleaner. Do not use metal tools, etc.
- Seal off open fuel rail connection with clean plug.

Installing

- Tightening torque ⇒ ["8.1 Injectors - exploded view", page 31](#)

**Note**

- ◆ *The fuel pressure regulating valve - N276- has a deformable sealing lip and no separate seal; it can therefore be used only once.*
- ◆ *Check that sealing surfaces (deformable sealing lip) and threads on new fuel pressure regulating valve - N276- are not damaged.*
- ◆ *Check sealing surface at opening in fuel rail.*
- ◆ *The beginning of the thread, the deformable sealing lip and the O-ring of the fuel pressure regulating valve - N276- must be coated with diesel fuel.*

- Screw on union nut by hand.
- Align new regulating valve so that connecting wire is free of tension after connector is attached.
- Hold regulating valve in this position by holding hexagon flats on housing of regulating valve with open-end spanner or pliers (water pump pliers or similar).
- Use suitable torque wrench with an open-end spanner insert (30 mm) to tighten union nut.
- Install fuel rail ⇒ [page 54](#) .
- After installation, run engine at moderate speed for several minutes and then switch off.
- Check fuel system for leaks.
- Interrogate event memory.

After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see "Guided Functions" in ⇒ Vehicle diagnostic tester

- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.
- Interrogate event memory again.

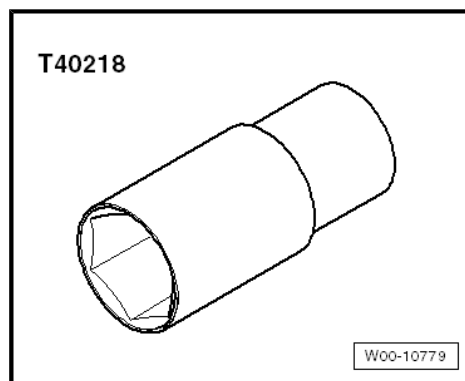
9.6 Removing and installing fuel pressure sender - G247-

**Note**

- ◆ *The fuel pressure sender - G247- continuously measures the fuel pressure in the high-pressure system. It transmits a corresponding voltage signal to the engine control unit - J623- .*
- ◆ *Should the fuel pressure sender fail, the engine control unit will control the fuel pressure via a mapped open-loop backup function. Maximum engine speed in this mode is restricted.*
- ◆ *The fuel pressure sender - G247- has a deformable sealing lip.*

Special tools and workshop equipment required

- ◆ Bit (27 mm) - T40218- or commercially available socket (27 mm)



Removing



Caution

Risk of malfunctions caused by dirt.

- ◆ **Observe**
⇒ ***“1.3 Rules for cleanliness and instructions for working on fuel system”, page 2.***

- Pull off engine cover panel ⇒ [page 15](#).
- Before removal, clean area around thread for fuel pressure sender using commercial cleaning solution etc. (no dirt must enter opening).



Note

Clean carefully; cleaning solution must not enter the electrical connector.

- Dry off fuel pressure sender - G247-

off fuel pressure sender - G247- is not intended for commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Unplug electrical connector -B- at fuel pressure sender - G247- .
- Unscrew fuel pressure sender - G247- using socket, 27 mm - T40218- .

**Note**

An open-end spanner must not be used for loosening or tightening.

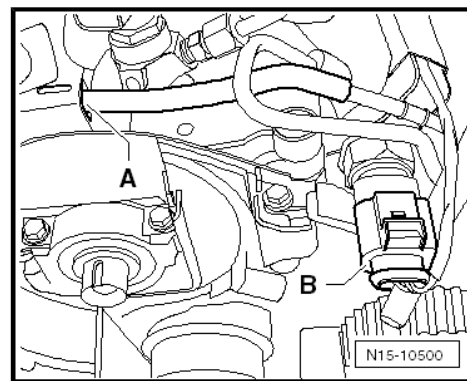
- Extract dirt from opening in fuel rail (thread and sealing surface) using a vacuum cleaner. Do not use metal tools, etc.
- Seal off opening in fuel rail with a plug.

Installing

- Tightening torques
⇒ ["8.1 Injectors - exploded view", page 31](#)

**Note**

- ◆ *The fuel pressure sender - G247- does not have a seal; instead, it has a deformable sealing lip.*
- ◆ *Check that sealing surfaces (deformable sealing lip) and threads on fuel pressure sender - G247- are not damaged. If inspection of fuel pressure sender - G247- shows that it is OK, it can be used again.*
- ◆ *Also check sealing surface at opening in fuel rail.*
- ◆ *The beginning of the thread and the deformable sealing lip of the fuel pressure sender - G247- must be coated with diesel fuel.*
- Screw in fuel pressure sender - G247- by hand.
- Then tighten fuel pressure sender - G247- to specified torque.
- After installing fuel pressure sender - G247- , leave engine running at moderate speed for a few minutes when bleeding fuel system and then switch off again.

**Note**

The fuel system is "self-bleeding"; do NOT open the high-pressure connections.

- Interrogate event memory and erase it if necessary.
- Switch off ignition.
- Carefully check the entire fuel system for leaks.
- Renew affected component if leakage still occurs after tightening to correct torque.
- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

- After road test, interrogate event memory again.

9.7 Removing and installing fuel rail

Removing



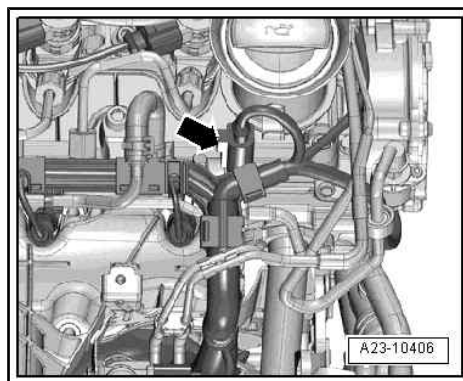
Caution

Risk of malfunctions caused by dirt.

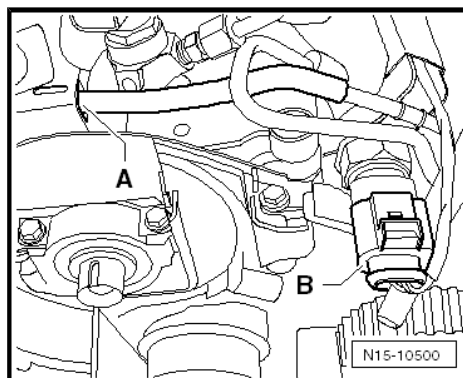
- ◆ **Observe**
⇒ "1.3 Rules for cleanliness and instructions for working on fuel system", page 2.

- Pull off engine cover panel ⇒ [page 15](#).
- Unplug electrical connector -arrow- at fuel pressure regulating valve - N276-.

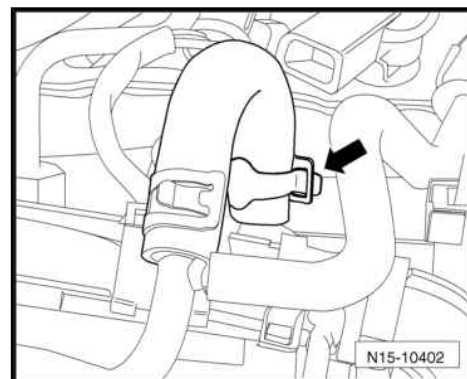
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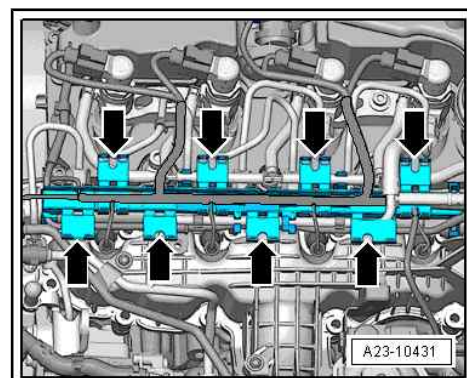
- Unplug electrical connector -B- at fuel pressure sender - G247-.
- Disconnect vacuum hose -A- from cylinder head cover.



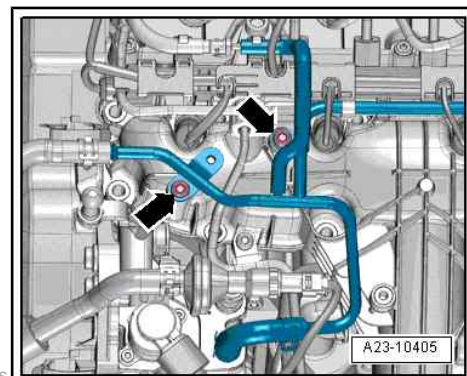
- Release hose clip -arrow- and detach fuel return hose from fuel rail.



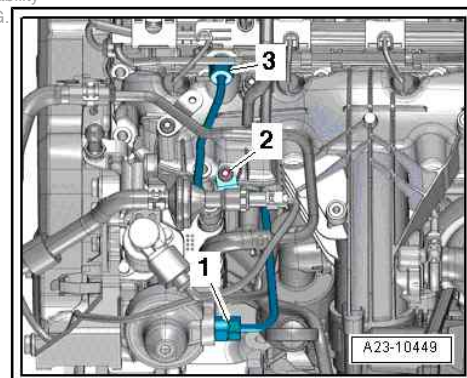
- Release retaining clips -arrows- at wiring harness and detach electrical connectors from glow plugs.



- Remove bolts -arrows- and place fuel return line to one side.
- Disconnect wiring guide from fuel rail and move clear to one side.



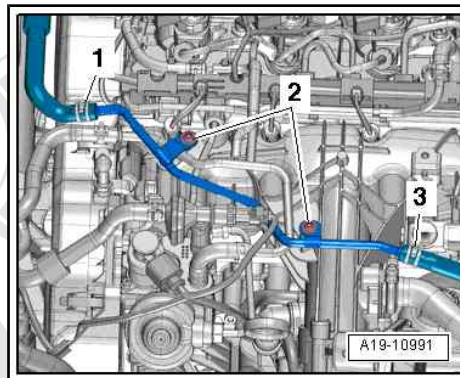
- Remove bolt -2- and union nuts -1 and 3- and detach high pressure pipe.



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- Remove bolts -2- and place coolant return line to one side.



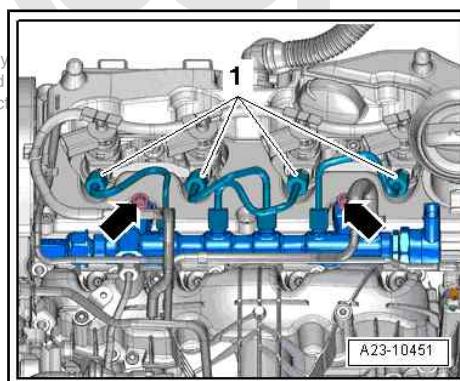
- Loosen union nuts on the 4 high-pressure pipes -1-.
- Unscrew both bolts -arrows- and remove fuel rail.

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Installing

Installation is carried out in the reverse order; note the following:

- Tightening torques
⇒ ["8.1 Injectors - exploded view", page 31](#)
- Install high-pressure pipes so they are free of tension
⇒ [page 43](#).



Note

- ◆ *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- ◆ *The high-pressure pipes can be re-used after performing the following checks:*
- ◆ *Check taper seats of high-pressure pipes for deformation and cracks.*
- ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- ◆ *Corroded pipes must not be used again.*

10 Lambda probe and exhaust gas temperature senders

- ◆ ⇒ ["10.1 Lambda probe, exhaust gas temperature senders and pressure senders - exploded view", page 57](#)
- ◆ ⇒ ["10.2 Removing and installing Lambda probe G39 with Lambda probe heater Z19", page 57](#)
- ◆ ⇒ ["10.3 Removing and installing pressure differential sender G505", page 58](#)

10.1 Lambda probe, exhaust gas temperature senders and pressure senders - exploded view

1 - Exhaust gas temperature sender 4 - G648-

- ☐ Removing and installing
⇒ Rep. gr. 26

2 - Exhaust gas temperature sender 1 - G235-

- ☐ Removing and installing
⇒ Rep. gr. 26

3 - Exhaust gas temperature sender 3 - G495-

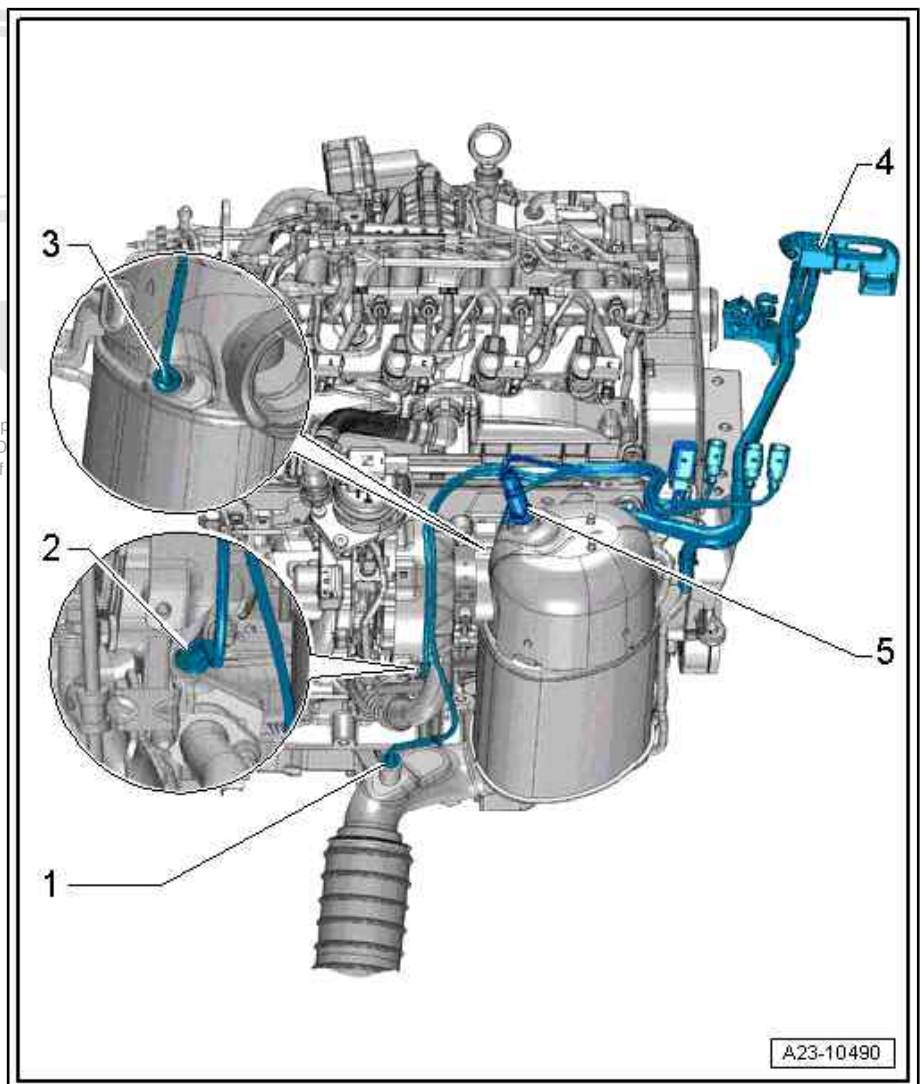
- ☐ Removing and installing
⇒ Rep. gr. 26

4 - Pressure differential sender - G505-

- ☐ Removing and installing
⇒ [page 58](#)
- ☐ 45 Nm

5 - Lambda probe - G39- with Lambda probe heater - Z19-

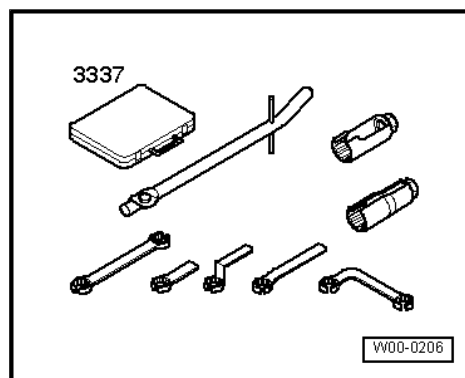
- ☐ Removing and installing
⇒ [page 57](#)
- ☐ New Lambda probes are coated with an assembly paste
- ☐ If you are re-using Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste
- ☐ 55 Nm



10.2 Removing and installing Lambda probe - G39- with Lambda probe heater - Z19-

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-



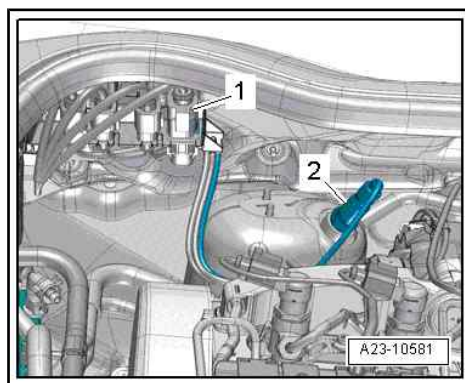
Removing

- Pull off engine cover panel ⇒ [page 15](#) .
- Unplug electrical connector -4- for Lambda probe - G39- .
- Unscrew Lambda probe - G39- -item 3- using a tool from Lambda probe open ring spanner set - 3337- .

Installing

Installation is carried out in the reverse order; note the following:

- Tightening torque
⇒ ["10.1 Lambda probe, exhaust gas temperature senders and pressure senders - exploded view", page 57](#)



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. For high-temperature paste refer to ⇒ [Electronic parts catalogue](#)*
- ◆ *When installing, the Lambda probe wiring must always be re-attached at the same locations to prevent it from coming into contact with the exhaust pipe.*

10.3 Removing and installing pressure differential sender - G505-



Note

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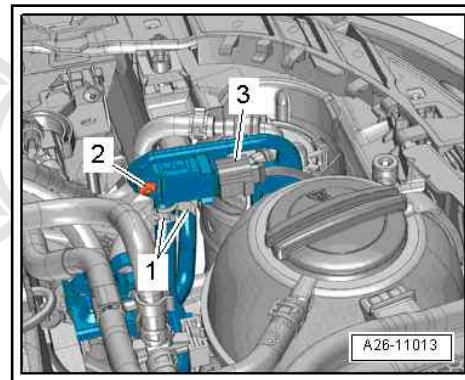
The pressure differential sender - G505- detects the amount of deposits in the particulate filter.

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester

Removing

- Pull off engine cover panel ⇒ [page 15](#) .
- Unplug electrical connector -3-.
- Release hose clips -1- and spray hoses at pressure differential sender - G505- with silicone-free lubricant before detaching.
- To prevent hose connections from breaking off, carefully disconnect hoses and keep them straight when pulling them off.
- Unscrew bolt -2- and detach pressure differential sender - G505- .



Installing

Installation is carried out in the reverse order; note the following:

- Tightening torques for Lambda probes, exhaust gas temperature senders and pressure senders: refer to exploded view ⇒ [page 57](#) .



Note

- ◆ *Blow through hose (towards particulate filter) with compressed air to remove dirt or ice (frozen condensation).*
- ◆ *Make sure that hoses are securely fitted and that there are no leaks.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- “Adaption” must be performed after renewing pressure differential sender ⇒ vehicle diagnostic tester .

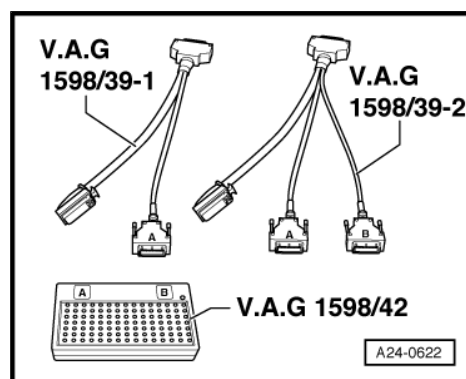
The adaption procedure is described in the “Guided Fault Finding”. (The procedure is also described under “Guided Functions”).

11 Engine control unit

11.1 Wiring and component check with test box - V.A.G 1598/42-

Special tools and workshop equipment required

- ◆ Adapter cable - V.A.G 1598/39-



- ◆ Test box - V.A.G 1598/42-
- ◆ Vehicle diagnostic tester



Note

- ◆ The test box - V.A.G 1598/42- has 105 sockets. It can be connected to the engine control unit via 2 different adapter cables.
- ◆ The engine control unit is connected to the vehicle's wiring harness via two connectors, one of which has 60 pins, the other has 94 pins.
- ◆ To carry out tests on the 60-pin wiring harness connector, the adapter cable - V.A.G 1598/39-1- is connected to connector -A- on the test box. For components connected to 60-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ To carry out tests on the 94-pin wiring harness connector, the adapter cable - V.A.G 1598/39-2- must be connected to connectors -A- and -B- on the test box. For components connected to 94-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ The test box - V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time. The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).
- ◆ Always use auxiliary measuring set - V.A.G 1527B- to connect test equipment (e.g. voltage tester - V.A.G 1526D- , hand-held multimeter - V.A.G 1594C- etc.).

The engine control unit has to be removed before connectors can be unplugged from engine control unit ⇒ [page 61](#) .



Caution

Electronic components are susceptible to damage.

- ◆ *Select the appropriate measuring range before connecting the test leads and observe test requirements.*

- Connect test box - V.A.G 1598/42- to wiring harness with adapter cable - V.A.G 1598/39-1- or adapter cable - V.A.G 1598/39-2- . Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in repair procedure.
- Make sure you fit protective housing back on engine control unit.
- After finishing tests, install engine control unit ⇒ [page 61](#) and interrogate and erase event memory ⇒ vehicle diagnostic tester .



Note

After completing the "Guided Functions" routine, the vehicle diagnostic tester will attempt to erase the event memories of all control units. If this is not successful, the remaining faults registered in the memories must be rectified before all event memories can be erased.

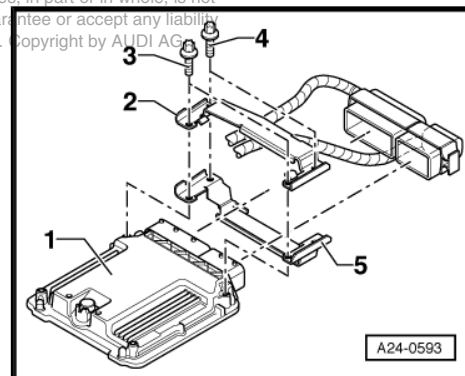
11.2 Removing and installing engine control unit - J623-

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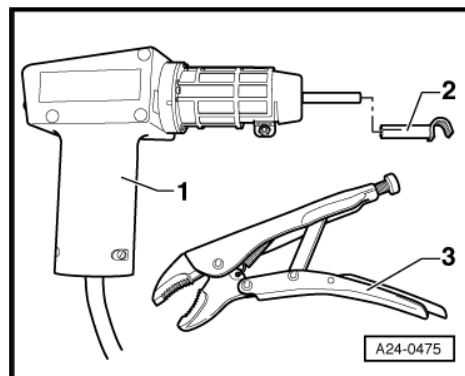
Note

- ◆ *Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/gearbox combination.*
- ◆ *The engine control unit -1- is bolted to the protective housing -5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.*
- ◆ *The protective housing has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).*



Special tools and workshop equipment required

- ◆ Hot air blower - VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set - VAS 1978 B-

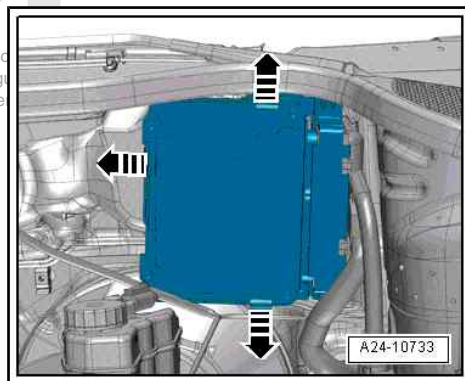


- ◆ Small mole grips -3- (commercially available)

Removing

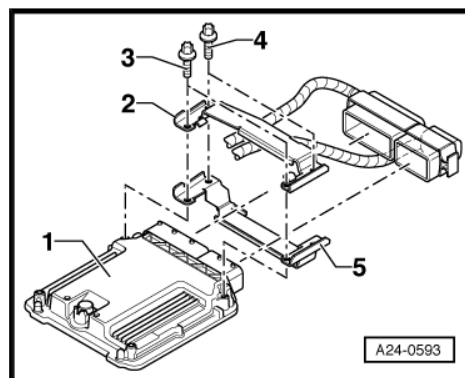
- Before removing the engine control unit - J623- , the adaption values of the injectors and the ash deposit mass must be read out. Use ⇒ Vehicle diagnostic tester.
- Store adaption values as electronic file.
- Switch off ignition and take out ignition key.
- Remove air cleaner housing ⇒ [page 17](#) .
- Release fasteners -arrows- and detach engine control unit - J623- from bracket.

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Note

- ◆ The threads of the two shear bolts -4- which are not screwed into the engine control unit -1- are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.
- ◆ The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.



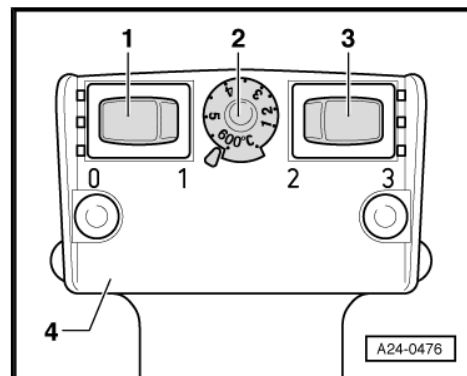


Caution

Wiring, connectors, insulation and control units can be burnt and damaged.

- ◆ *Keep exactly to the following procedure. Observe operating instructions for hot air blower.*

- Select settings on hot air blower -4- as shown in illustration:
- 2 - Temperature potentiometer to maximum heat output
- 3 - Two-stage air flow switch to position "3"



Note

- ◆ *Then use hot air blower to heat threaded holes in protective housing into which shear bolts have been screwed. This reduces the inhibiting action of the locking fluid on the shear bolt threads and makes it easier to unscrew these bolts.*
- ◆ *Cover up all painted parts to avoid any damage caused by hot air blower or vice-grip pliers.*

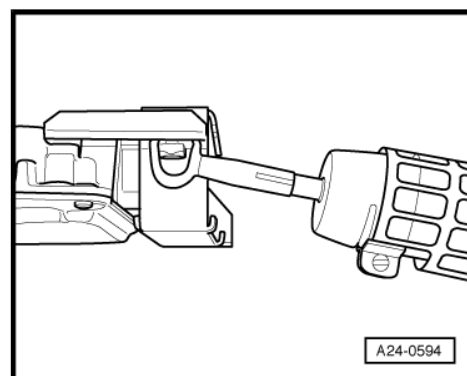


WARNING

Risk of burns.

- ◆ *Parts of the protective housing will become very hot as a result of heating the shear bolts. Try to ensure that only the thread is heated and none of the nearby components. These should be covered if necessary.*

Switch on the hot air blower and heat the bolt for approximately 20 ... 30 seconds.



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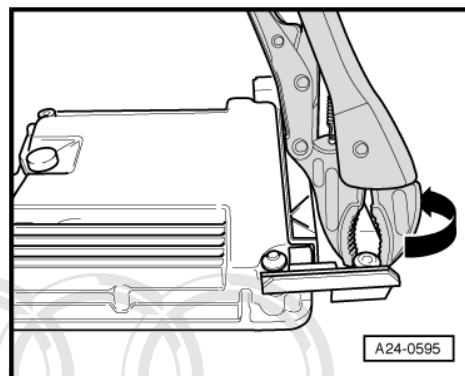
- Then grasp bolt head with vice-grip pliers and unscrew shear bolt.
- The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
- Detach protective housing from control unit connectors.
- Release connectors on engine control unit - J623- and unplug connectors.

Installing

Installation is carried out in the reverse order; note the following:

- After installation, the protective housing must be re-fitted on the engine control unit - J623- .
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.
- Install air cleaner housing ⇒ [page 17](#) .

The procedure required after connecting the new engine control unit is described in the Guided Fault Finding or Guided Functions.
Use ⇒ Vehicle diagnostic tester.



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28 – Glow plug system

1 Glow plug system

1.1 Glow plugs, Hall sender, engine speed sender - exploded view

1 - Hall sender - G40-

- ☐ Removing and installing
⇒ [page 67](#)

2 - Bolt

- ☐ 9 Nm

3 - Glow plug

- ☐ Glow plug 1 - Q10- , glow plug 2 - Q11- , glow plug 3 - Q12- , glow plug 4 - Q13-
- ☐ Removing and installing
⇒ [page 66](#)
- ☐ 18 Nm

4 - Electrical connector

- ☐ For glow plug

5 - Bolt

- ☐ 4.5 Nm

6 - Engine speed sender - G28-

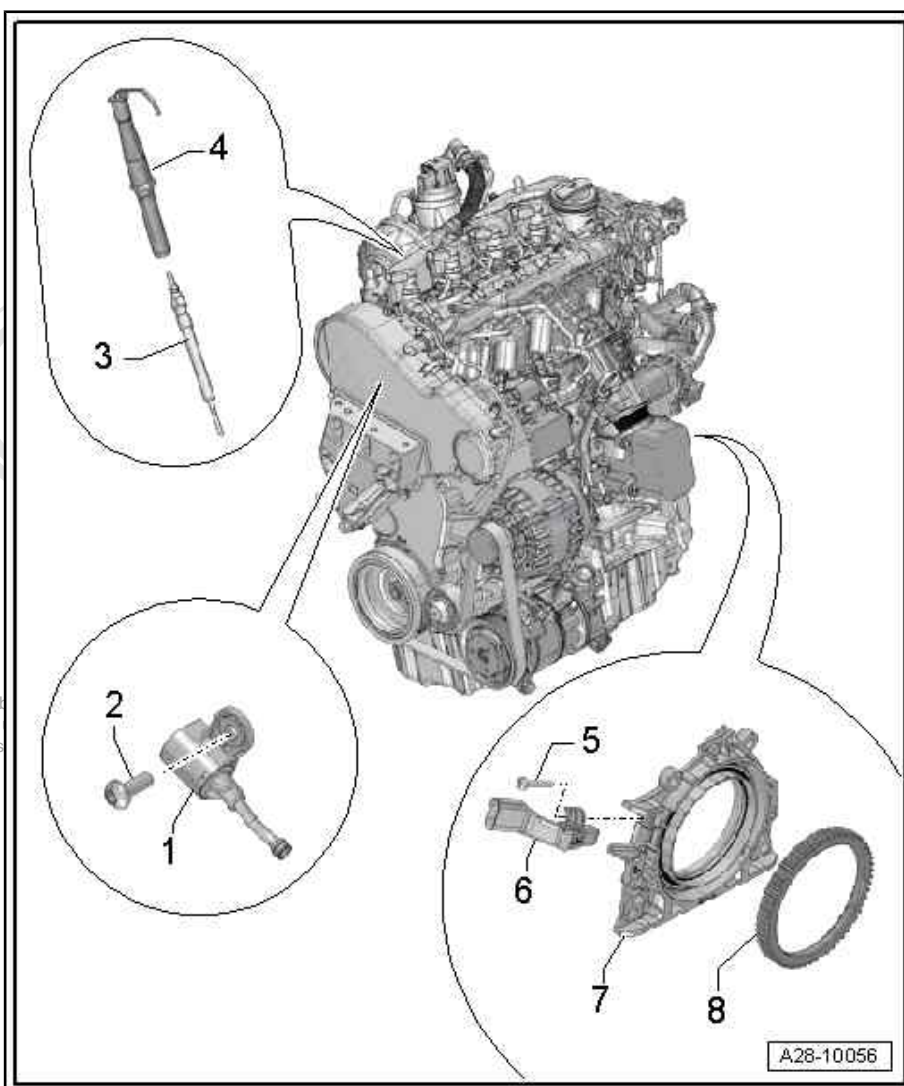
- ☐ Removing and installing
⇒ [page 68](#)

7 - Sealing flange (gearbox end)

- ☐ With oil seal
- ☐ Renewing ⇒ Rep. gr. 13

8 - Sender wheel

- ☐ For engine speed sender - G28-
- ☐ Removing and installing
⇒ Rep. gr. 13



1.2 Checking glow plug system

- ◆ The glow plug system is activated via the automatic glow period control unit - J179- . The control unit is self-diagnosis compatible.
- ◆ The control unit for the glow plug system is located in the mounting for the fuse holder B - SB- in the engine compartment (front left) ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ A fault is stored in the event memory of the engine control unit - J623- if a fault occurs in the glow plug system.

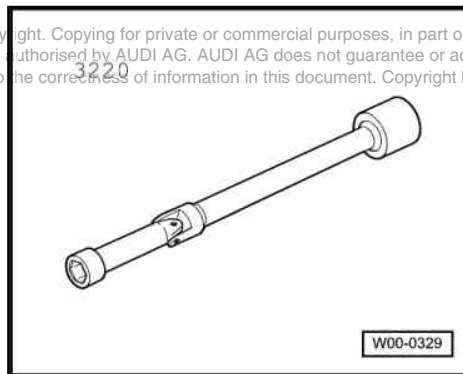
- ◆ The procedure for checking the glow plug system is described in the "Guided Fault Finding".
- ◆ For faster starting, the vehicle is equipped with electronically controlled glow plugs and a separate glow period control unit.
- ◆ Each glow plug is activated and diagnosed separately.

1.3 Removing and installing glow plugs

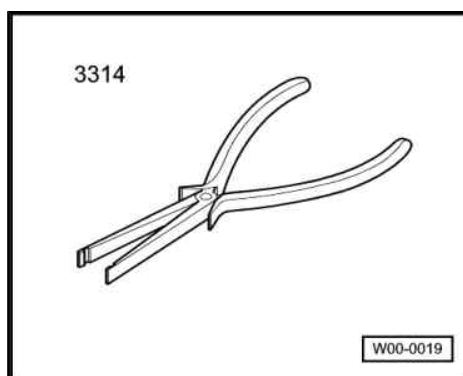
Special tools and workshop equipment required

- ◆ U/J extension and socket, 10 mm - 3220-

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- ◆ Pliers - 3314-



- ◆ Safety goggles

Removing

- Switch off ignition.
- Pull off engine cover panel ⇒ [page 15](#) .
- Clean glow plug opening to make sure no dirt gets into cylinders.
- Use a vacuum cleaner to remove coarse dirt.
- Spray glow plug opening with brake cleaner and wait for it to take effect.



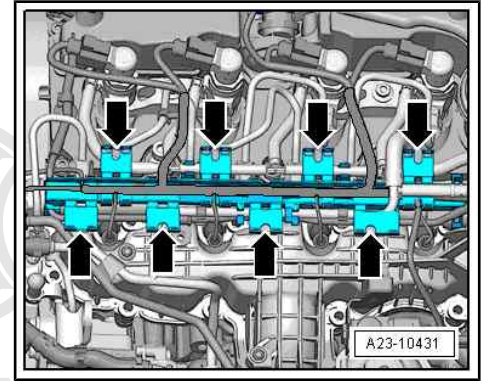
WARNING

Risk of eye injury.

- ◆ *Wear safety goggles.*

- Blow out glow plug opening with compressed air and then clean glow plug opening with an oily cloth.

- Release fasteners -arrows- of wiring duct and move clear wiring harness.

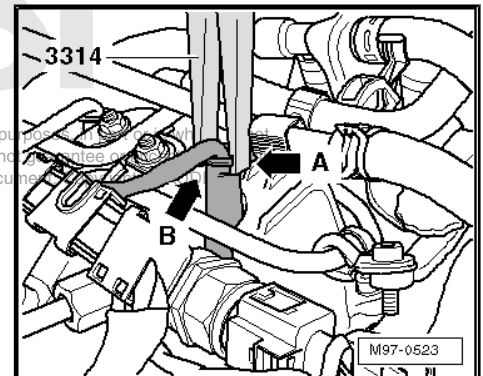


Caution

Risk of damage to support sleeves.

- ◆ ***Use pliers - 3314- to remove glow plug connectors, squeezing just enough to grasp the collar of the support sleeve securely without damaging it.***

- Apply groove -arrow A- of pliers - 3314- to collar of support sleeve -arrow B- as shown in illustration.

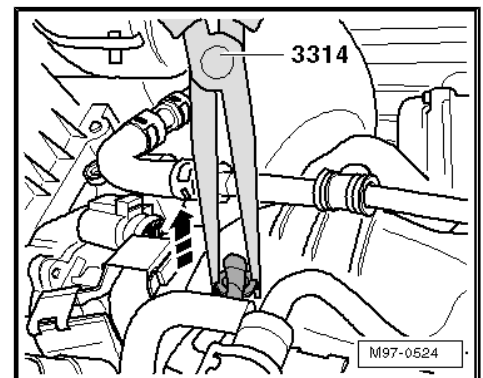


- Carefully detach glow plug connectors from glow plugs -arrow-.
- Loosen glow plugs using U/J extension and socket, 10 mm - 3220- and unscrew by hand.

Installing

Installation is carried out in the reverse order; note the following:

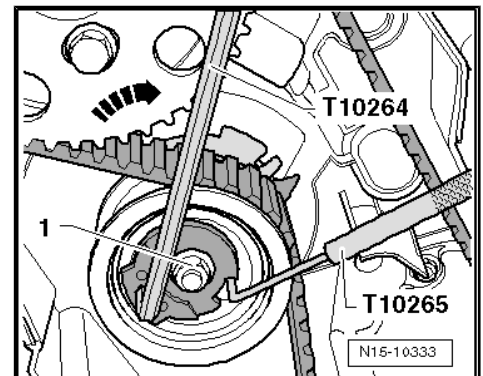
- Tightening torque
⇒ ["1.1 Glow plugs, Hall sender, engine speed sender - exploded view", page 65](#)
- When reconnecting, check that glow plug connectors are securely seated.



1.4 Removing and installing Hall sender - G40-

Removing

- Detach toothed belt from idler roller and high-pressure pump
⇒ Rep. gr. 15 ; Removing and installing toothed belt .

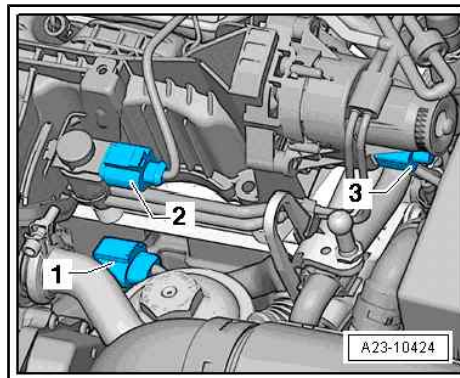


- Detach electrical connector -1- from bracket and unplug.

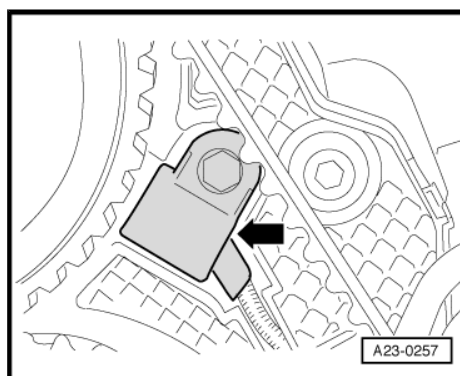


Note

Disregard -items 2, 3-.



- Unscrew bolt for Hall sender - G40- -arrow-.

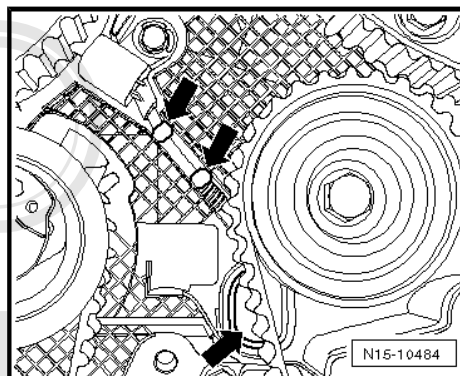


- Use screwdriver to remove tabs -upper arrows- and take out cover -bottom arrow- for repair opening.
- Take Hall sender - G40- off cylinder head and guide electrical connector through repair opening in toothed belt cover.

Installing

Installation is carried out in the reverse order; note the following:

- Seal repair opening in toothed belt cover with plug; for plug refer to ⇒ Electronic parts catalogue .
- Install toothed belt ⇒ Rep. gr. 15 .

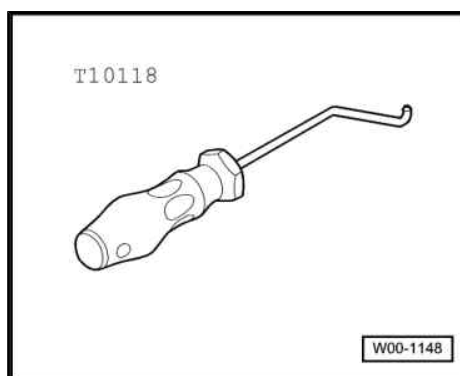


1.5 Removing and installing engine speed sender - G28-

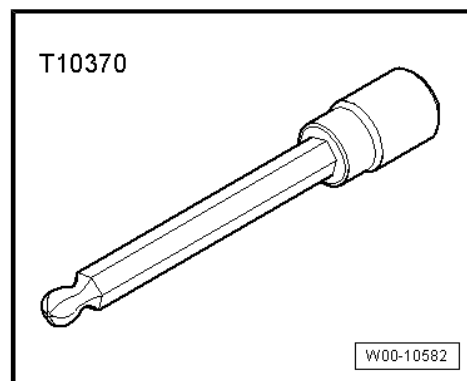
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Special tools and workshop equipment required

- ◆ Assembly tool - T10118-

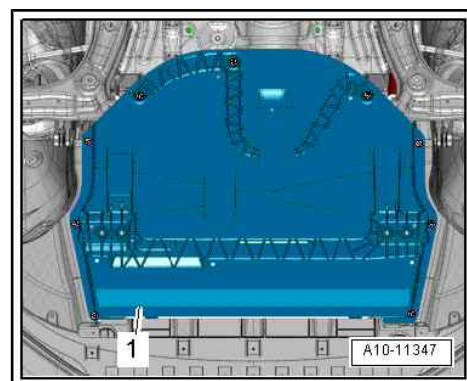


- ◆ Socket, AF 4 mm - T10370-



Removing

- Remove noise insulation -1- ⇒ Rep. gr. 66 .

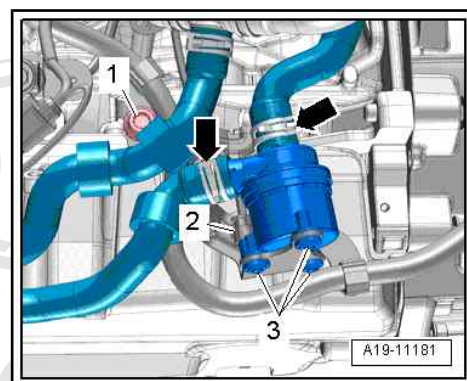


- Unscrew bolts -3- and tie pump for exhaust gas recirculation cooler - V400- up to the right side (with coolant hoses -arrows- attached).

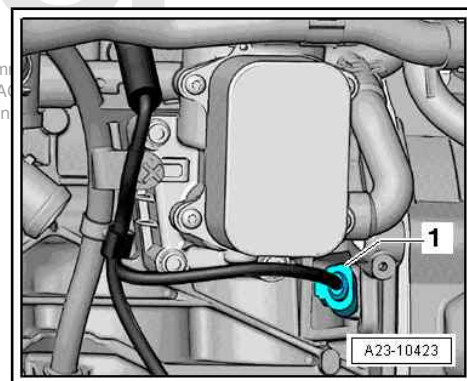


Note

Disregard -items 1, 2-.



- Use assembly tool - T10118- to unplug electrical connector -1-.



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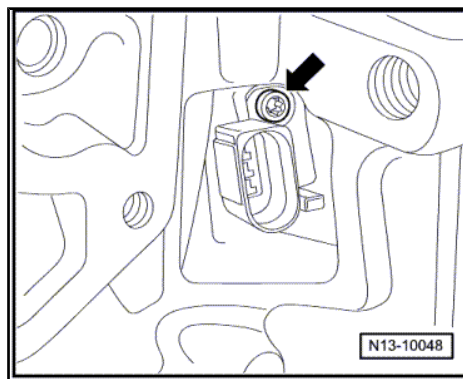


- Unscrew bolt -arrow- using socket, AF 4 mm - T10370- and detach engine speed sender - G28- .

Installing

Installation is carried out in the reverse order; note the following:

- Tightening torque
⇒ ["1.1 Glow plugs, Hall sender, engine speed sender - exploded view", page 65](#)
- Install pump for exhaust gas recirculation cooler - V400- ⇒ Rep. gr. 19 .
- Install noise insulation ⇒ Rep. gr. 66 .



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