Workshop Manual

Audi TT 2007 ➢

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

Edition 03.2010

List of Workshop Manual Repair GroupsList of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Repair Group

23 - Mixture preparation - injection

28 - Glow plug system

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.

Contents

23 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

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 Rules for cleanliness and instructions for working on fuel system

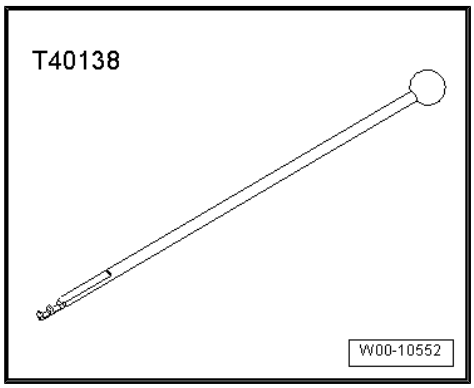
To prevent the high-pressure fuel pump from running while it is empty and to ensure that the engine starts quickly after parts have been renewed, it is important to observe the following:

- ♦ If components of the fuel system between the fuel tank and the high-pressure fuel pump are removed or renewed, the basic setting “Checking fuel system pressurisation pump” must be performed to bleed the fuel system.
- ♦ If a fuel pump, fuel line or fuel filter are removed or renewed, the basic setting “Display group 35” must be performed ONCE before the engine is started for the first time.
- ♦ If the high-pressure fuel pump is removed or renewed, the basic setting “Display group 35” must be performed THREE TIMES before the engine is started for the first time.
- Clean tools and workbench etc. before working on the injection system.
- Thoroughly clean all unions and surrounding areas before disconnecting.
- 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. After removal, components should be kept in new, sealable plastic bags (use the original new part packaging if possible).
- Before installation, check the injectors and their surroundings visually; they must be undamaged and free of lint. 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 fuel lines must always be re-installed in their original positions (i.e. on the same cylinder).
- The following components and seals/O-rings must always be renewed when the injectors are removed and installed: “copper seal”, “O-ring for injector bore”, “O-ring for injector return connection”.
- The following components and seals/O-rings must always be renewed when an injector is renewed: “clamping piece”, “copper seal”, “O-ring for injector bore”, “O-ring for injector return connection”.
- Always fit new copper seals for the injectors. Check all new O-rings for damage before installing. Lubricate O-rings lightly with assembly oil or clean engine oil before installing. Use assembly tool for installing the “O-ring for injector return connection”.
- Take care not to damage the injectors when removing the old copper seals.
- Align the high-pressure fuel lines so they are free of tension. 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 return lines 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 return lines are seated securely by pulling them by hand from above. Also check that they seal properly (fuel pressure in return line as far as pressure retention valve: between 8 and 10 bar).
- 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.

Use release tool -T40138- to unplug connectors that cannot be accessed easily.



1.3 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).*

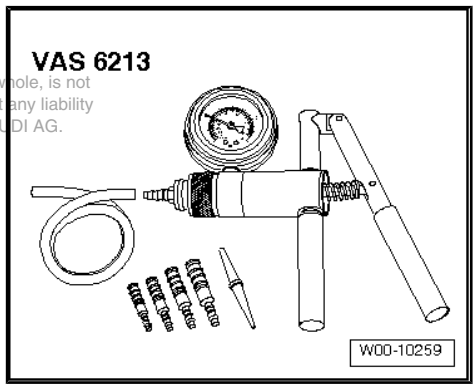
1.4 To avoid any risk of injuries to persons and/or damage to the injection and glow plug system, always observe the following safety precautions:

- 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 fault 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

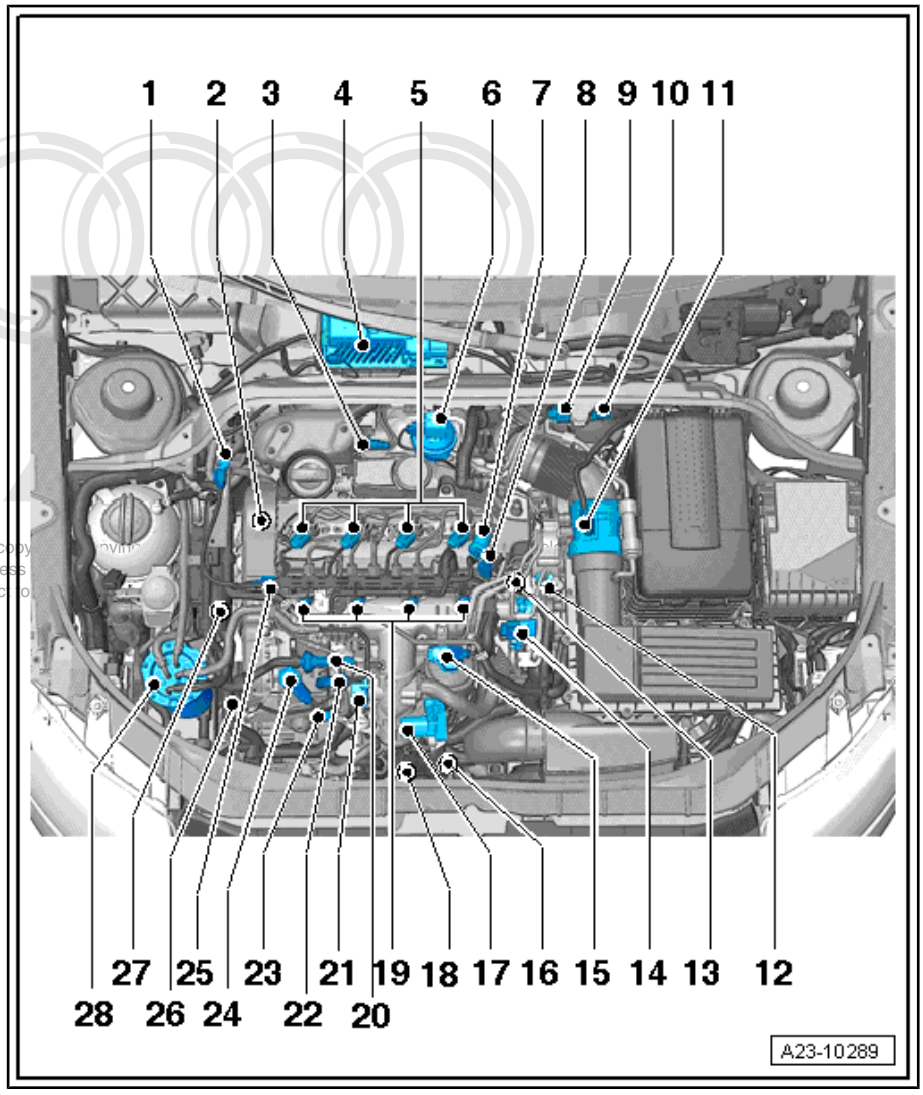
– Check vacuum line to solenoid valve and from solenoid valve to corresponding component.

– If a fault is stored in the fault memory, check the 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 pressure with the hand vacuum pump -VAS 6213- or if the pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

2 Overview of fitting locations

Components A to J are not shown on the exploded view.



1 - Exhaust gas pressure sensor 1 -G450-

- ❑ Fitting location ⇒ page 10
- ❑ Adaption must be performed after renewing this component
- ❑ Removing and installing ⇒ page 67

2 - Hall sender -G40- (camshaft position sensor)

- ❑ Fitting location ⇒ page 10
- ❑ Removing and installing ⇒ page 75

3 - Lambda probe -G39- with Lambda probe heater -Z19-

- ❑ Fitting location ⇒ page 13
- ❑ Removing and installing ⇒ page 65
- ❑ 50 Nm

4 - Engine control unit -J623-

- ❑ Fitting location ⇒ page 8
- ❑ Removing and installing ⇒ page 68

5 - Injectors (piezo injectors)

- ❑ Fitting location ⇒ page 12
- ❑ Removing and installing ⇒ page 42

6 - Position sender for charge pressure positioner -G581-

- ❑ Fitting location ⇒ page 12

7 - Pressure retention valve

- ❑ The pressure retention valve maintains a residual pressure of approx. 10 bar in the return lines.
- ❑ This residual pressure is required for the control function of the piezo injectors.
- ❑ The pressure retention valve may only be renewed together with the fuel return lines.
- ❑ After replacement, engine must be run at idling speed for approx. 2 minutes to bleed fuel system.
- ❑ Checking pressure retention valve ⇒ page 54

8 - Fuel pressure regulating valve -N276-

- ❑ Fitting location ⇒ page 10
- ❑ Removing and installing ⇒ page 59
- ❑ 80 Nm

9 - Charge pressure control solenoid valve -N75-

- ❑ Fitting location ⇒ page 12
- ❑ Electrical connector for exhaust gas temperature sender 3 -G495-

10 - Electrical connector

- For exhaust gas temperature sender 4 -G648-
- For exhaust gas temperature sender 1 -G235-
- For Lambda probe -G39-
- Fitting location ⇒ page 12

11 - Air mass meter -G70-

- Removing and installing ⇒ page 49

12 - Coolant temperature sender -G62-

- Fitting location ⇒ page 12
- Removing and installing ⇒ Rep. Gr. 19

13 - Engine speed sender -G28-

- Fitting location ⇒ page 11
- 4.5 Nm

14 - Variable intake manifold motor -V183-

- With variable intake manifold position sender -G513-
- Fitting location ⇒ page 11

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

- Fitting location ⇒ page 11

16 - Pump for exhaust gas recirculation cooler -V400-

- Fitting location ⇒ page 10

17 - Intake manifold flap motor -V157-

- With throttle valve potentiometer -G69-
- Fitting location ⇒ page 10
- Intake manifold - exploded view ⇒ page 24
- Removing and installing ⇒ page 49

18 - Charge pressure sender -G31-

- Combined with intake air temperature sender -G42-
- Fitting location ⇒ page 11
- Removing and installing ⇒ Rep. Gr. 21

19 - Glow plugs

- Glow plug 1 -Q10-
- Glow plug 2 -Q11-
- Glow plug 3 -Q12-
- Glow plug 4 -Q13-
- Removing and installing ⇒ page 73

20 - Fuel temperature sender -G81-

- Fitting location ⇒ page 10

21 - Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-

- Fitting location ⇒ page 10

22 - Fuel supply line connection from fuel filter

23 - Fuel supply line connection (high-pressure pipe)

24 - High-pressure fuel pump with fuel metering valve -N290-

- Do not open fuel metering valve -N290-
- After renewing, first fuel filling MUST be performed (it is important not to allow pump to run while it is still empty) ⇒ page 33
- Removing and installing ⇒ page 31

25 - Fuel pressure sender -G247-

- ❑ Fitting location ⇒ page 10
- ❑ Removing and installing ⇒ page 63
- ❑ 100 Nm

26 - Radiator outlet coolant temperature sender -G83-

- ❑ Fitting location ⇒ page 11
- ❑ Removing and installing ⇒ Rep. Gr. 19

27 - Supplementary fuel pump -V393-

28 - Fuel filter

- ❑ Fuel filter - exploded view ⇒ Rep. Gr. 20
- ❑ Renewing fuel filter ⇒ Rep. Gr. 20

A - Low heat output relay -J359- and high heat output relay -J360-

- ❑ Fitting location ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

B - Brake light switch -F- and brake pedal switch -F47-

- ❑ Fitting location ⇒ page 8
- ❑ In footwell on brake pedal

C - Clutch position sender -G476-

- ❑ Fitting location ⇒ page 9
- ❑ Only fitted on vehicles with manual gearbox

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

- ❑ Fitting location ⇒ page 8
- ❑ Removing and installing ⇒ Rep. Gr. 20

E - Actuator for structure-borne sound -R214-

- ❑ Fitting location ⇒ page 9

F - Control unit for structure-borne sound -J869-

- ❑ Fitting location ⇒ page 9

G - Exhaust gas temperature sender 3 -G495-

- ❑ Fitting location ⇒ page 13
- ❑ Lambda probes and exhaust gas temperature sensors - exploded view ⇒ page 65
- ❑ Removing and installing ⇒ Rep. Gr. 26

H - Exhaust gas temperature sender 1 -G235-

- ❑ Fitting location ⇒ page 13
- ❑ Lambda probes and exhaust gas temperature sensors - exploded view ⇒ page 65
- ❑ Removing and installing ⇒ Rep. Gr. 26

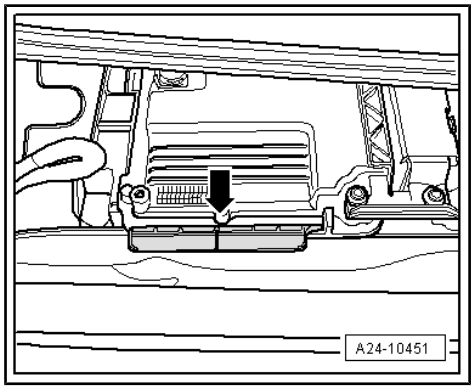
I - Exhaust gas temperature sender 4 -G648-

- ❑ Fitting location ⇒ page 13
- ❑ Lambda probes and exhaust gas temperature sensors - exploded view ⇒ page 65
- ❑ Removing and installing ⇒ Rep. Gr. 26

J - Particulate filter

- ❑ Fitted on underbody
- ❑ Combined with a catalytic converter
- ❑ Adaption must be performed after renewing this component
- ❑ Removing and installing ⇒ Rep. Gr. 26

Adaption must be performed after renewing exhaust gas pressure sensor 1 -G450- and/or particulate filter. The adaption procedure is described in the Guided Fault Finding or Guided Functions; use a vehicle diagnostic tester.

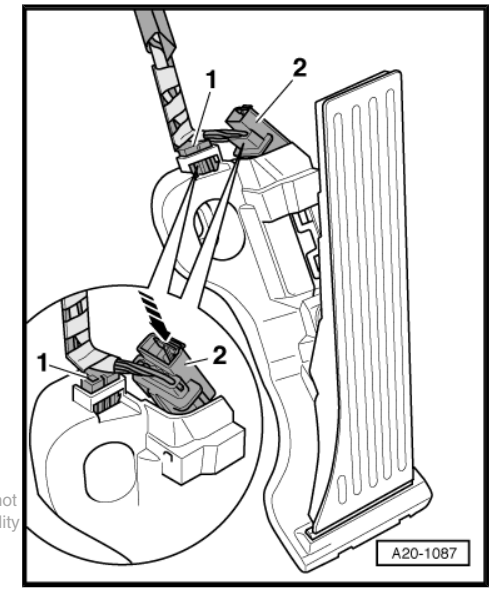


Fitting location of engine control unit -J623-

Removing and installing ⇒ page 70

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

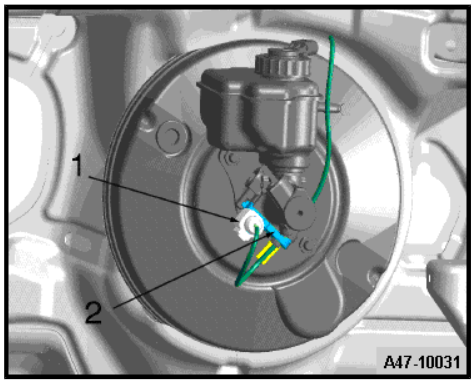
Removing and installing ⇒ Rep. Gr. 20



Note

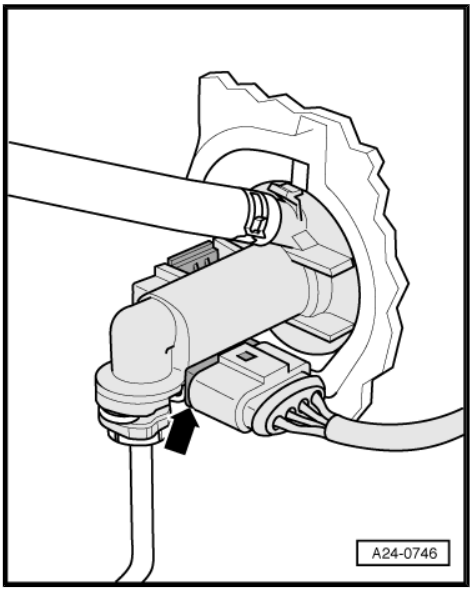
The accelerator position sender -G79- and accelerator position sender 2 -G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Brake light switch -F- and brake pedal switch -F47- -1-



Clutch position sender -G476-

Integrated functions: clutch pedal switch for engine start -F194- and clutch pedal switch -F36- (manual gearbox only)

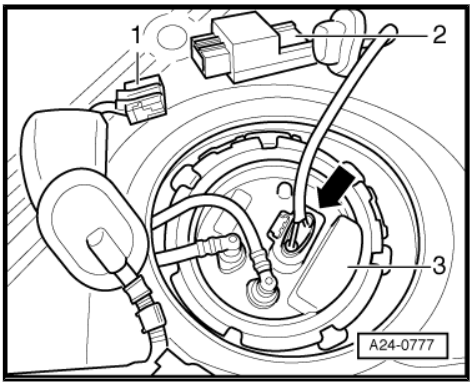


Fuel pump control unit -J538-

1 - Connector for fuel pump control unit -J538-

2 - Fuel pump control unit -J538-

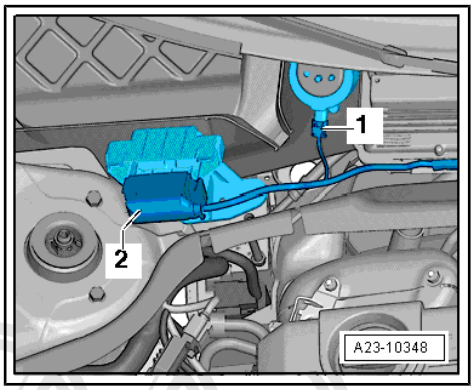
3 - Fuel system pressurisation pump -G6-



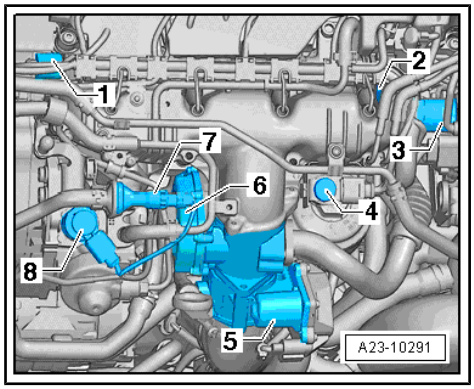
Sound package

1 - Actuator for structure-borne sound -R214-

2 - Control unit for structure-borne sound -J869-



Fitting locations



1 - Fuel pressure sender -G247-

2 - Fuel pressure regulating valve -N276-

3 - Variable intake manifold motor -V183- with variable intake manifold position sender -G513-

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

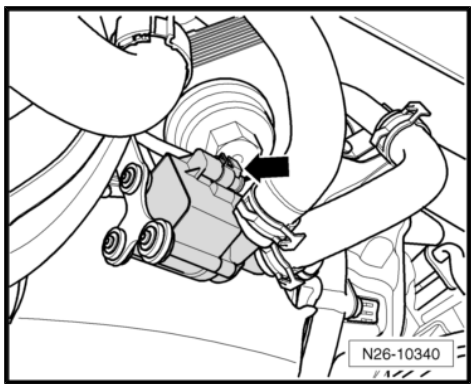
5 - Intake manifold flap motor -V157- with throttle valve potentiometer -G69-

6 - Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-

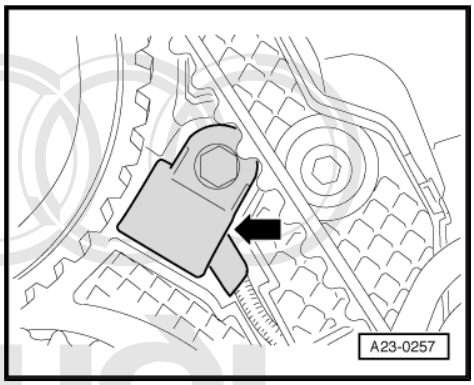
7 - Fuel temperature sender -G81-

8 - Fuel metering valve -N290-

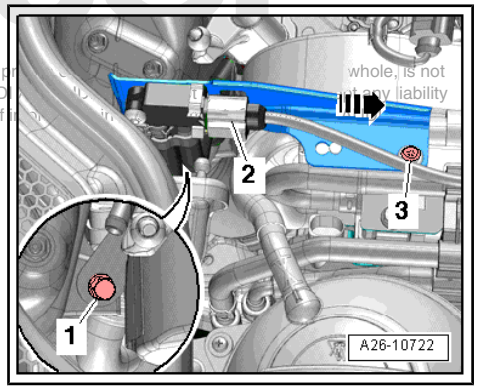
Pump for exhaust gas recirculation cooler -V400- -arrow-



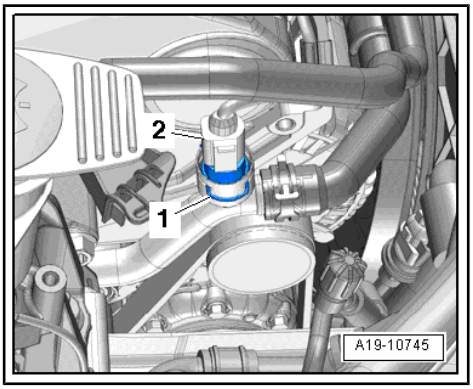
Hall sender -G40-



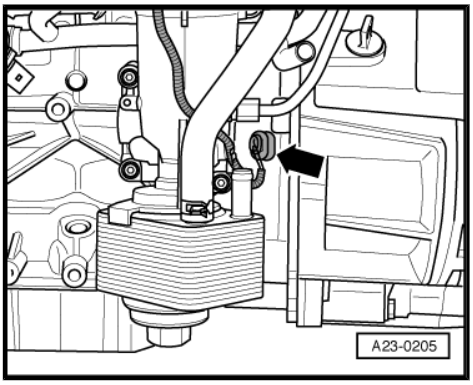
Exhaust gas pressure sensor 1 -G450-



Radiator outlet coolant temperature sender -G83-



Engine speed sender -G28- -arrow-

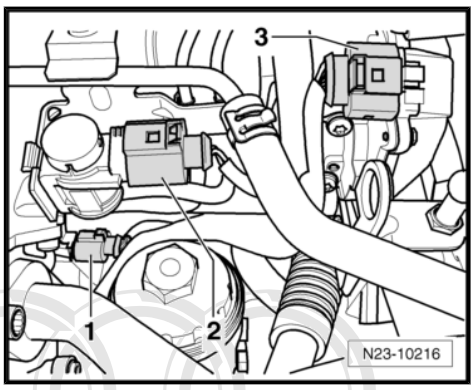


Components at front of engine

1 - Electrical connector for Hall sender -G40-

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

3 - Variable intake manifold motor -V183- with variable intake manifold position sender -G513-



Components at front of engine

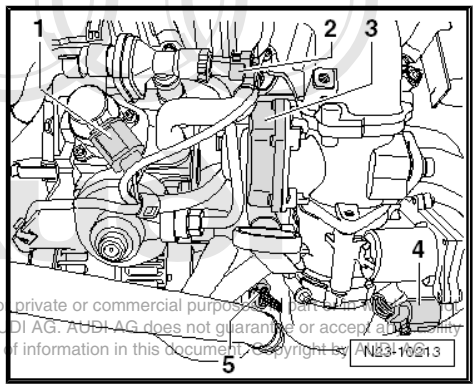
1 - Fuel metering valve -N290-

2 - Fuel temperature sender -G81-

3 - Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-

4 - Intake manifold flap motor -V157- with throttle valve potentiometer -G69-

5 - Charge pressure sender -G31- with intake air temperature sender -G42-



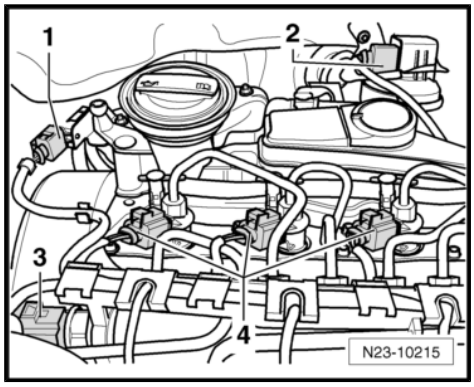
Components on engine

1 - Exhaust gas pressure sensor 1 -G450-

2 - Position sender for charge pressure positioner -G581-

3 - Fuel pressure sender -G247-

4 - Injectors (N30 to N32)



Injectors

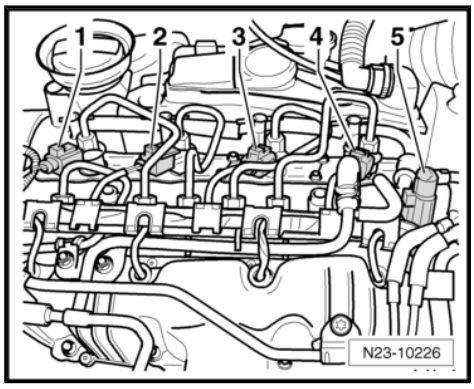
1 - Injector, cylinder 1 -N30-

2 - Injector, cylinder 2 -N31-

3 - Injector, cylinder 3 -N32-

4 - Injector, cylinder 4 -N33-

5 - Fuel pressure regulating valve -N276-



Fitting locations and connectors

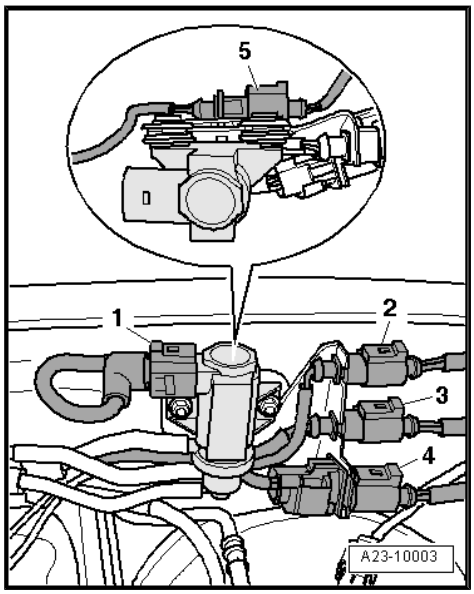
1 - Electrical connector for charge pressure control solenoid valve -N75-

2 - Electrical connector for exhaust gas temperature sender 4 -G648-

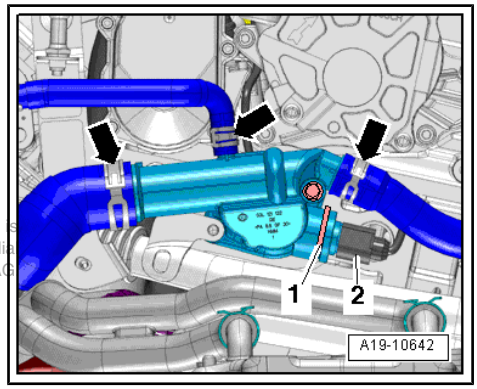
3 - Electrical connector for exhaust gas temperature sender 1 -G235-

4 - Electrical connector for Lambda probe -G39-

5 - Electrical connector for exhaust gas temperature sender 3 -G495-



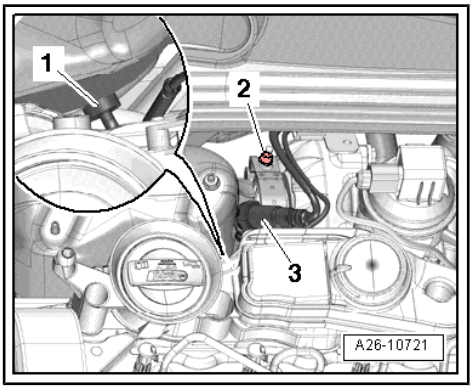
Coolant temperature sender -G62- -2-



Components in particulate filter

1 - Exhaust gas temperature sender 3 -G495-

3 - Lambda probe -G39-

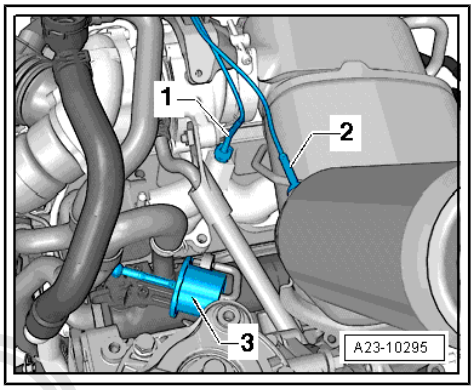


Components at rear of engine

1 - Exhaust gas temperature sender 1 -G235-

2 - Exhaust gas temperature sender 4 -G648-

3 - Vacuum unit for exhaust gas recirculation cooling system



3 Fuel system - exploded view

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

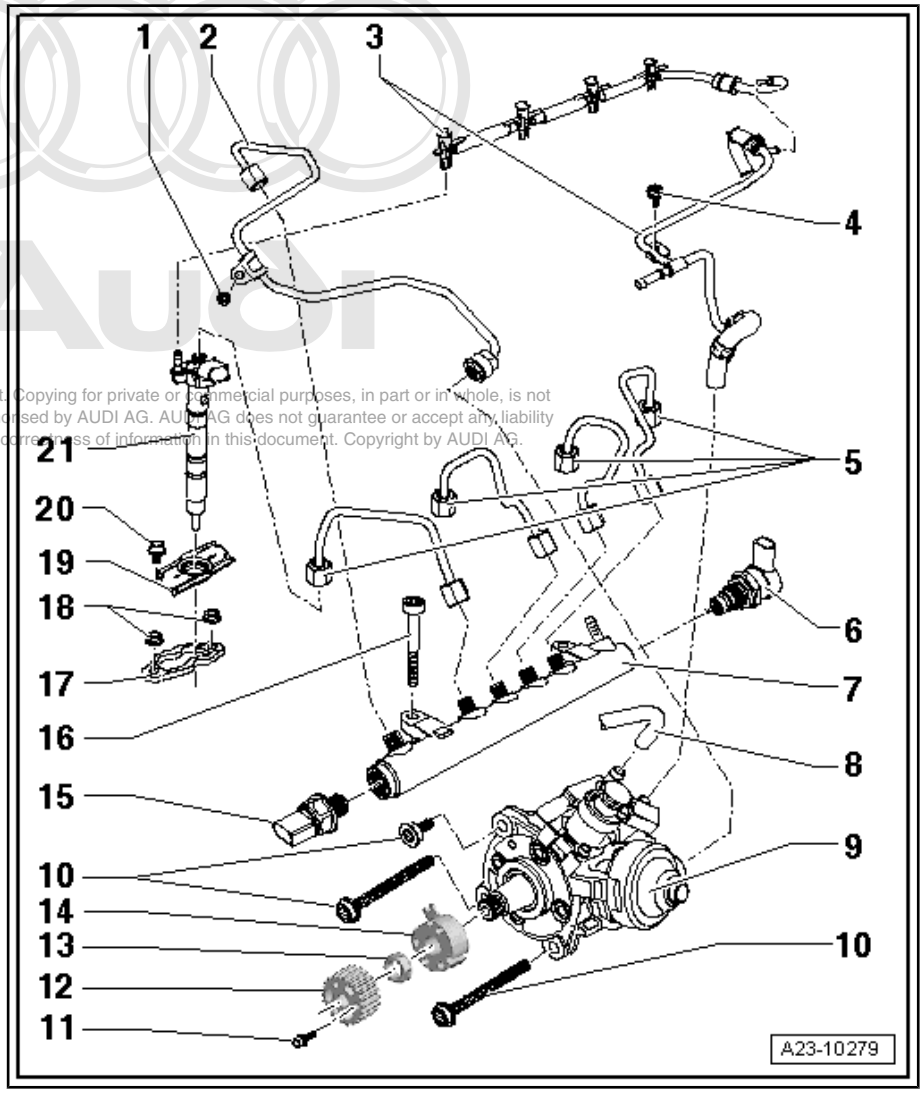
Caution

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:

- *If components of the fuel system between the fuel tank and the high-pressure fuel pump are removed or renewed, the first fuel filling must be performed.*
- *If a fuel pump, fuel line (between fuel tank and high-pressure fuel pump) or fuel filter is removed or renewed, the fuel system must be bled before the engine is started for the first time.*
- *If the high-pressure fuel pump is removed or renewed, the fuel system must be bled before the engine is started for the first time.*
- *Performing first fuel filling after installing high-pressure pump ⇒ page 33*

Note

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



1 - Bolt

- ❑ 10 Nm

2 - High-pressure pipe

- ❑ 25 Nm
- ❑ Between high-pressure pump and fuel rail

3 - Fuel return lines (from injectors)

- ❑ To fuel tank
- ❑ Fuel return line must not be kinked, damaged or clogged
- ❑ The fuel return lines must not be dismantled; if necessary they must be renewed complete with pressure retention valve.
- ❑ The pressure retention valve maintains a residual pressure of approx. 10 bar in the return lines.
- ❑ This residual pressure is required for the control function of the piezo injectors.
- ❑ Checking pressure retention valve ⇒ page 54
- ❑ After replacement, engine must be run at idling speed for approx. 2 minutes to bleed fuel system. Then check fuel return lines for leaks.

4 - Bolt

- ❑ 10 Nm

5 - High-pressure pipes

- ❑ 25 Nm
- ❑ Between fuel rail and injectors
- ❑ Do not interchange
- ❑ Install free of stress

6 - Fuel pressure regulating valve -N276-

- ❑ 80 Nm
- ❑ Cannot be re-installed
- ❑ Removing and installing ⇒ page 59

7 - Fuel rail

- ❑ Removing and installing ⇒ page 28

8 - Fuel supply line

9 - High-pressure fuel 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 33
- ❑ Removing and installing ⇒ page 31

10 - Bolt

- ❑ 20 Nm

11 - Bolt

- ❑ 1st stage: 15 Nm
- ❑ 2nd stage: 20 Nm + 1/4 turn (90 °) further

12 - High-pressure pump sprocket

13 - Nut

- ❑ 95 Nm

14 - Hub

- ❑ With sender wheel
- ❑ Use counterhold tool -T10051- to loosen and tighten
- ❑ To remove, use puller -T40064-

15 - Fuel pressure sender -G247-

- ❑ 100 Nm
- ❑ Removing and installing ⇒ page 63

16 - Bolt

- ❑ 22 Nm

17 - Clamping piece

- ❑ If they are to be re-installed, the injectors and clamping pieces must always be re-fitted on the same cylinder.
- ❑ When an injector is renewed, the corresponding clamping piece must be renewed at the same time.

18 - Hexagon flange nut

- ❑ For clamping piece
- ❑ 10 Nm

19 - Cover for injector

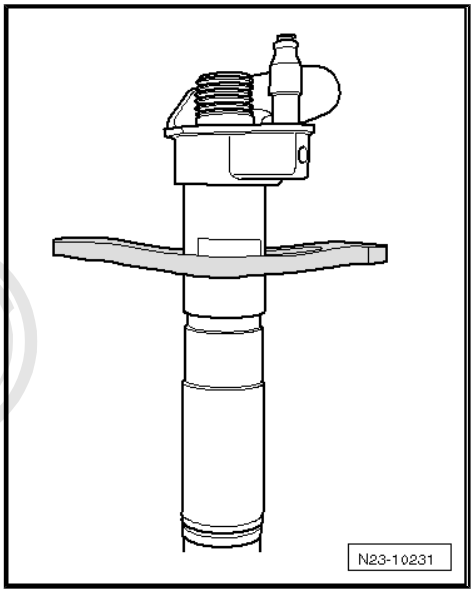
20 - Bolt

- ❑ 5 Nm

21 - Injector (piezo injectors)

- ❑ When removing and installing, always renew the following components and seals/O-rings: “copper seal”, “O-ring for injector bore”, “O-ring for injector return connection”.
- ❑ The following components and seals/O-rings must always be renewed when an injector is renewed: “clamping piece”, “copper seal”, “O-ring for injector bore”, “O-ring for injector return connection”.
- ❑ When re-installing “high-pressure injector pipe” check taper seats visually for damage, scores and corrosion (always renew if damaged)
- ❑ If they are to be re-installed, the injectors, high-pressure fuel pipes and clamping pieces must always be re-fitted in their original positions (i.e. on the same cylinder).
- ❑ Removing and installing ⇒ page 42

Installation position of clamping piece



4 Performing fuel filling

Caution

If a fuel pump, fuel line (between fuel tank and high-pressure fuel pump) or fuel filter is removed or renewed, the fuel system must be bled before the engine is started for the first time.

After installation, the high-pressure pump must first be filled with fuel before the engine is started (the pump must NOT be allowed to run while still empty).

– Connect a vehicle diagnostic tester.
– Switch on ignition.
– Select “Engine electronics” in vehicle self-diagnosis.
– Then select “Basic setting”.
– Select “Display group 35”.
– Press “activate” button.
– The fuel pumps start running.
– The fuel pumps must run for approx. 1 minute to ensure that the high-pressure pump is filled with sufficient 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 fault in fault memory using diagnostic tester.
– After completing the repair, road-test the vehicle over a distance of at least 20 km. Accelerate with full throttle at least once. Then inspect the high-pressure section of the fuel system again for leaks.

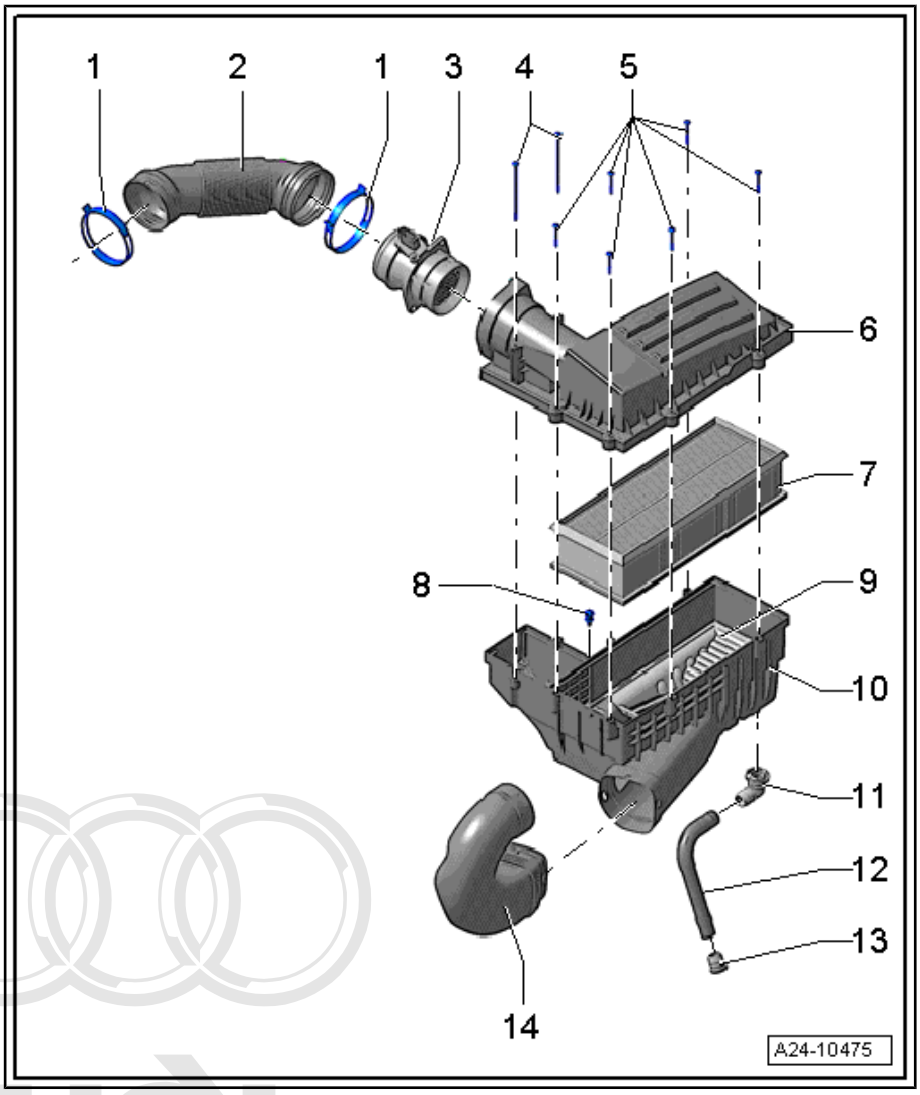
Note

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 fault memory. Then continue the road test.

– Interrogate fault memory.

5 Air cleaner

5.1 Air cleaner - exploded view



1 - Spring-type clip

2 - Air hose

- ❑ To turbocharger
- ❑ Check air intake hose for dirt and leaves

3 - Air mass meter -G70-

- ❑ 1.5 Nm
- ❑ Removing and installing ⇒ page 49

4 - Bolts

- ❑ For air cleaner (top section)
- ❑ 1.5 Nm

5 - Bolts

- ❑ For air cleaner (top section)
- ❑ 1.5 Nm

6 - Air cleaner (top section)

- ❑ Clean any salt residue, leaves and dirt out of air cleaner (top section)

7 - Filter element

- ❑ Always use genuine part for air filter element
- ❑ Removing and installing ⇒ page 21
- ❑ Observe change intervals ⇒ Maintenance ; Booklet 810

8 - Bolt

- ❑ For air cleaner (bottom section)
- ❑ 8 Nm

9 - Snow screen

- ❑ Not installed in all vehicles

10 - Air cleaner (bottom section)

- ❑ Clean any salt residue, leaves and dirt out of air cleaner (bottom section)
- ❑ On vehicles for cold climates, air cleaner (bottom section) with hot-air-intake hose is installed

11 - Connection for water drain hose

- ❑ Clean connection

12 - Water drain hose

- ❑ Clean water drain hose

13 - Flutter valve

- ❑ Clean and re-install

14 - Intake air duct

- ❑ To lock carrier
- ❑ Clean any leaves and dirt out of intake air duct

5.2 Removing and installing engine cover panel

Removing

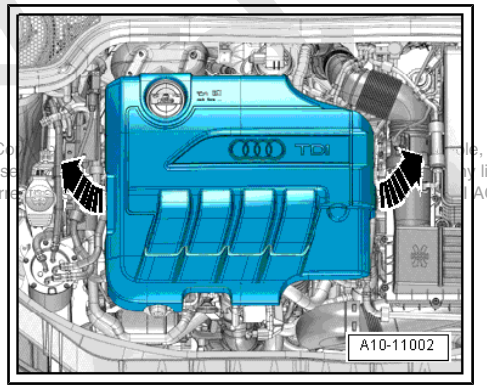
– Carefully pull engine cover panel off retaining pins one after the other “arrows”. Do not jerk the cover panel away, and do not try to pull on one side only.

Installing

– To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.

– Position engine cover panel on engine (note locations of oil filler neck and oil dipstick).

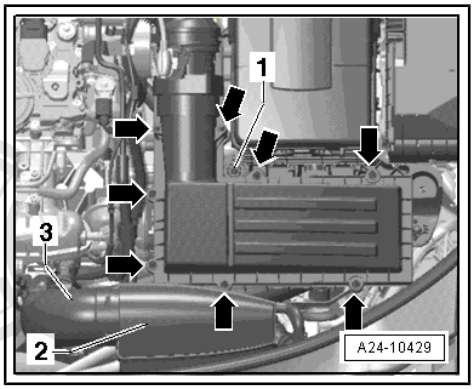
– Press engine cover panel with both hands into the rubber grommets at the rear and then into the grommets at the front.



5.3 Removing and installing air filter element

Removing

– Unscrew bolts -arrows- from air cleaner (top section).



Note

Disregard items 1 to 3.

– Lift up air cleaner (top section) and take out air filter element.

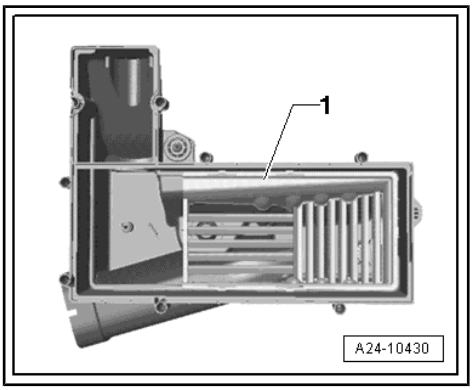
Installing

To ensure the proper function of the air mass meter -G70- 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 -G70- 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.*
- *Hose connections and hoses for charge air system must be free of oil and grease before assembly. Do not use any lubricants containing silicone when assembling.*
- *Both sections of the air cleaner housing MUST be clean.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue*
- *To prevent malfunctions, cover all critical parts of the engine air intake tract (air mass meter, intake pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- *Please observe requirements for disposal.*

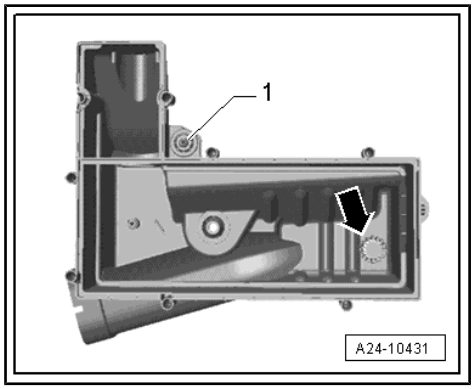
– Remove snow screen -1- and clean it.



Note

The snow screen is not fitted on all vehicles.

– Clean water drain -arrow- and air cleaner (bottom section).
– Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.
– 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 the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).
– Fit the top section of the air cleaner carefully on the bottom section, without using force. Make sure the top section of the air cleaner is fitted straight on the air filter element (note position of sealing lip on air filter element).
– Ensure secure fit of intake hose at air mass meter -G70- .

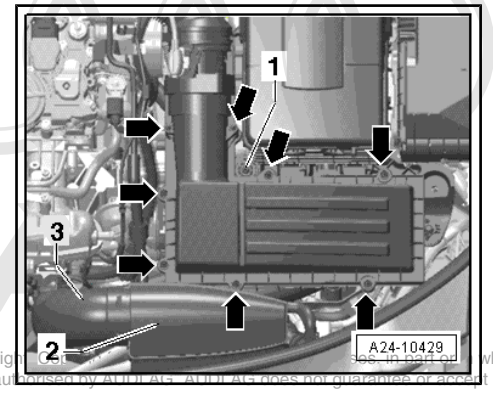


The remaining installation steps are carried out in the reverse sequence.

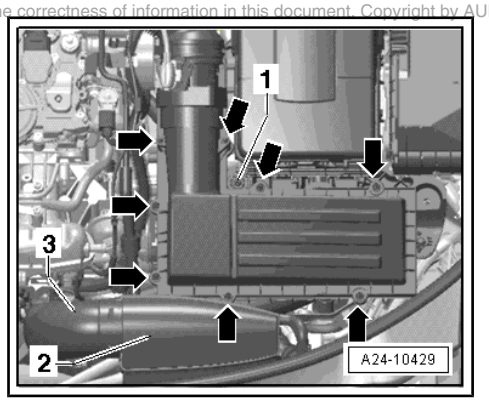
5.4 Removing air cleaner (bottom section)

Removing

– Unscrew bolts -arrows- from air cleaner (top section).
– Lift up air cleaner (top section) and take out air filter element.
– Remove air duct leading from lock carrier to air cleaner housing -2 and 3-.



– Slacken bolt -1-.
– Carefully lift air cleaner (bottom section).



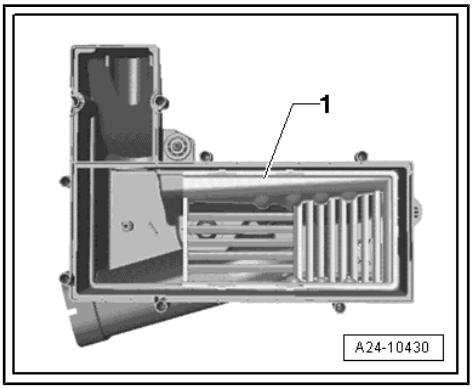
Installing

To ensure the proper function of the air mass meter -G70- it is important to observe the following instructions.

Note

- *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter -G70- 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.*
- *Use a silicone-free lubricant when installing the intake hose.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue*

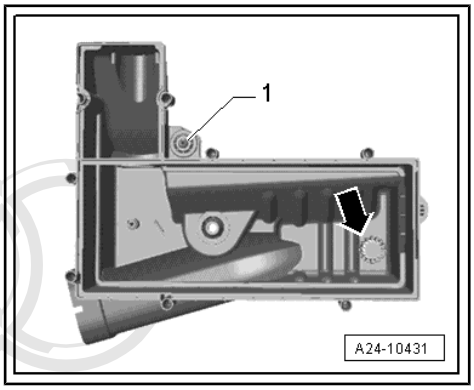
– Remove snow screen -1- and clean it.



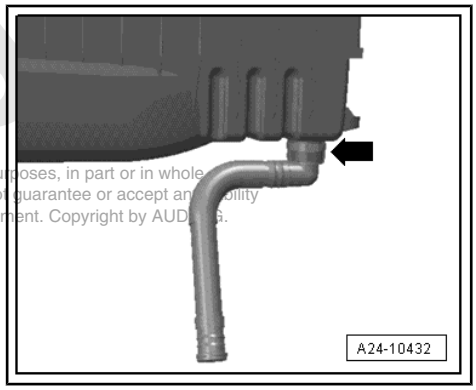
Note

The snow screen is not fitted on all vehicles.

– Clean water drain -arrow- and air cleaner (bottom section).



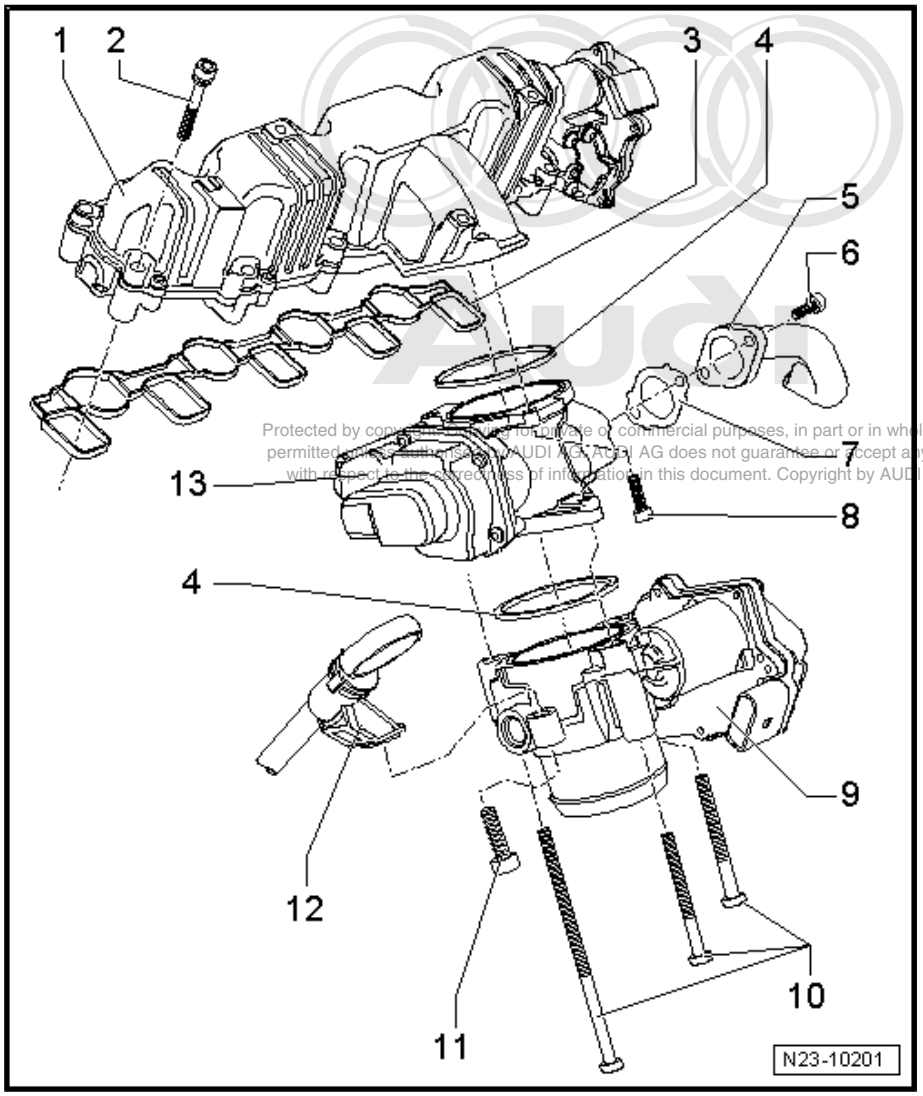
– Disconnect water drain hose -arrow- from air cleaner (bottom section) and clean any dirt or leaves out of connection and hose.
– When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).
– Fit the top section of the air cleaner carefully on the bottom section, without using force. Make sure the top section of the air cleaner housing is fitted straight on the air filter element (note position of sealing lip on air filter element).



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

6 Intake manifold

6.1 Intake manifold with attached components - exploded view



1 - Intake manifold

- ❑ With variable intake manifold motor -V183- and variable intake manifold position sender -G513- (combined in one component)
- ❑ Must not be dismantled
- ❑ Removing and installing ⇒ page 24

2 - Bolt

- ❑ 8 Nm

3 - Gasket

- ❑ Renew

4 - Seal

- ❑ Renew

5 - Connecting pipe

- ❑ To exhaust gas recirculation cooler

6 - Bolt

- ❑ 20 Nm

7 - Gasket

- ❑ Renew

8 - Bolt

- ❑ 10 Nm

9 - Intake manifold flap motor -V157-

- ❑ Removing and installing ⇒ page 49

10 - Bolt

- ❑ 10 Nm

11 - Bolt

- ❑ 10 Nm

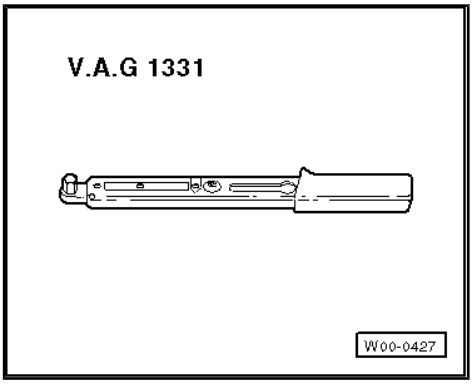
12 - Oil dipstick

13 - Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-

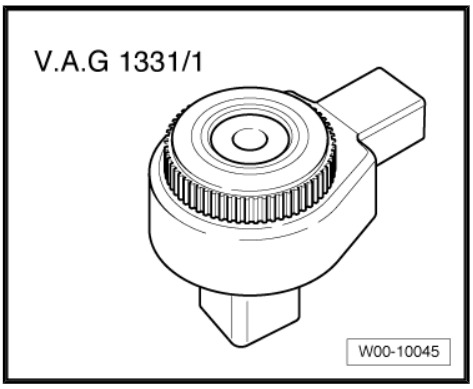
6.2 Removing and installing intake manifold

Special tools and workshop equipment required

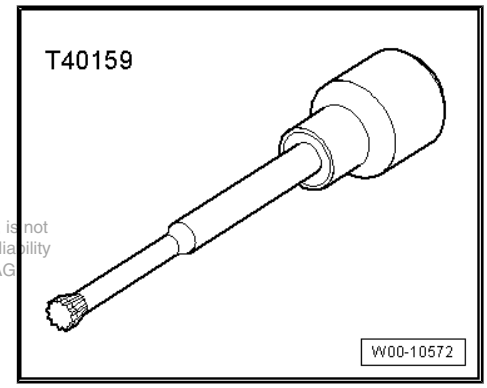
- Torque wrench -V.A.G 1331-



- Ratchet -V.A.G 1331/1-



- Bit XZN 8 -T40159-



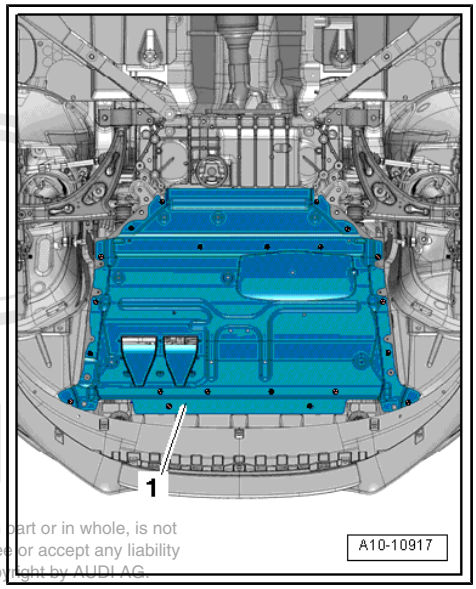
Removing

WARNING

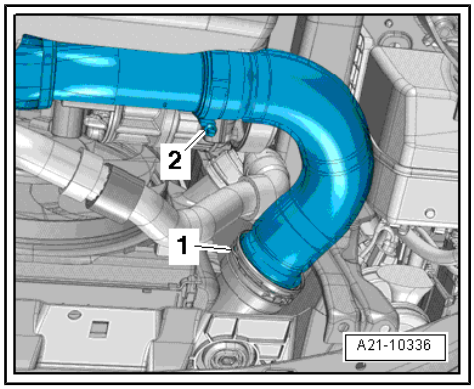
- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

– Remove engine cover panel ⇒ page 20 .
– Take noise insulation off cylinder head cover.

– Remove noise insulation -1- ⇒ Rep. Gr. 50 .



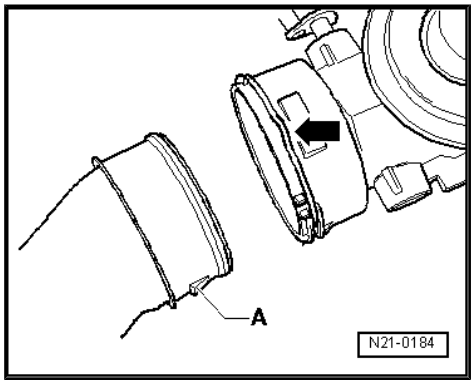
– Loosen hose clip -2- and remove air hose.



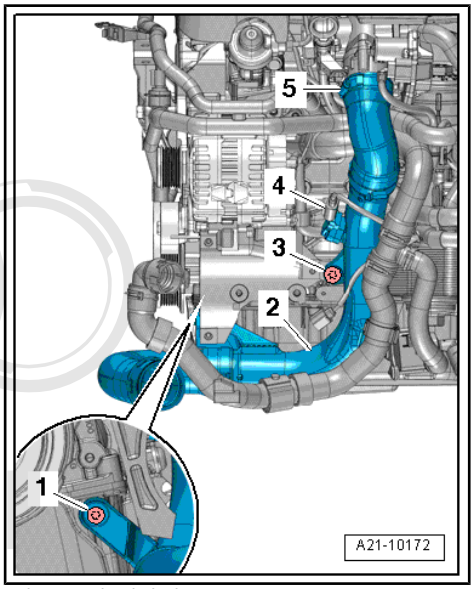
Removing air hoses with plug-in connectors

– Release tab -A- on plug-in connector by lifting retaining clip -arrow-.

– Disconnect air pipes and hoses by hand (do not use a tool).



– Remove bolts -1- and -3-.
– Slacken hose clip -5- at intake manifold flap motor -V157- , detach air pipe -2- but do not remove.

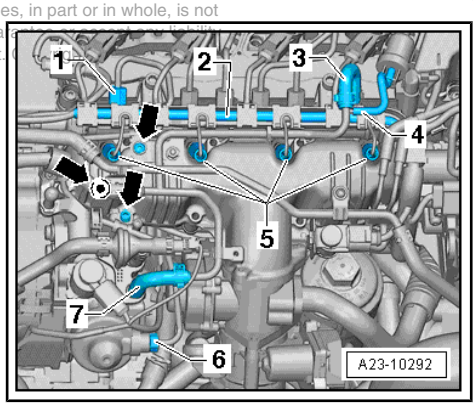


Note

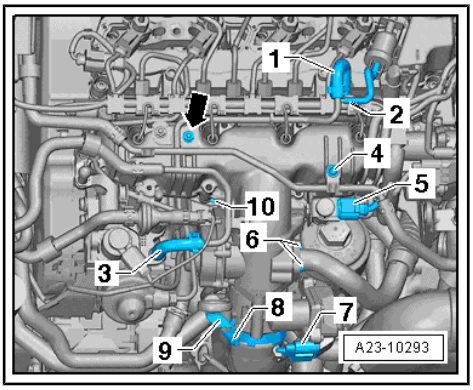
Disregard item -4-.

– Unplug electrical connectors -5- from glow plugs.

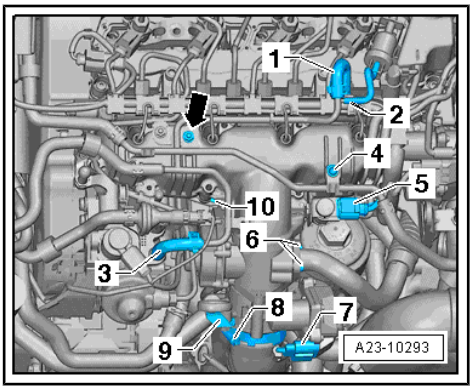
– Unscrew union nuts at high-pressure pump -6- and fuel rail -1- and remove high-pressure fuel pipe.
– Remove bolts -arrows- securing retainers for high-pressure fuel pipe.
– Move wiring harness -2- clear.



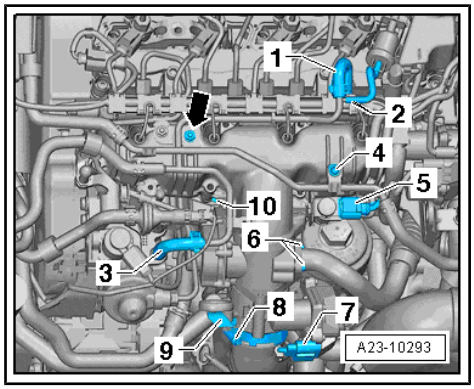
– Detach fuel return lines -1, 2 and 3-.
– Remove securing bolt -arrow- and take out return line.
– Remove bolt from bracket -4- for exhaust gas recirculation cooler change-over valve -N345- .
– Unplug connectors -9- from exhaust gas recirculation valve -N18- and throttle valve module -J338- -7-.



– Remove bolts -6- from connecting pipe for exhaust gas recirculation.



– Open hose clip -8- securing air hose and disconnect hose downwards from intake manifold flap motor -V157- .
– Remove bolt -9- on bracket for oil dipstick.
– Remove bolts securing intake manifold in diagonal sequence starting from outside and working inwards using bit XZN 8 - T40159- .
– Remove intake manifold.



Installing

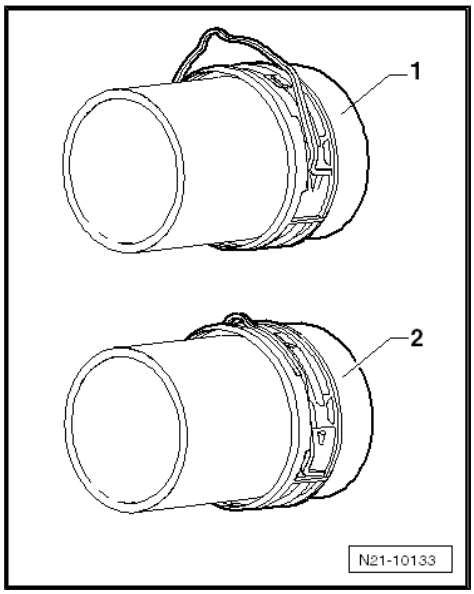
Installation is carried out in the reverse order; note the following:

– Renew seals and/or gaskets.
– Tighten bolts securing intake manifold in diagonal sequence starting from outside and working inwards.
• Tightening torque for intake manifold: refer to exploded view of intake manifold ⇒ Item 2 (page 24) .
– Install air pipe: Charge air cooler - exploded view ⇒ Rep. Gr. 21 .

Installing air hoses with plug-in connectors

Note

♦ *Renew seal if damaged.*
♦ *Make sure that the seal is correctly seated in the groove on the complete circumference of the air pipe/hose.*
♦ *Apply a thin coating of silicon-free lubricant to the sealing area and the seal.*

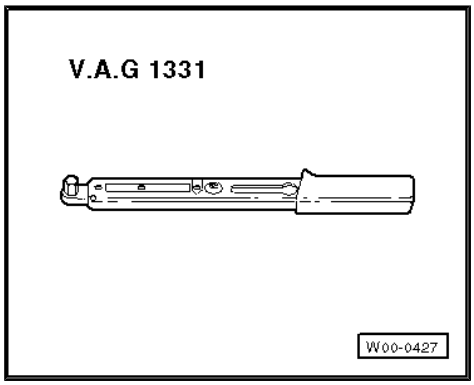


– Release retaining clip (position -1-).
– Push air pipe/hose in as far as stop and press retaining clip to lock -2-.
– Press air pipe/hose again and pull again to check that plug-in connector is correctly engaged.
– Install noise insulation ⇒ Rep. Gr. 50 .

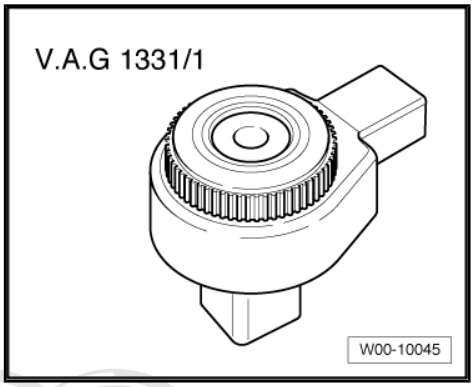
6.3 Removing and installing fuel rail

Special tools and workshop equipment required

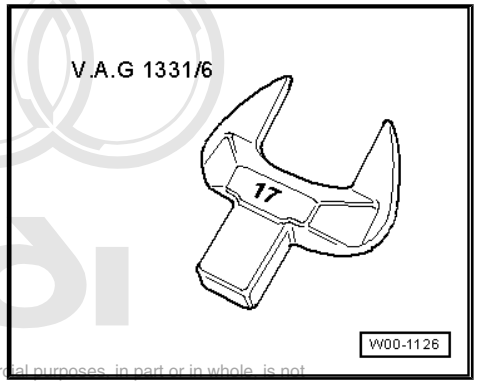
♦ Torque wrench -V.A.G 1331-



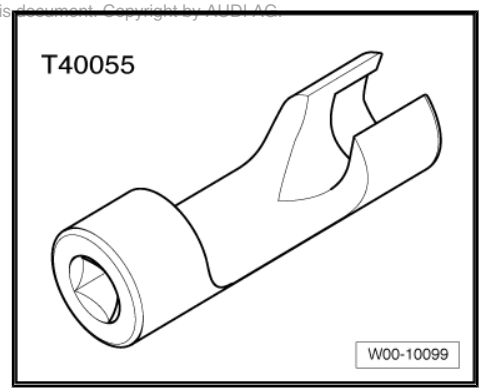
- Ratchet -V.A.G 1331/1-



- Tool insert, AF 17 -V.A.G 1331/6-



- Socket -T40055-



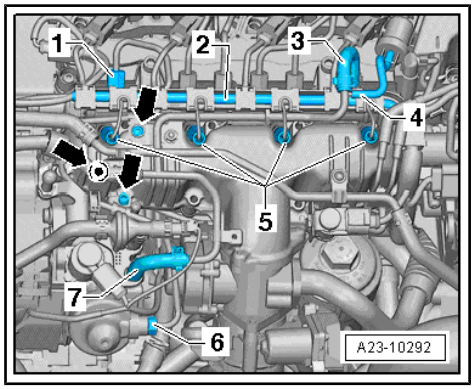
Removing

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

– Remove engine cover panel ⇒ page 20 .
– Take noise insulation off cylinder head cover.

– Unscrew union nuts at high-pressure pump -6- and fuel rail -1- and remove high-pressure fuel pipe.
– Remove bolts -arrows- for high-pressure fuel pipe.
– Detach fuel return hose -3-.
– Move wiring harness -2- clear.



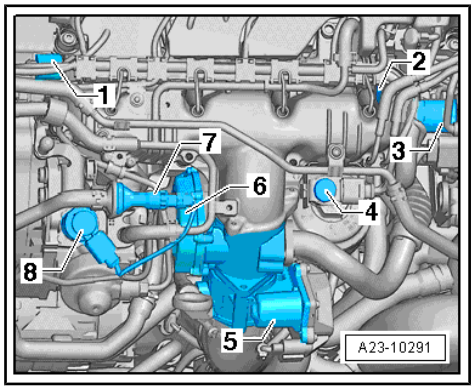
– To do so, unplug the following electrical connectors:

1 - Fuel pressure sender -G247-

2 - Fuel pressure regulating valve -N276-

- Injectors

- Glow plugs



Caution

- *Mark cylinder numbers on high-pressure pipes. They must always be re-installed on the same cylinders.*
- *Observe rules for cleanliness when working on the injection system.*
- *Plug open connections with suitable sealing caps immediately.*

– Loosen union nuts for high-pressure pipes at injectors using socket -T40055- (17 mm).
– Loosen union nuts for high-pressure pipes at fuel rail using tool insert, AF 17 -V.A.G 1331/6- .
– After removal, lay high-pressure pipes on a clean cloth.
– Unscrew both bolts and remove fuel rail.

Installing

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

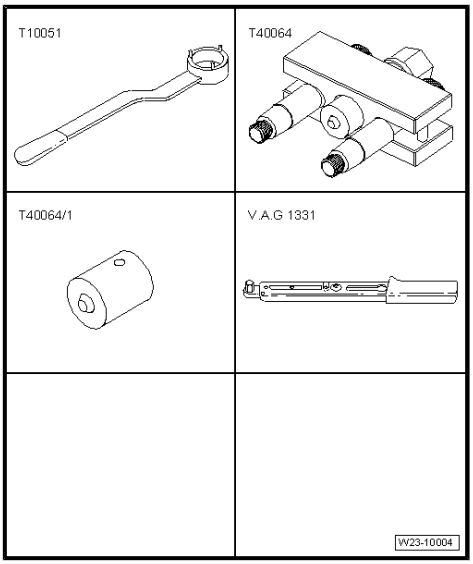
– Install high-pressure pipes free of stress.
• Tightening torques: refer to exploded view of fuel system ⇒ page 14

7 High-pressure pump

7.1 Removing and installing high-pressure pump

Special tools and workshop equipment required

- Counterhold tool -T10051-
- Puller -T40064- with T40064/1
- Torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1-



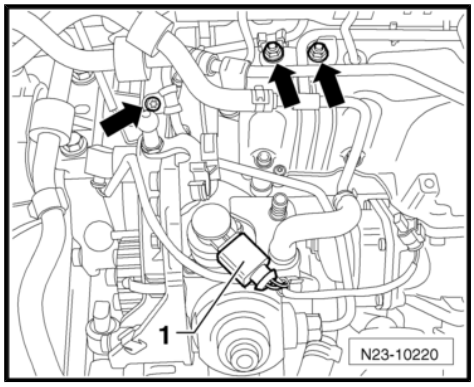
Removing

Caution

- *Always observe rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*
- *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 (performing first fuel filling ⇒ page 33).*

– Remove toothed belt from camshaft and high-pressure pump ⇒ Rep. Gr. 15 .

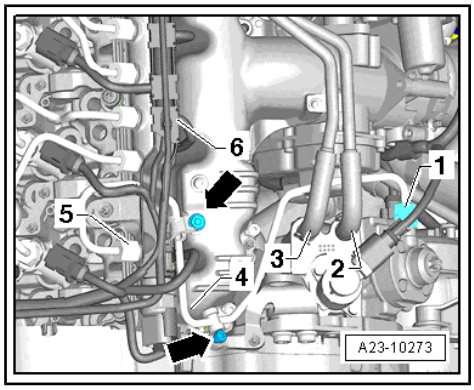
– Unplug electrical connector -1- at fuel metering valve -N290- .
– Remove securing bolts for coolant line on intake manifold and move coolant line to one side.



– Pull fuel pipe connections -2 and 3- off high-pressure pump.
– Unscrew union nuts at high-pressure pump -1- and fuel rail -5- and remove high-pressure fuel pipe -4-.

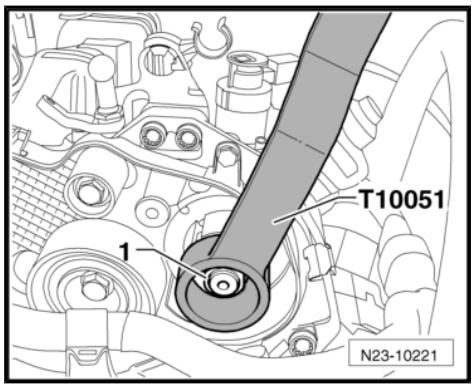
Note

Do not bend fuel pipes.

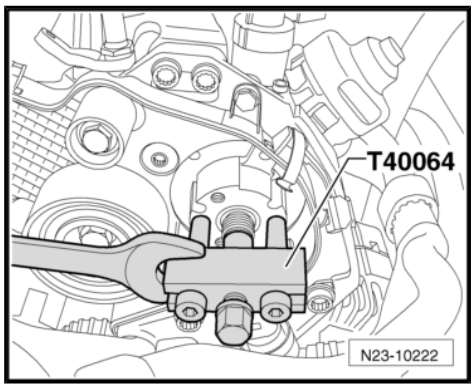


– Remove toothed belt sprocket from high-pressure pump.

– Counterhold hub of high-pressure pump using counterhold tool -T10051- and unscrew securing nut -1-.

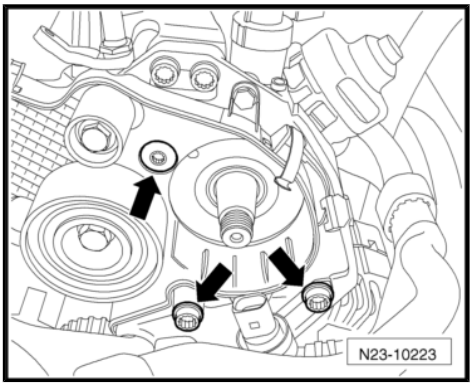


– Apply puller -T40064- with thrust piece -T40064/1- as shown in illustration and pull hub off high-pressure pump. If necessary, counterhold using an open-end spanner (24 mm).



– Unscrew securing bolts -arrows- for high-pressure pump.

– Carefully take out high-pressure pump.



Installing

Install in reverse order.

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 pipes.*
- *There must be sufficient fuel in the tank.*

- Tightening torques: refer to exploded view of fuel system ⇒ page 14

– Install toothed belt for high-pressure pump ⇒ Rep. Gr. 15 .

– Install high-pressure pipes ⇒ page 52 .

Caution

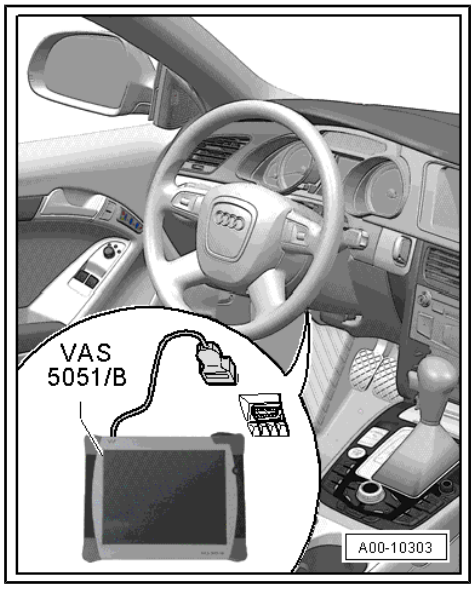
- *The high-pressure pump must first be filled with fuel before the engine is started. The high-pressure pump must not be allowed to run while still empty. First fuel filling ⇒ page 33*
- *Running when dry causes irreparable damage to high-pressure pump.*

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

Caution

After installation, the high-pressure pump must first be filled with fuel before the engine is started (the pump must NOT be allowed to run while still empty).

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



– Connect up the vehicle diagnostic, testing and information system -VAS 5051B- .
– Switch on ignition.
– Select “Engine electronics” in vehicle self-diagnosis.
– Then select “Basic setting”.
– Select “Display group 35”.
– Fuel pumps will run for approx. 60 seconds.
– Repeat this procedure by selecting “Display group 35” 3 times to ensure that high-pressure pump is sufficiently filled 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 fault in fault memory using diagnostic tester.
– After completing the repair, road-test the vehicle over a distance of at least 20 km. Accelerate with full throttle at least once. Then inspect 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 fault memory. Then continue the road test.

– Interrogate fault memory.

8 Injectors

8.1 Checking injectors (piezo injectors)

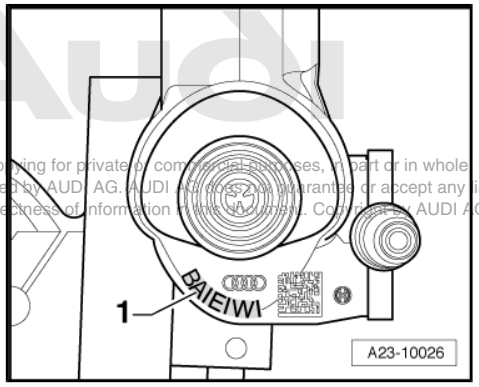
There are three different tests for checking the operation of the injectors.

- Checking adaption of “Injector delivery calibration values” and “Injector voltage calibration values” ⇒ page 35
- Checking return flow rate of injectors with engine running ⇒ page 35
- Checking return flow rate of injectors at starter cranking speed ⇒ page 38

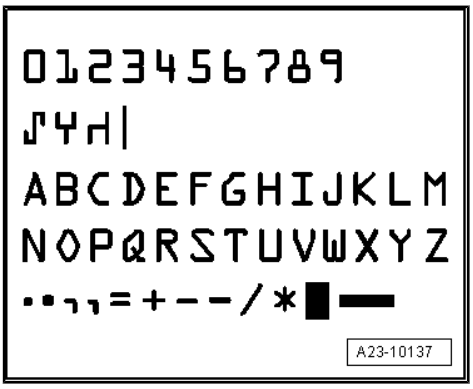
8.2 Adaption of injector delivery calibration values and injector voltage calibration values

The “Injector delivery calibration” and “Injector voltage calibration” functions serve 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. They may consist of letters and/or numbers (ASCII code).



Reference table for reading out letters and/or numbers on each injector



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

When the engine control unit is renewed, the appropriate “injector delivery calibration” values with “injector voltage calibration” values must be written into the new control unit.

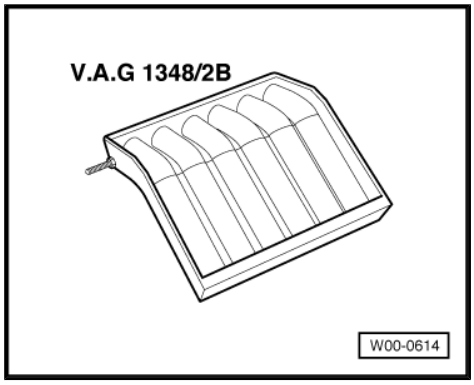
Additionally, check that the “injector delivery calibration values” with “injector voltage calibration values” are correctly entered for all the other injectors. Do NOT attempt to re-enter these calibration values if the correct values are already stored in the engine control unit.

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

8.3 Checking return flow rate of injectors (piezo injectors) with engine running

Special tools and workshop equipment required

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



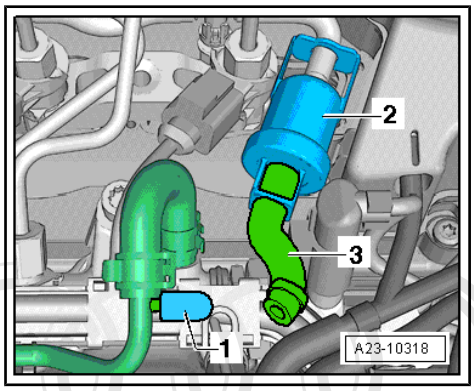
- 4 lengths of hose (made up in the workshop) to fit return line connections on injectors

Checking return flow rate of all injectors

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

– Remove engine cover panel ⇒ page 20 .
– Remove noise insulation from injectors.
– Disconnect hose connection downstream of pressure retention valve -2- in fuel return line.
– Seal off the open return connection with a plug -1-.
– Hold the end of this hose -3- (lengthen if necessary) in a suitable 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.

Checking return flow rate of individual injectors

Special tools and workshop equipment required

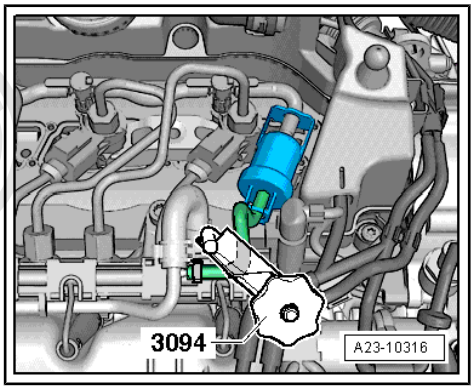
- Injection rate comparison meter -V.A.G 1348/2 B-
- 4 lengths of hose (made up in the workshop) to fit return line connections on injectors

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.

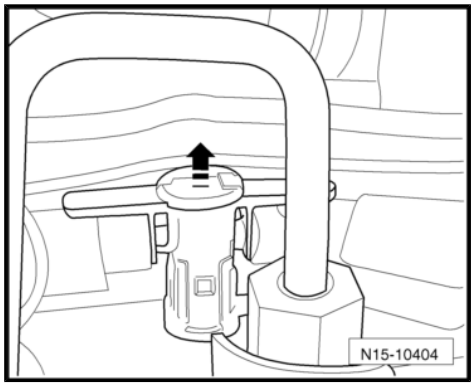
– Clean all return line connections (with commercial cleaning solution or similar) before removing.

– Dry all components after cleaning.

– Clamp off fuel return line downstream of pressure retention valve using hose clamp up to 25 mm -3094- .



– Pull return line connections off injectors; to do so, press both tabs 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

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

Running the engine at higher speeds with the return lines disconnected will cause damage to the injectors.

– 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 42 .

Installing fuel return lines

– Renew O-rings for all return line connections.

Note

Lubricate all O-rings with engine oil or assembly oil before installing.

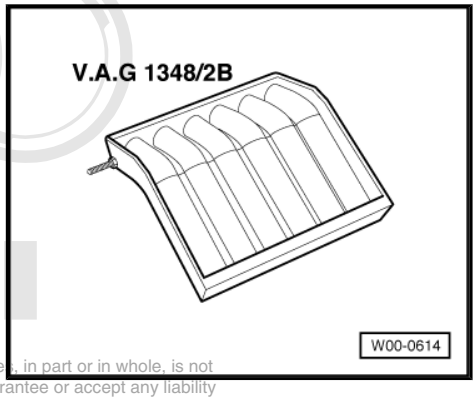
– Push the return line connections carefully over the new seals and onto the injectors. The catch should engage audibly. Then press release pin down carefully.
– Check fuel system for leaks ⇒ page 55 .

8.4 Checking return flow rate of injectors (piezo injectors) at starter cranking speed

If it is not possible to start engine, check return flow rate of injectors at starter cranking speed.

Special tools and workshop equipment required

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



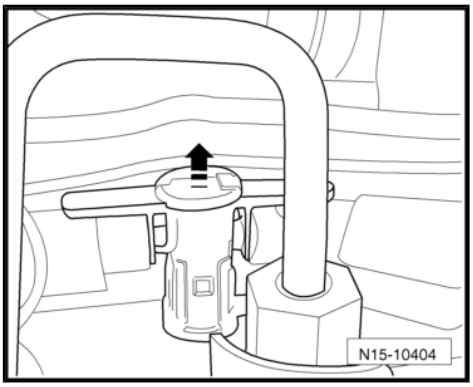
- 4 lengths of hose (made up in the workshop) to fit return line connections on injectors

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

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.

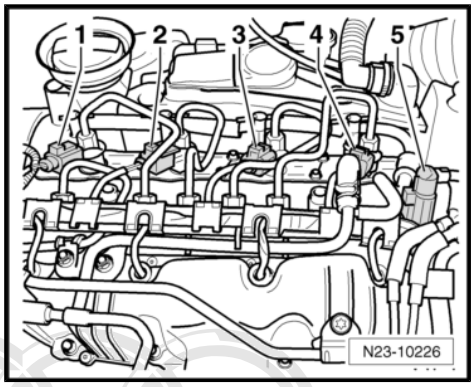
– Remove engine cover panel ⇒ page 20 .
– Clean all return line connections (with commercial cleaning solution or similar) before removing.
– Dry all components after cleaning.
– Pull return line connections off injectors; to do so, press both tabs down and at the same time pull release pin upwards -arrow-.



Note

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

– Detach electrical connector -5- from fuel pressure regulating valve -N276- .



Note

This prevents fuel from being injected when starter is operated.

– Connect the 4 hoses onto return line connections of all 4 injectors.
– Run the 4 hoses into injection rate comparison meter -V.A.G 1348/2 B- .
– Operate starter three times. (Wait approx. 20 seconds each time after operating starter to prevent it from overheating.)
• Specification of return flow rate: 0 ml
– If fuel comes out of one injector, that injector must be renewed.
– Re-attach electrical connector on fuel pressure regulating valve -N276- .

Installing fuel return lines

– Renew O-rings for all return line connections.

Note

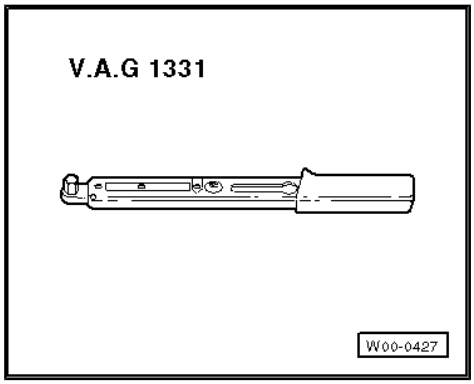
Lubricate all O-rings with engine oil or assembly oil before installing.

– Push the return line connections carefully over the new seals and onto the injectors. The catch should engage audibly. Then press release pin down carefully.
– Check fuel system for leaks ⇒ page 55 .
– Erase fault in fault memory using a diagnostic tester.

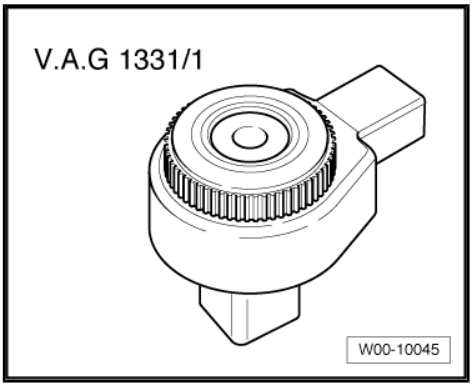
8.5 Checking for injectors sticking open (piezo injectors)

Special tools and workshop equipment required

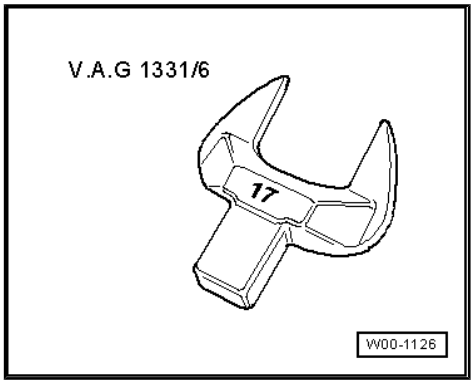
♦ Torque wrench -V.A.G 1331-



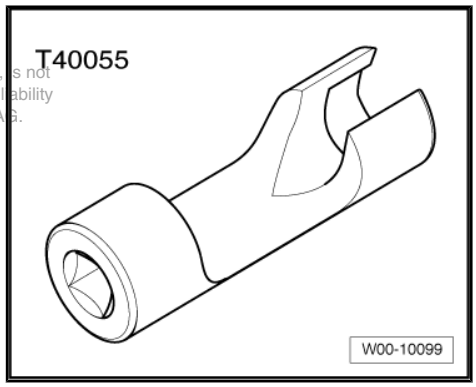
- Ratchet -V.A.G 1331/1-



- Tool insert, AF 17 -V.A.G 1331/6-



- Socket -T40055-



- Screw plug -T40204-

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

– Erase fault memory of engine control unit.

– Remove engine cover panel ⇒ page 20 .

– 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.

– Unscrew union nut at fuel rail for cylinder 1 and also loosen union nut on injector slightly using socket -T40055- . Seal off open connection on injector pipe.

– Plug open connection using plug -T40204- .

– The electrical connector of the relevant injector must remain connected.

– Erase all faults in fault memory.

– Perform test drive.

Note

- *The fault "positive fuel pressure control" should no longer be indicated when the defective injector has been located.*
- *Other fault messages may possibly be stored in the memory. These result from previous steps and can be disregarded.*

– Interrogate fault memory after road-testing vehicle. If a fault relating to "positive fuel pressure control" is still being indicated, repeat the above steps for all rail element connections until the fault is no longer indicated after the road-test.

Observe all instructions for connecting injector pipes.

– Lubricate threads of union nuts with fuel.

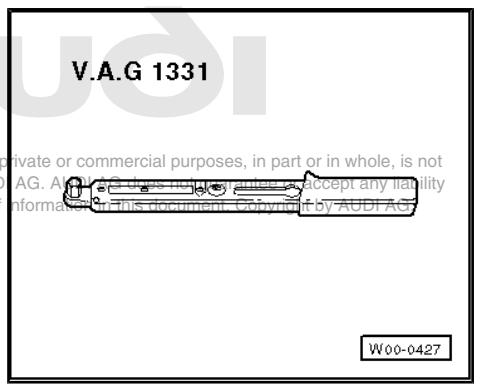
– Hand-tighten union nuts on high-pressure pipes. Make sure that connections are not under tension.

– Install high-pressure pipes ⇒ page 52 .

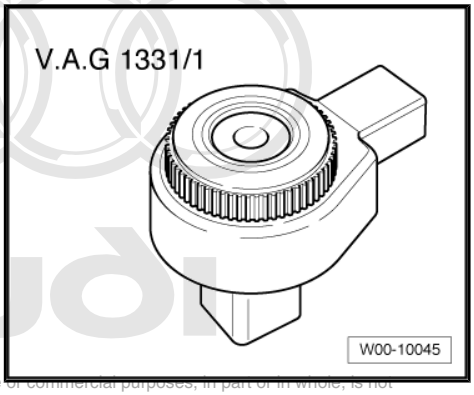
8.6 Removing and installing injectors (piezo injectors)

Special tools and workshop equipment required

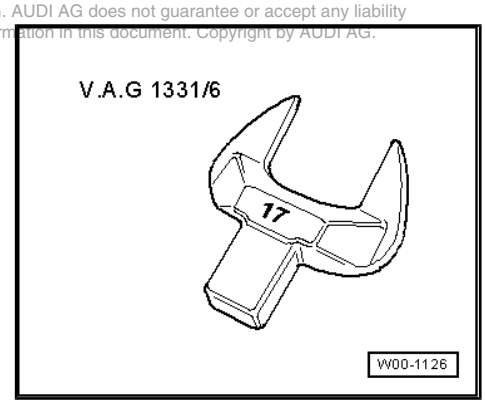
- Torque wrench -V.A.G 1331-



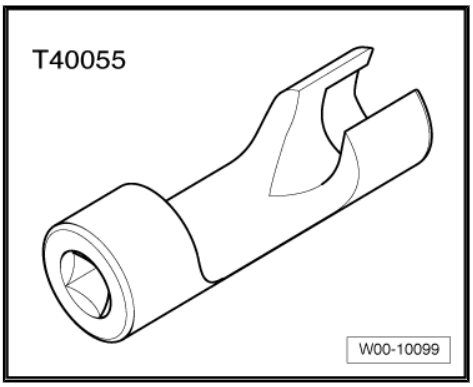
- Ratchet -V.A.G 1331/1-



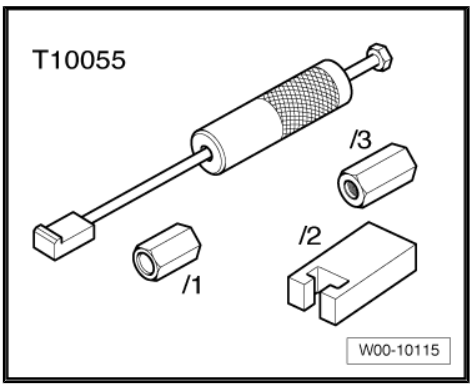
- Tool insert, AF 17 -V.A.G 1331/6-



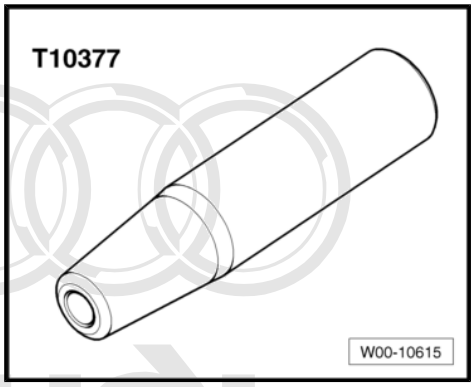
- Socket -T40055-



- Puller -T10055- with adapter -T10055/1-



- Assembly sleeve -T10377-



Removing

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

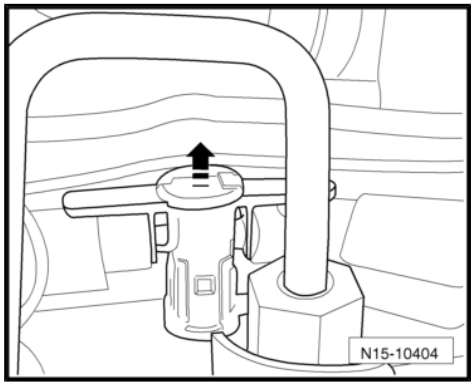
– Remove engine cover panel ⇒ page 20 .

– Take noise insulation off cylinder head cover.

Caution

- *Mark cylinder numbers on injector units. They must always be re-installed on the same cylinders.*
- *Observe rules for cleanliness when working on the injection system.*
- *Plug open connections with suitable sealing caps immediately.*

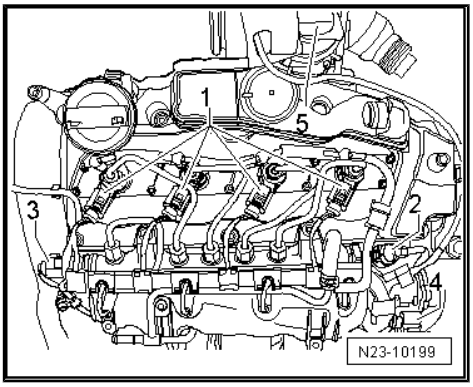
– Pull return line connections off injectors; to do so, press both tabs down and at the same time pull release pin upwards -arrow-.



Note

Should you not be able to pull the return line connection upwards, open the connection using a small screwdriver.

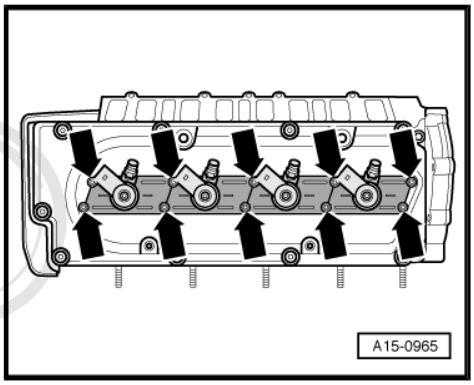
– Unplug electrical connectors -1- at injectors which are to be removed.
– Loosen union nuts for high-pressure pipes at injectors using socket -T40055- (17 mm).
– Loosen union nuts for high-pressure pipes at fuel rail using tool insert, AF 17 -V.A.G 1331/6- .



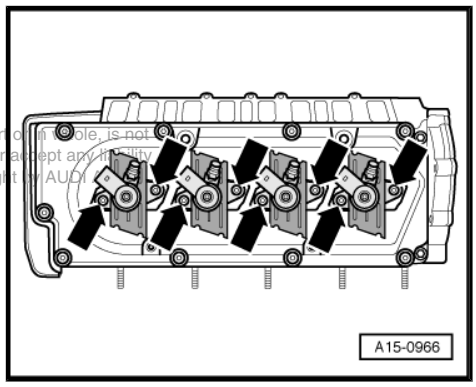
– Unbolt covers for injectors -arrows-.
– Pull covers upwards and turn them $^{1}/_{4}$ turn (90°).

Caution

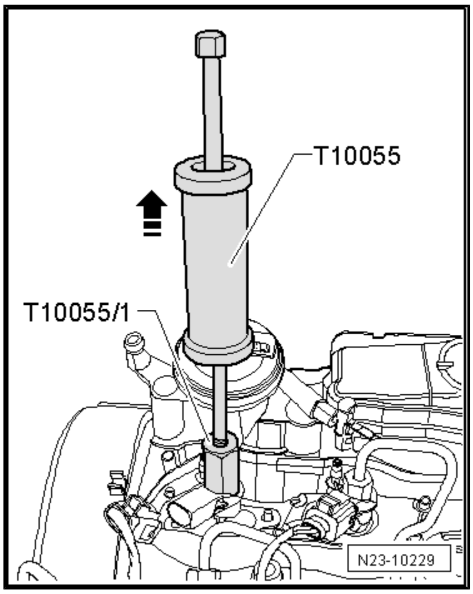
When removing securing nuts on injector there is a risk that the relevant nut will fall into the cylinder head. Proceed very carefully to prevent unnecessary dismantling or further damage.



– Unbolt clamping pieces for injectors -arrows-.



– Apply puller -T10055- with adapter -T10055/1- as shown in illustration and pull injector out upwards by tapping gently.



– After removal, lay injectors on a clean cloth.

Important instructions for installing injectors:

• When removing and installing, always renew the following components and seals/O-rings: “copper seal”, “O-ring for injector bore”, “O-ring for injector return connection”.

• The following components and seals/O-rings must always be renewed when an injector is renewed: “clamping piece”, “copper seal”, “O-ring for injector bore”, “O-ring for injector return connection”.

• Lubricate all O-rings with engine oil or assembly oil before installing.

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.

– If an injector is very dirty, the tip of the nozzle should also be cleaned with a soft brass wire brush to make it easier to remove the copper seal. Do not apply the wire brush to the bores in the nozzle.

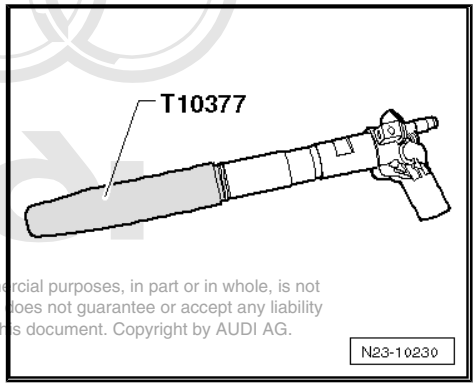
– To remove the old copper seal from the injector, clamp the seal carefully in a vice so that it is just held between the jaws without turning. Then carefully pull and twist the injector out of the copper seal by hand.

– Clean off deposits under the copper seal using a suitable scraper.

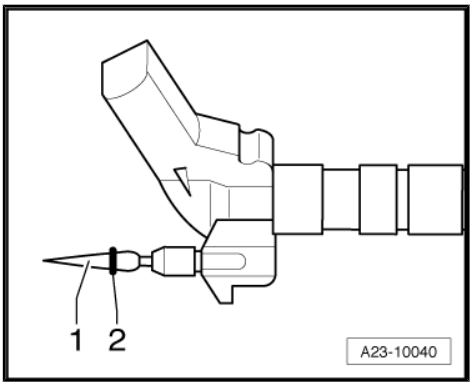
Caution

To remove carbon deposits from the injector sealing surface, clean the injector seat in the cylinder head with a cloth soaked in engine oil or rust solvent. Take care not to damage the sealing surface.

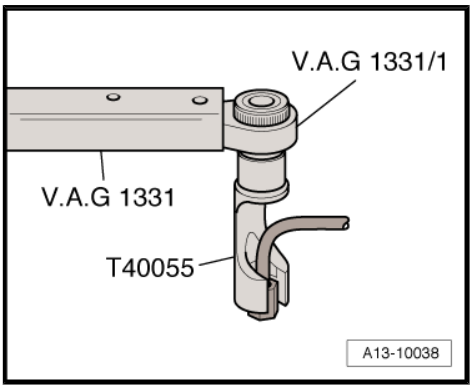
– Renew seal for injector bore using assembly sleeve -T10377- .



– To prevent damage to the new O-ring -2- for the fuel return line connection, push it over assembly tool -1-.
– Install injectors.
– Hand-tighten union nuts on high-pressure pipes. Make sure that connections are not under tension.



– To tighten unions of high-pressure pipes at injectors, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket -T40055- .

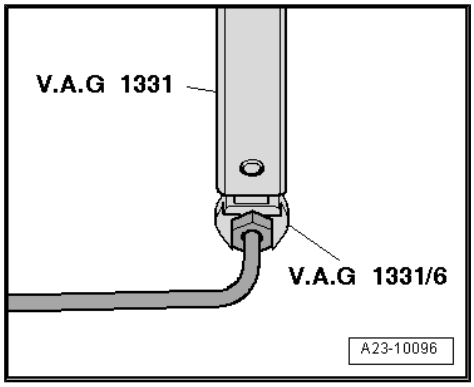


– To tighten unions of high-pressure pipes to fuel rail, use torque wrench -V.A.G 1331- with tool insert, AF 17 -V.A.G 1331/6- .

♦ Observe tightening torque: Installing high-pressure pipes ⇒ page 52 .

♦ Tightening torques: refer to exploded view of fuel system ⇒ page 14

– Press return line connections carefully over the seals and onto the injector units (check seal for damage before connecting return line). The catch should engage audibly. Then press release pin down carefully.



After replacement of one or more injectors, the “injector delivery calibration values” and “injector voltage calibration values” for the new injectors must be written into the engine control unit Vehicle diagnostic, testing and information system -VAS 5051B- .

Additionally, check that the “injector delivery calibration values” and “injector voltage calibration values” are correctly entered for all the other injectors. Do NOT attempt to re-enter these calibration 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 together with the pressure retention valve as one unit.

– After completing the repair, road-test the vehicle over a distance of at least 20 km. Accelerate with full throttle at least once. Then inspect the high-pressure section of the fuel system again for leaks.

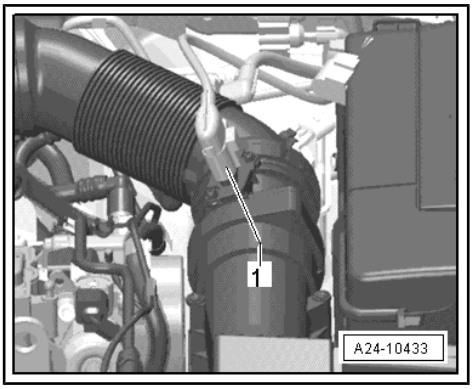
Note

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 fault memory. Then continue the road test.

9 Components of injection system

9.1 Removing and installing air mass meter -G70-

Removing



– Unplug electrical connector -1- at air mass meter -G70- .

– Unscrew both bolts from air mass meter -G70- and carefully pull air mass meter -G70- out of guide on air cleaner housing.

Installing

To ensure the proper function of the air mass meter -G70- 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 -G70- 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.*
- *Use a silicone-free lubricant when installing the air hose.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue*

– Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).

– Check for dirt in air duct leading to air filter element. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing air cleaner ⇒ page 22 .

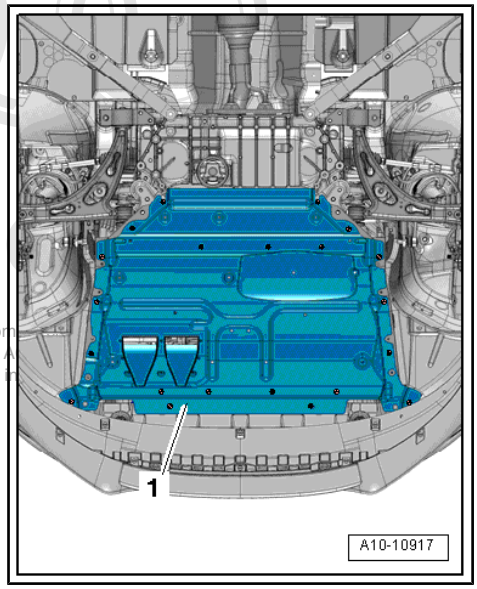
The remaining installation steps are carried out in the reverse sequence.

9.2 Removing and installing intake manifold flap motor -V157-

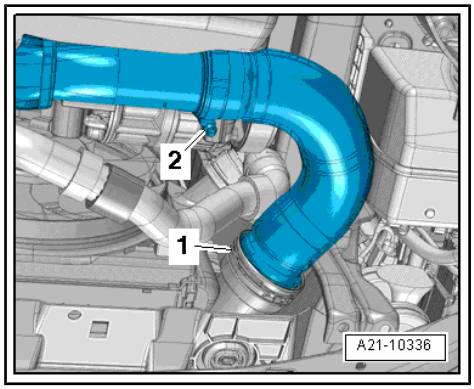
Removing

– Remove engine cover panel -arrows-.

– Remove noise insulation -1- ⇒ Rep. Gr. 50 .



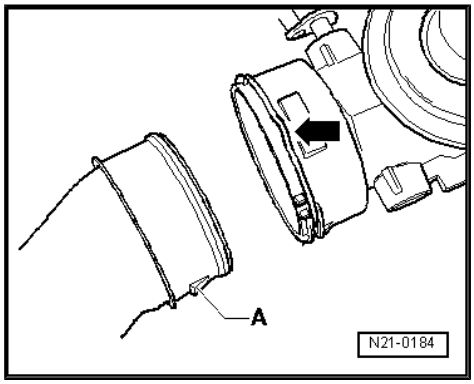
– Loosen hose clip -2- and remove air hose.



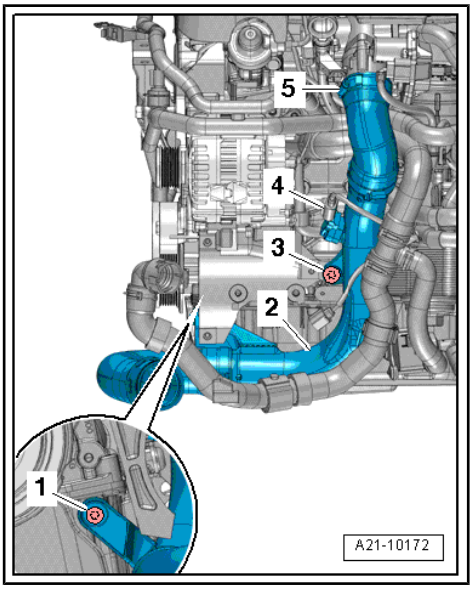
Removing air hoses with plug-in connectors

– Release tab -A- on plug-in connector by lifting retaining clip -arrow-.

– Disconnect air pipes and hoses by hand (do not use a tool).



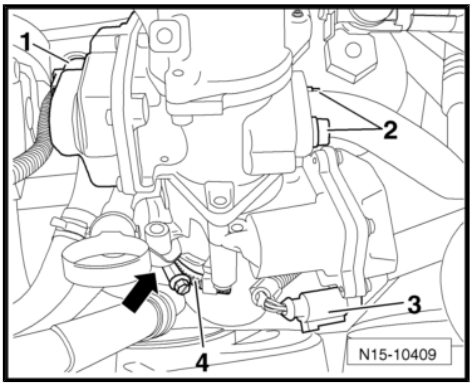
– Remove bolts -1- and -3-.
– Slacken hose clip -5- at intake manifold flap motor -V157- , detach air pipe -2- but do not remove.



Note

Disregard item -4-.

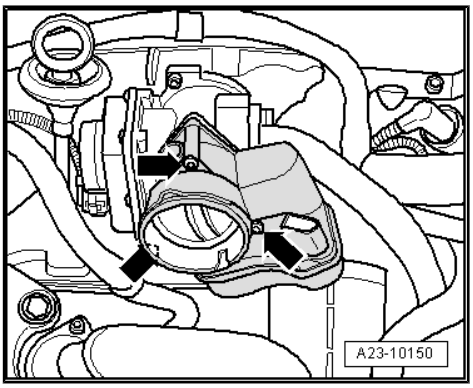
– Unplug electrical connector -3- at intake manifold flap motor -V157- .



Note

Disregard items marked -1, 2, 4- and -arrow-.

– Unscrew bolts -arrows- and detach intake manifold flap motor -V157- .



Installing

- Tightening torque: refer to intake manifold with attached components - exploded view ⇒ page 24

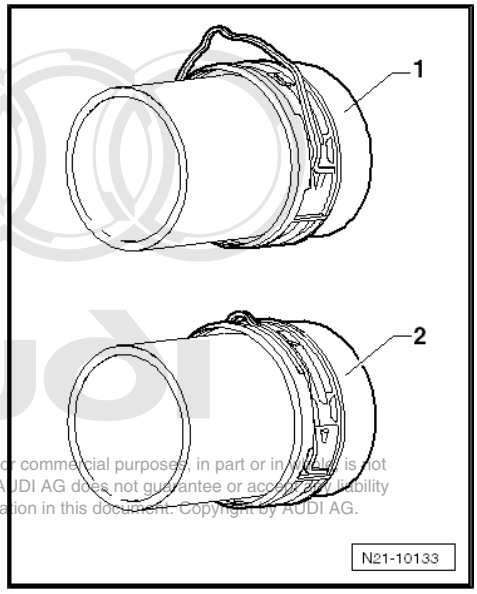
Installation is carried out in the reverse order; note the following:

Note

Renew O-ring.

– Install air pipe: Charge air cooler - exploded view ⇒ Rep. Gr. 21 .

Installing air hoses with plug-in connectors



Note

- *Renew seal if damaged.*
- *Make sure that the seal is correctly seated in the groove on the complete circumference of the air pipe/hose.*
- *Apply a thin coating of silicon-free lubricant to the sealing area and the seal.*

– Release retaining clip (position -1-).

– Push air pipe/hose in as far as stop and press retaining clip to lock -2-.

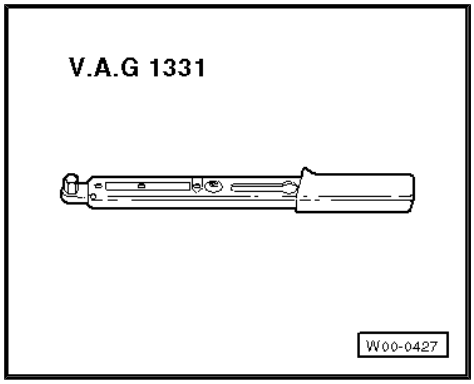
– Press air pipe/hose again and pull again to check that plug-in connector is correctly engaged.

– Install noise insulation ⇒ Rep. Gr. 50 .

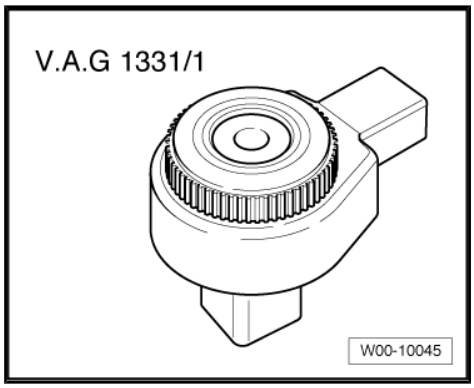
9.3 Installing high-pressure pipes

Special tools and workshop equipment required

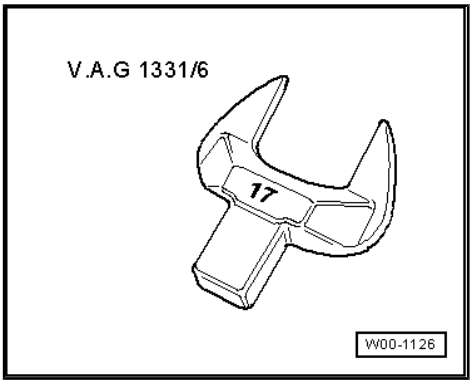
- Torque wrench -V.A.G 1331-



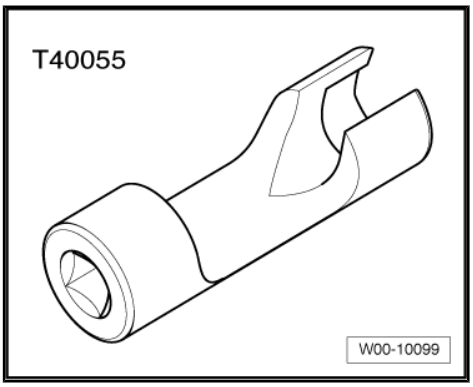
- Ratchet -V.A.G 1331/1-



- Tool insert, AF 17 -V.A.G 1331/6-



- Socket -T40055-



Procedure

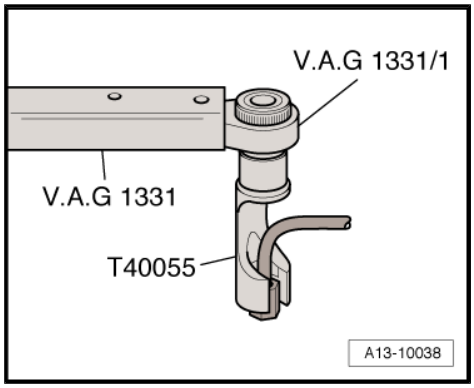
Note

- *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.*

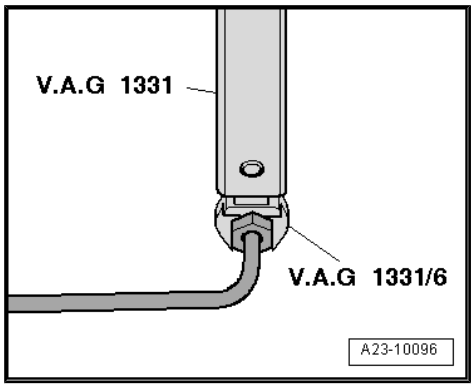
– Use vacuum cleaner to remove dirt from taper seat at fuel rail.
– Clean fuel pipe and end of pipe using cleaning solution and dry with compressed air.
– Lubricate threads of union nuts with fuel.
– Hand-tighten union nuts on high-pressure pipes (ensure that pipes are not under tension).

• Tightening torque: 25 Nm

– To secure high-pressure pipes, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket, AF 17 - T40055- .



– To secure high-pressure pipes, use torque wrench - V.A.G 1331- with tool insert, AF 17 -V.A.G 1331/6- .



– Check fuel system for leaks ⇒ page 55 .

9.4 Checking pressure retention valve in fuel return line

The pressure retention valve maintains a residual pressure of approx. 10 bar in the fuel return line.

This residual pressure is required for the control function of the piezo injectors.

Special tools and workshop equipment required

♦ Tester for fuel return system -6330-

WARNING

♦ *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*

♦ *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

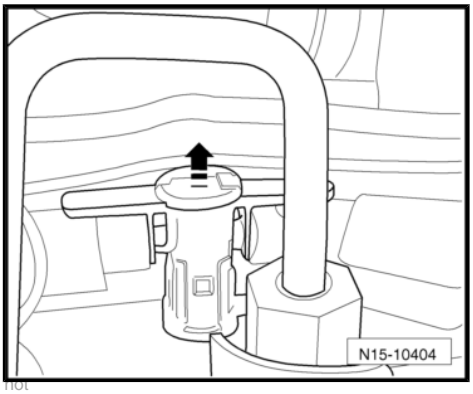
– Remove engine cover panel ⇒ page 20 .

– Clean return line connection on cylinder 1 (with commercial cleaning solution or similar) before removing.

– Dry return line connection on cylinder 1.

– Cover return line connection on cylinder 1 with a cloth.

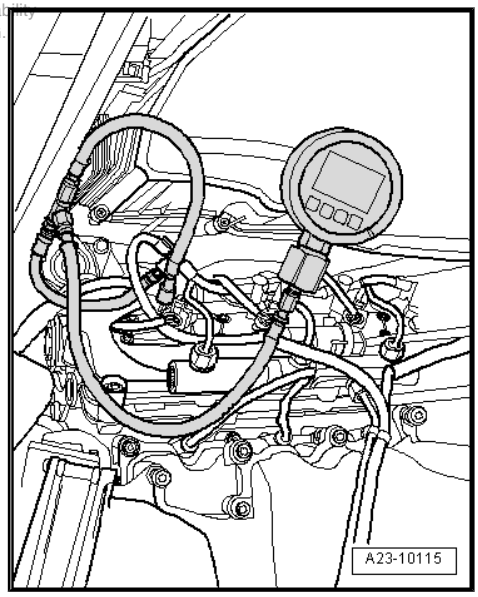
– Pull return line connection off cylinder 1; to do so, press both tabs down and at the same time pull centre piece up to release connection -arrow-.



Note

Take care to keep all components clean. No dirt must be allowed to get into the disconnected return line or the open connection on the injector.

– Connect tester for fuel return system -VAS 6330- between return line connection on injector and return line.



– Start engine.

– Check pressure indicated on tester.

♦ Specification: approx. 10 bar

If the value does not match the specification, fit a new pressure retention valve.

9.5 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.

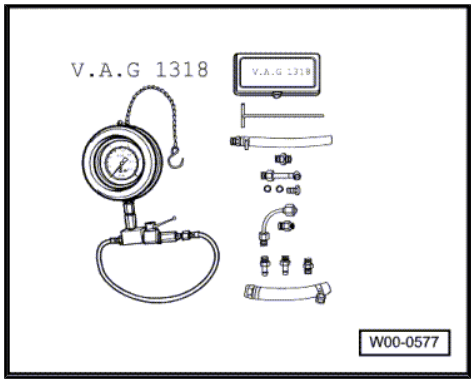
Note

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 fault memory. Then continue the road test.

9.6 Checking fuel pressure (low pressure) system

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.

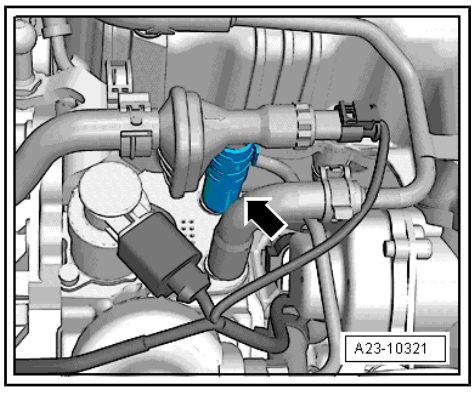
Checking residual pressure

– Remove engine cover panel ⇒ page 20 .

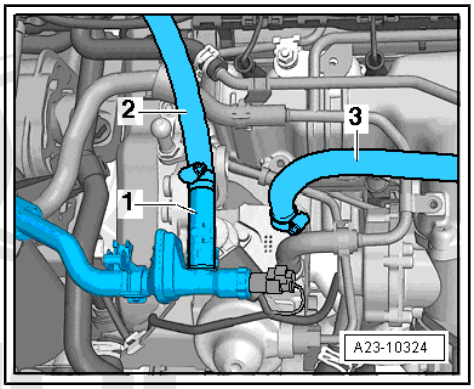
WARNING

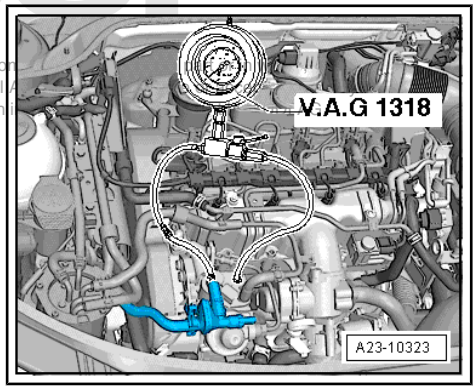
- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*
- *To reduce the pressure in the fuel system, wrap a clean cloth around the connection and carefully loosen the connection.*

– Disconnect fuel supply line -arrow- at high-pressure pump.



– Connect K-Jetronic pressure tester -V.A.G 1318- to fuel supply line -1- with suitable adapter -2-. Connect the other adapter -3- from K-Jetronic pressure tester -V.A.G 1318- to open connection at high-pressure pump.





Note

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

– Connect up the vehicle diagnostic, testing and information system -VAS 5051B- .
– Switch on ignition.
– Select “Engine electronics” in vehicle self-diagnosis.
– Then select “Basic setting”.
– Select “Display group 35”.
– Press “activate” button.
– The fuel pumps start running.
– Let fuel pumps run until maximum fuel pressure has built up.

• Specification: at least 3.5 bar

If specification is not obtained:

Check union between pressure gauge and fuel line for leaks.

Test pressure gauge for leaks.

Check fuel lines and their connections for leaks.

Fuel filter is blocked.

Check delivery rate of fuel pump ⇒ page 57 .

Note

Check fuel system for leaks.

9.7 Checking delivery rate of fuel pumps

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.

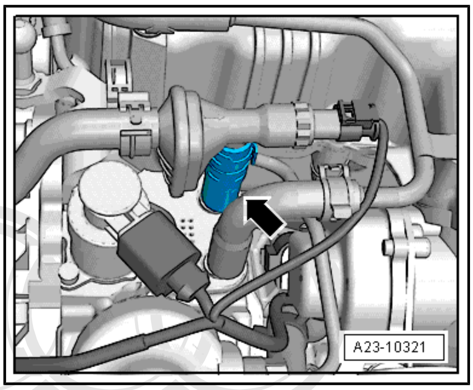
Checking fuel delivery rate

– Remove engine cover panel ⇒ page 20 .

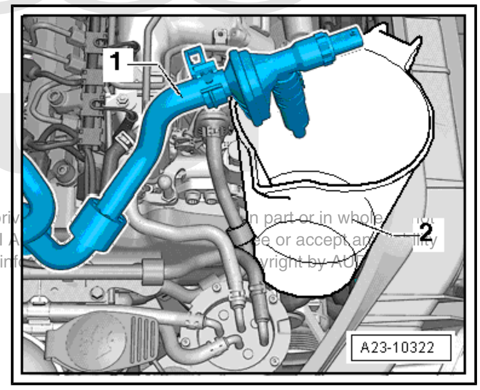
– Take noise insulation off cylinder head cover.

> **WARNING**
>
> ♦ *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
>
> ♦ *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*
>
> ♦ *To reduce the pressure in the fuel system, wrap a clean cloth around the connection and carefully loosen the connection.*

– Disconnect fuel supply line -arrow- at high-pressure pump.



– Hold fuel supply line -1- into a measuring container -2-.



– Connect up the vehicle diagnostic, testing and information system -VAS 5051B- .

– Switch on ignition.

– Select “Engine electronics” in vehicle self-diagnosis.

– Then select “Basic setting”.

– Select “Display group 35”.

– Press “activate” button.

– The fuel pumps start running.

– Let fuel pumps 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 pumps were not running for 15 seconds

♦ Fuel lines have been crushed

♦ Fuel filter is blocked

♦ Fuel pumps defective: Checking ⇒ Rep. Gr. 20

Note

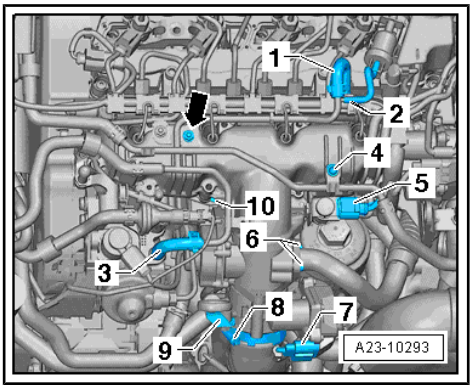
Check fuel system for leaks.

9.8 Checking fuel pressure regulating valve -N276-

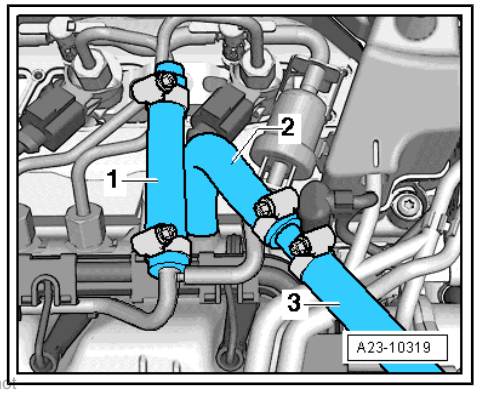
WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

– Remove engine cover panel ⇒ page 20 .
– Remove noise insulation from injectors.
– Detach fuel return line -1-.



– Seal off the open return line connection with a plug -1-.
– Attach a suitable hose -3- to return line -2-.



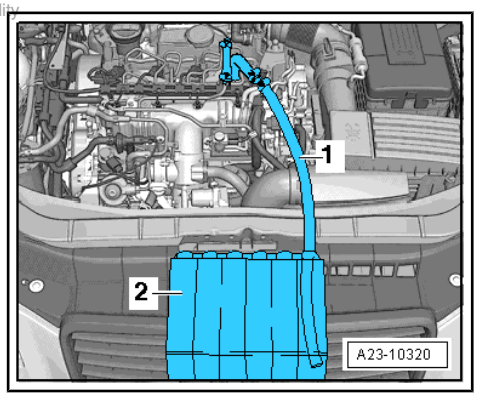
– Hold this hose -1- in a suitable container -2- to measure the return flow rate.
– Start engine and let it idle.
- Specification: 100 ml (+/- 10 %) in 30 seconds

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

If it is not possible to start engine, perform test at starter cranking speed.

- Specification of return flow rate: 0 ml

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



9.9 Removing and installing fuel pressure regulating valve -N276-

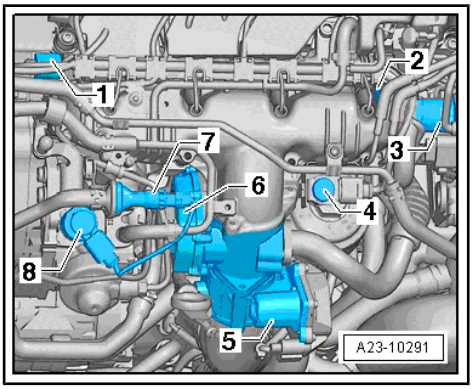
Special tools and workshop equipment required

- Torque wrench
- Open-end spanner insert, 30 mm
- Open-end spanner, 33 mm

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.



Note

The fuel pressure regulating valve -N276- cannot be re-used.

Removing

WARNING

- ***Always observe rules for cleanliness and instructions for working on fuel system ⇒ page 1 .***
- ***Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.***

– Remove engine cover panel ⇒ page 20 .

– Remove fuel rail ⇒ page 28 .

– 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).

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.

– Remove dirt from thread and sealing surface using vacuum cleaner. Do not use metal tools, etc.

Note

Seal off hole immediately with a suitable plug to prevent dirt from entering.

Installing

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 bore.*
- *The beginning of the thread and the deformable sealing lip 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 28 .

• Tightening torque: refer to fuel system - exploded view ⇒ page 14

– After installation, run engine at moderate speed for several minutes and then switch off.

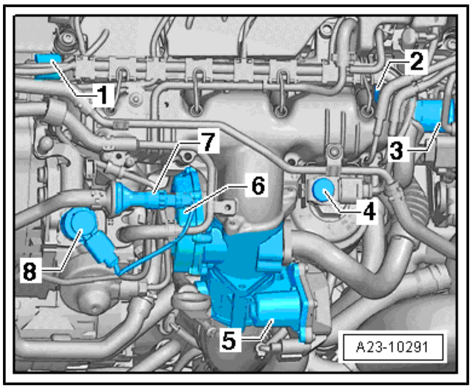
– Check fuel system for leaks.

– Interrogate fault memory.

– 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 fault memory again.

9.10 Removing and installing fuel pressure sender -G247-



The fuel pressure sender -G247- -1- is located in the fuel rail and continuously measures the fuel pressure in the high-pressure system. It transmits a corresponding voltage signal to the engine control unit -J623- .

Should the sender fail, the engine control unit will control the fuel pressure via a mapped open-loop backup function, allowing a maximum of approx. 3000 rpm.

Removing

WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 1 .*
- *Follow these instructions and rules for cleanliness before starting work and while working on the fuel system.*

– Remove engine cover panel ⇒ page 20 .

– Before removal, clean area around thread for fuel pressure sender using commercial cleaning solution etc. (no dirt must enter opening in fuel rail).

Note

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

– Dry off fuel pressure sender -G247- .

– Unplug electrical connector at fuel pressure sender -G247- .

– Unscrew fuel pressure sender -G247- .

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

Note

Seal off opening in fuel rail immediately with a suitable plug to prevent dirt from entering.

Installing

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.*
- *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 lubricated with Molykote grease.*

– Screw in fuel pressure sender -G247- by hand.
– Then tighten fuel pressure sender -G247- to specified torque.
• Tightening torque: refer to fuel system - exploded view ⇒ page 14

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 fault 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.

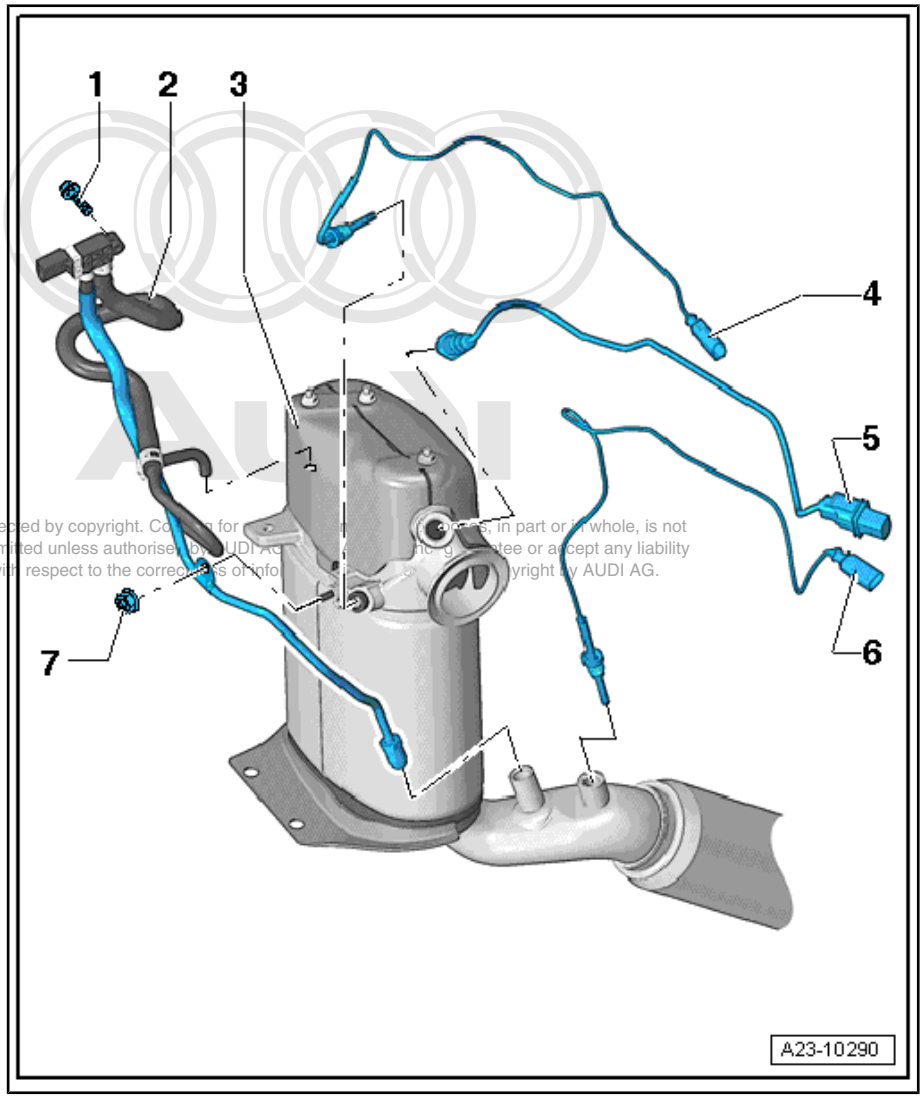
Note

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 fault memory. Then continue the road test.

– After road test, interrogate fault memory again.

10 Lambda probe and exhaust gas temperature sensors - exploded view

10.1 Lambda probe and exhaust gas temperature sensors - exploded view



1 - Bolt for exhaust gas pressure sensor 1 -G450-

- ❑ 4.5 Nm
- ❑ Removing and installing ⇒ page 67
- ❑ Pressure pipes to particulate filter: 45 Nm

2 - Measuring line for exhaust gas pressure sensor 1 -G450-

3 - Particulate filter

- ❑ Adaption must be performed after particulate filter has been renewed; use a vehicle diagnostic tester

4 - Exhaust gas temperature sender 3 -G495-

- ❑ Removing and installing ⇒ Rep. Gr. 26
- ❑ 45 Nm

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

- ❑ New Lambda probes are coated with an assembly paste
- ❑ In the case of a used Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Parts catalogue for high-temperature paste
- ❑ The assembly paste / high-temperature paste must not make contact with the slots on the Lambda probe body
- ❑ Removing and installing ⇒ page 65
- ❑ 50 Nm

6 - Exhaust gas temperature sender 4 -G648-

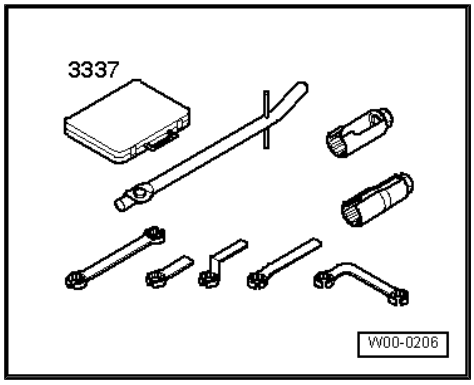
- ❑ Removing and installing ⇒ Rep. Gr. 26
- ❑ 45 Nm

7 - Nut

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

Special tools and workshop equipment required

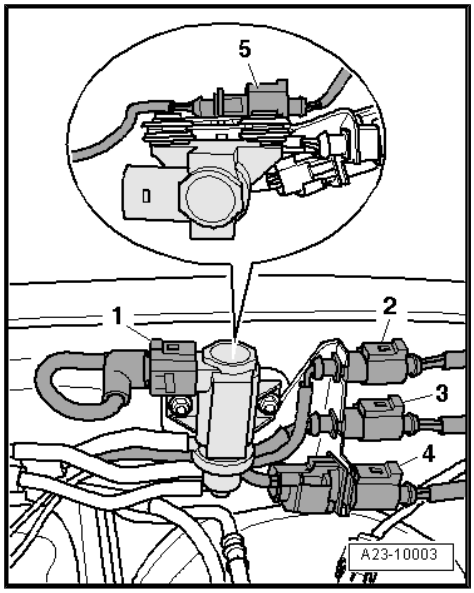
♦ Lambda probe open ring spanner set -3337-



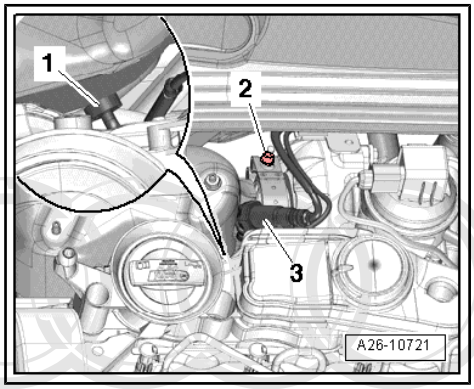
Removing

– Remove engine cover panel ⇒ page 20 .

– Unplug electrical connector -4- for Lambda probe -G39- .



– Unscrew Lambda probe -G39- -3- using tool from Lambda probe open ring spanner set -3337- .



Installing

When installing, note the following:

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 ⇒ Parts catalogue .*

♦ *When installing, the Lambda probe wiring must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

• Tightening torques: refer to Lambda probe - overview ⇒ page 65

10.3 Removing and installing exhaust gas pressure sensor 1 -G450-

Exhaust gas pressure sensor 1 -G450- is connected via two pipes to the take-off points upstream and downstream of the particulate filter. Lambda probe - overview ⇒ page 65

Exhaust gas pressure sensor 1 -G450- detects the amount of deposits in the particulate filter.

Removing

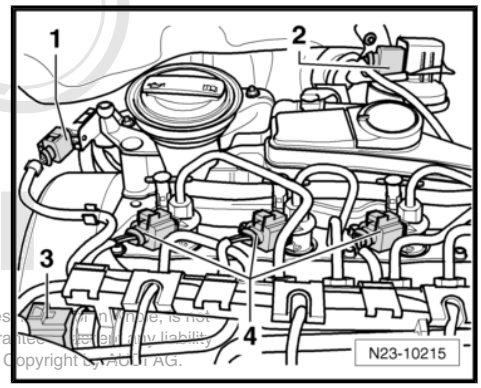
– Remove engine cover panel ⇒ page 20 .

– Before disconnecting, spray hoses coming from exhaust gas pressure sensor 1 -G450- with suitable release agent.

– Detach electrical connector -1- from exhaust gas pressure sensor 1 -G450- .

– Carefully pull hoses off connections (take care to keep the hoses straight; the connections can easily break off exhaust gas pressure sensor 1 -G450-).

– Unscrew bolt and remove exhaust gas pressure sensor 1 -G450- .



Installing

– When installing, note the following:

• Tightening torque for bolt for exhaust gas pressure sensor 1 -G450- : refer to Lambda probe - overview ⇒ page 65 .

Note

- *Before installing, blow out hoses leading from exhaust gas pressure sensor 1 -G450- to particulate filter towards particulate filter with compressed air (hoses can become obstructed or may ice up due to condensation).*
- *Make sure that hoses are securely fitted and seal properly.*
- *If pressure connections are detached from particulate filter, tighten to 45 Nm.*

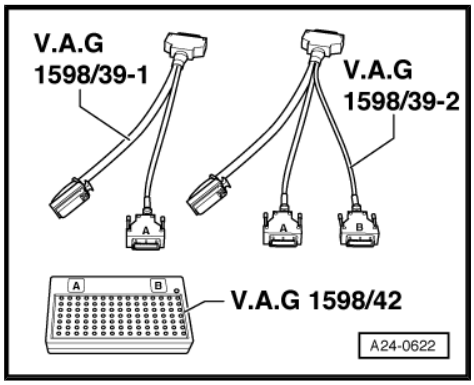
Adaption must be performed after renewing exhaust gas pressure sensor 1 -G450- and/or particulate filter. (The procedure is described under Guided Functions.) Use vehicle diagnostic tester to do so.

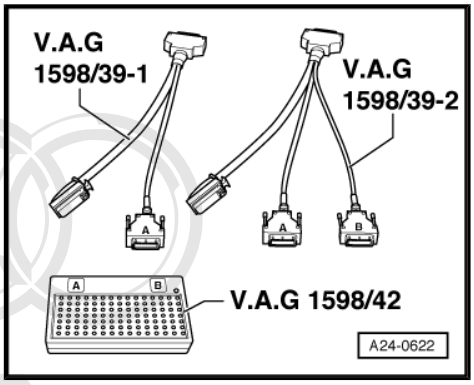
11 Engine control unit

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 1598/39-1-
- Adapter cable -V.A.G 1598/39-2-
- Test box -V.A.G 1598/42-





Note

- *The test box has 105 sockets. The connecting cable can be disconnected from the test box. This means that only the cable (and not the test box) has to be purchased for future engine control units with different types of connectors.*
- *The smaller of the two connectors on the engine control unit has the contacts 1 to 60. The larger of the two connectors has the contacts 1 to 94.*
- *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).*
- *The relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.*

WARNING

To prevent damage to the electronic components, select appropriate measuring range before connecting the measuring cables and observe the test requirements.

– Remove engine control unit ⇒ page 70 .

– Connect the 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 appropriate repair procedures.

Installing engine control unit

Installation is performed in the reverse sequence.

– After installation, the protective housing must be re-fitted on the control unit.

– 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.

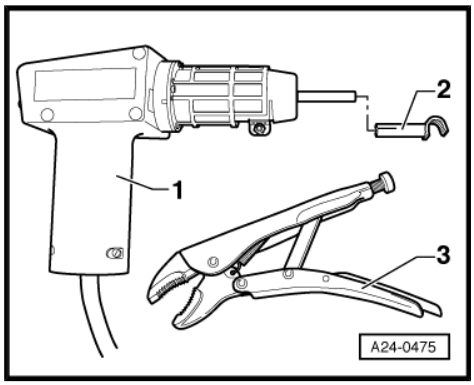
Perform the following after reconnecting engine control unit:

– Interrogate fault memory.

11.2 Renewing engine control unit -J623-

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, commercially available vice grip pliers -3-



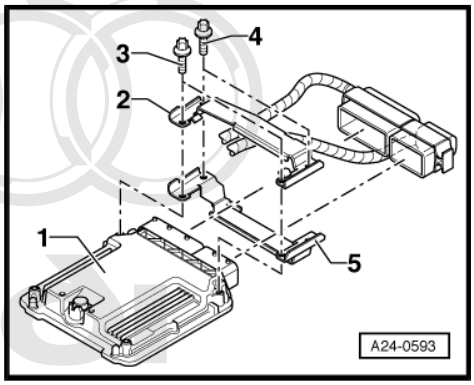
Removing

– 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 to do so.

Note

If the adaption values of the injectors of the old (defective) engine control unit cannot be read out, the adaption values must be entered into the new engine control unit manually and the adaption procedure must be performed accordingly.

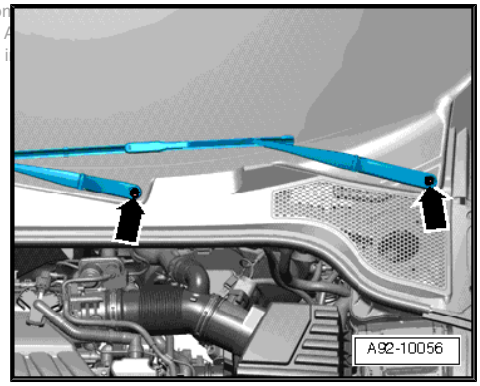
The engine control unit -1- is bolted to a protective casing -2 and 5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.



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).

– Switch off ignition and remove ignition key.
– Lever off caps on windscreen wiper arms with a screwdriver.

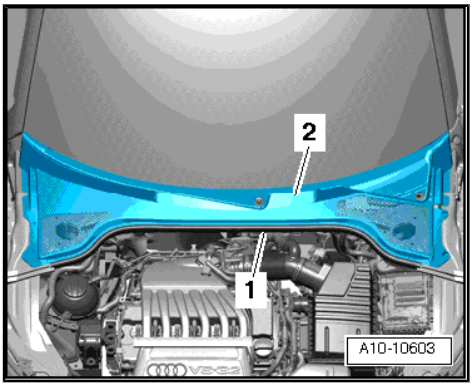
– Loosen hexagon nuts -arrows- several turns.
– Loosen wiper arms from wiper shafts by tilting them slightly.
– Completely remove hexagon nuts and detach wiper arms from wiper shafts.



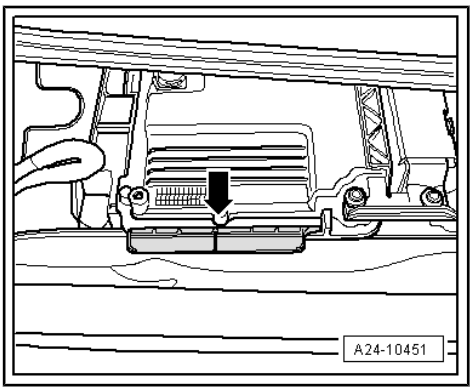
Note

Use puller (commercially available) to remove wiper arms if necessary.

– Pull off rubber seal -1- and remove plenum chamber cover -2-.



– Release clip -arrow- and remove engine control unit -J623- .

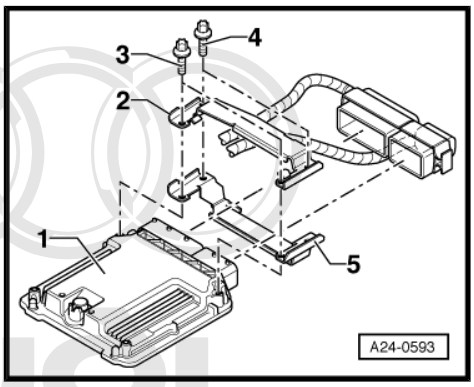


Note

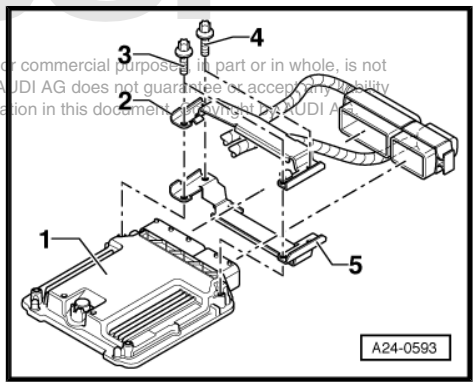
Cover painted surfaces with a cloth to prevent scratching.

To help prevent unauthorised access to the connectors on the engine control unit, the engine control unit -1- is bolted on by means of locking plates -2 and 5- and shear bolts -3 and 4-.

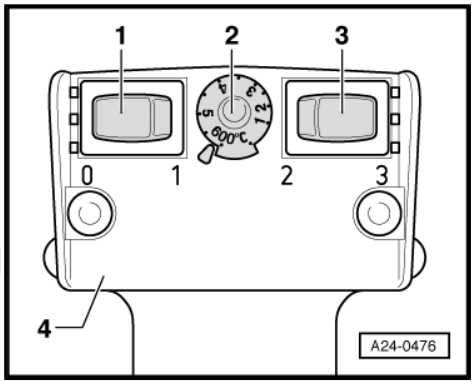
The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.



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.



Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.

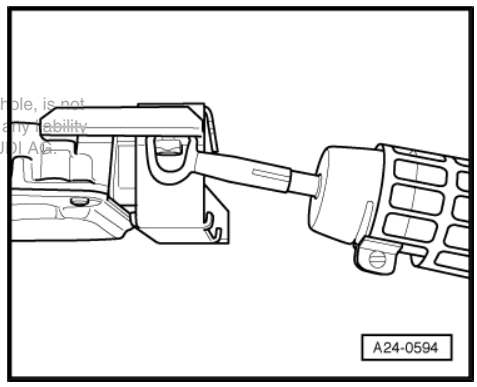


WARNING

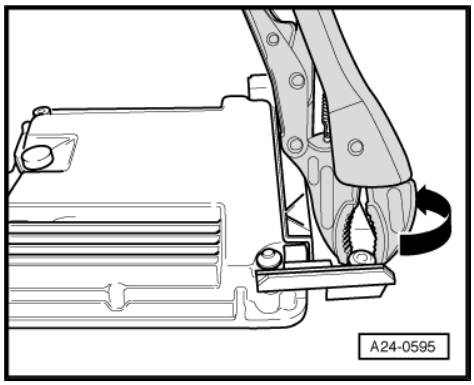
Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

Apply heat to the threads of the shear bolts on the connector side as shown in the illustration.

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



- Unscrew shear bolts using suitable vice-grip pliers (see arrow in illustration).
- The two shear bolts screwed into the engine control unit do not need to be heated. They can be removed without heating.
- Detach protective housing from control unit connectors.
- Release connectors on engine control unit -J623- and unplug connectors.
- Take out old engine control unit -J623- and connect new engine control unit -J623- .



Installing

Installation is performed in the reverse sequence.

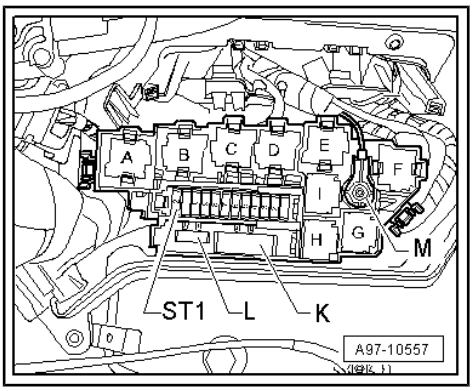
- After installation, the protective housing must be re-fitted on the engine control unit -J623- .
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.

The procedure required after connecting the new engine control unit is described in the Guided Fault Finding or Guided Functions. Use vehicle diagnostic tester to do so.

- The injector delivery calibration and the injector voltage calibration must additionally be re-adapted in the engine control unit -J623- after the control unit has been renewed (these functions influence engine power and exhaust emissions).
- On vehicles with particulate filter the current mileage (km) reading must be stored in the engine control unit via an adaption procedure.

28 – Glow plug system

1 Checking glow plug system



Automatic glow period control unit -J179- is located in relay and fuse holder in electronics box in plenum chamber.

A - Automatic glow period control unit -J179-

The glow plug system is activated via the automatic glow period control unit -J179- . The automatic glow period control unit -J179- is capable of self-diagnosis.

A fault is stored in the engine control unit if a fault occurs in the glow plug system.

The procedure for checking the glow plug system is described in the Guided Fault Finding.

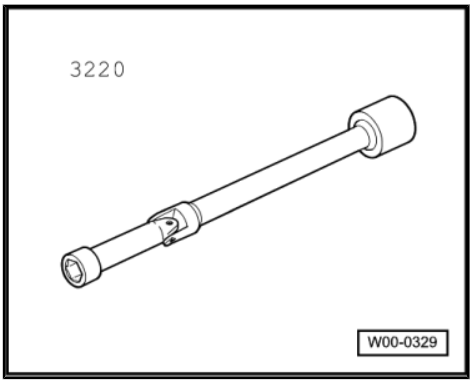
For faster starting, the vehicle is equipped with electronically controlled glow plugs and a separate glow period control unit.

Each glow plug is activated and diagnosed separately.

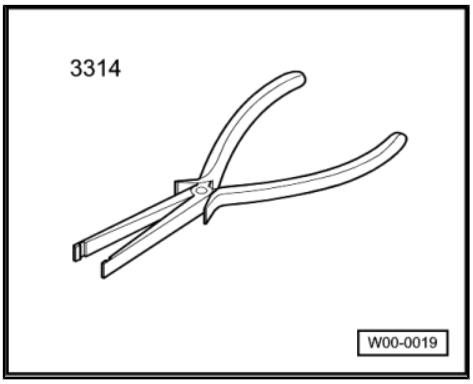
1.1 Removing and installing glow plugs

Special tools and workshop equipment required

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



- Pliers -3314-



Removing

– Switch off ignition.

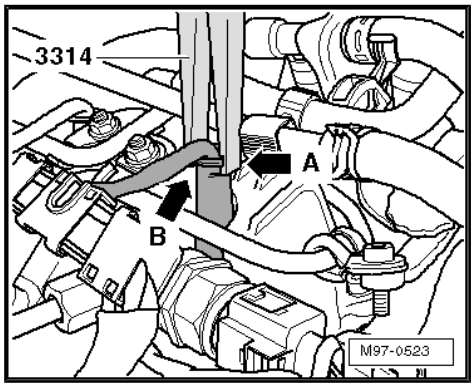
– Remove engine cover panel ⇒ page 20 .

Caution

Make sure that no wire connection is damaged when unplugging the connectors; otherwise the entire wiring harness must be renewed. When unplugging the connectors, do not compress the pliers -3314- with too much force so that the support sleeve is not damaged.

– Apply groove -arrow A- of pliers -3314- to collar of support sleeve -arrow B- and pull connectors off glow plugs.

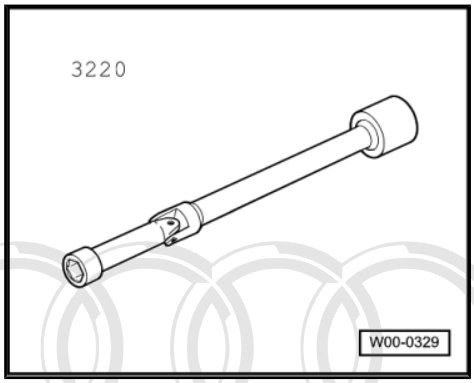
– Clean glow plug openings in cylinder head; make sure no dirt gets into cylinder.



Note

- *Cleaning procedure:*
- *Use a vacuum cleaner to remove coarse dirt.*
- *Spray brake cleaner or suitable cleaning agent into glow plug openings, let it work in briefly, and blow out with compressed air.*
- *Then clean the glow plug openings using a cloth moistened with oil.*

– To slacken the glow plugs use special tool U/J extension and socket, 10 mm -3220-



Installing

– To tighten the glow plugs use special tool U/J extension and socket, 10 mm -3220- with a suitable torque wrench.

– Then tighten glow plugs to specified torque.

• Tightening torque: 17 Nm

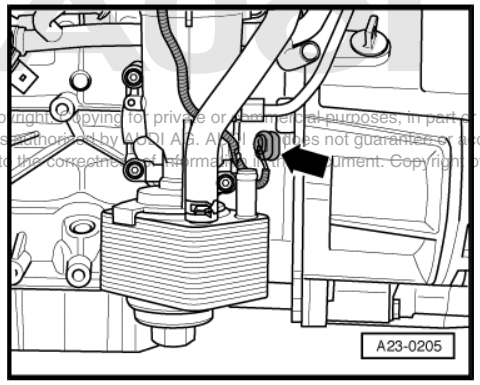
– Attach glow plug connectors correctly and make sure they are securely fitted.

1.2 Removing and installing engine speed sender -G28-

Removing

– Remove oil filter bracket ⇒ Rep. Gr. 17 .

– Unplug electrical connector at engine speed sender -G28- -arrow- using assembly tool -T10118- .

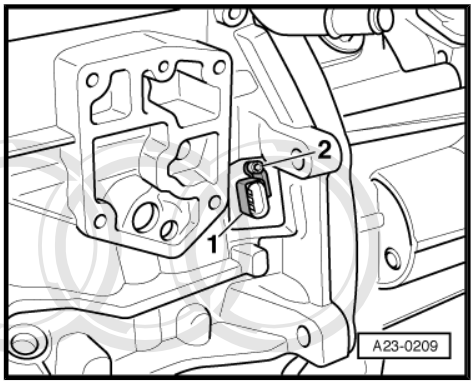


Note

To release electrical connector without assembly tool -T10118- , press connector on engine speed sender in with a screwdriver and at the same time lift release tab with a thin wire hook.

– Move wiring clear.

– Unscrew securing bolt -2- for engine speed sender -G28- -item 1-.



Installing

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

– Install oil filter bracket ⇒ Rep. Gr. 17 .

• Tightening torque: refer to overview of fitting locations ⇒ page 5 .

1.3 Removing and installing Hall sender - G40-

– Remove front right wheel housing liner.

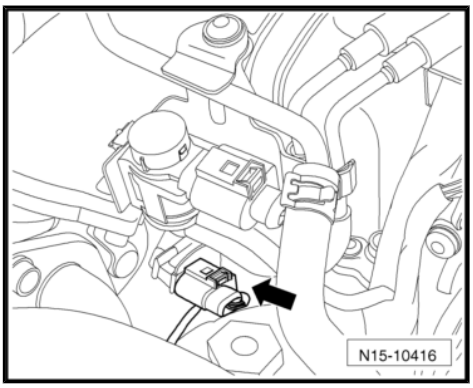
– Remove poly V-belt ⇒ Rep. Gr. 13 .

– Remove toothed belt ⇒ Rep. Gr. 15 .

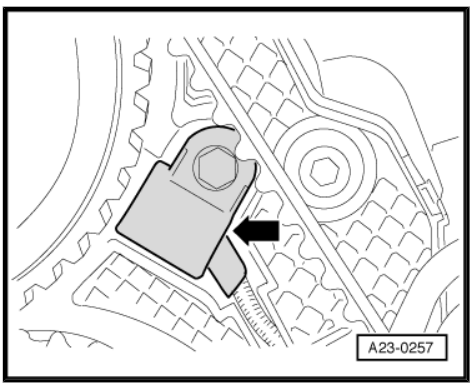
– Remove vibration damper ⇒ Rep. Gr. 13 .

– Unplug electrical connector for Hall sender -G40- -arrow-.

– Release connector from its retainer.

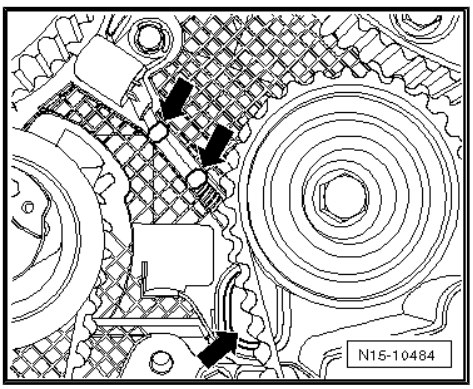


– Unbolt Hall sender -G40- -arrow-.



– Using a screwdriver, remove projections and take out cover for repair opening -arrows-.

– Take Hall sender -G40- off cylinder head and guide its connector through repair opening in toothed belt cover.



Installing

Install in reverse order. Note the following:

♦ Seal repair opening in toothed belt cover with rubber plug; for rubber plug refer to ⇒ ETKA (Electronic parts catalogue) .

– Fit toothed belt and adjust valve timing ⇒ Rep. Gr. 15 .