Workshop Manual
Audi A8 2003 ➤

TDI injection and glow plug system (8-cyl. 4.0 ltr. 4-valve common rail)									
Engine ID	ASE								

Edition 03.2014

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 Servicing diesel direct injection system

(ARL003790; Edition 03.2014)

1.1 Safety precautions when using testers and measuring instruments during a road test

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.*
>
> *Press the DONE button when you are ready for the test drive.*

1.2 To avoid injury and/or damage to the injection and glow plug system, note the following:

- 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 or ignition system wiring or tester cables.
- Always switch off the ignition before cleaning the engine.
- 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.

1.3 Safety precautions when working on the fuel system

WARNING

The fuel can become extremely hot. This can cause injuries.

- *In extreme cases the fuel lines and the fuel can reach a temperature of 100 °C on vehicles with common rail engine, even after the engine is switched off. Allow the fuel to cool down before disconnecting the lines - danger of scalding.*
- *Wear protective gloves.*
- *Wear safety goggles.*

Risk of injury - fuel system operates under pressure.

- *If the battery is not disconnected, the fuse for the fuel pump control unit - J538- must be removed as a precautionary measure before opening the fuel system because the fuel pump will otherwise be activated by the contact switch on the driver's door.*
- *Wrap a clean cloth around the connection before opening the fuel system. Then release pressure by carefully loosening the connection.*
- *Wear protective gloves.*
- *Wear safety goggles.*

Caution

- *Observe notes on procedure for disconnecting the battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .*

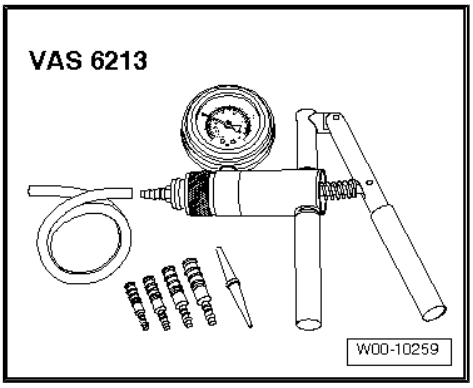
- Clean tools and workbench etc. before working on the injection system.
- Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- When removing components, plug all open connections immediately with suitable clean sealing caps.
- Do not remove sealing caps from components until immediately prior to installation. Keep components that are to be re-used in new, sealable plastic bags.
- Before installing, check the injectors and their surroundings visually; they must be undamaged and clean. Make sure the injector bores in the cylinder head are clean. Wipe out if necessary using a clean cloth, taking care not to cause damage. Do not use sharp objects of any kind.
- If the high-pressure fuel lines are to be re-used, you must mark them before removal. High-pressure pipes must always be re-installed on the same cylinder.
- Take care not to damage the injectors when removing the old copper seals.
- Check all new O-rings for damage before installing. Lubricate O-rings with engine oil or assembly oil before installing.

- Position high-pressure pipes so they are free of stress. Tighten all unions lightly to start with before tightening to final torque.
- Never attempt to bend high-pressure fuel lines to shape.
- When working on any parts of the high-pressure fuel system, tools may only be used for loosening and tightening pipe unions. All other components must always be removed and installed by hand without using tools or other equipment.
- Press the fuel return hoses onto the injectors by hand from above so that they engage audibly on each injector (do not press in the release pins when doing this). Then press down the release pin after connecting the return line. Check that the fuel return hoses are seated securely 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).
- Do not dismantle individual common rail components. If there is a fault, the complete components must be renewed.
- When the engine is running, do not perform any repairs to the common rail system.
- Do not bleed the common rail system by unfastening high-pressure components after the engine has been started.
- All cable ties which are released or cut open when removing must be refitted in the same position when installing.
- When the fuel system is open: Do not work with compressed air if this can be avoided. Do not move the vehicle unless absolutely necessary.
- Also ensure that no diesel fuel comes into contact with the coolant hoses. Should this occur, the hoses must be cleaned immediately. Damaged hoses must be renewed.

1.4 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 an entry is stored in the event memory, check the vacuum lines leading to the corresponding component and also check the other 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.

1.5 Overview of fitting locations

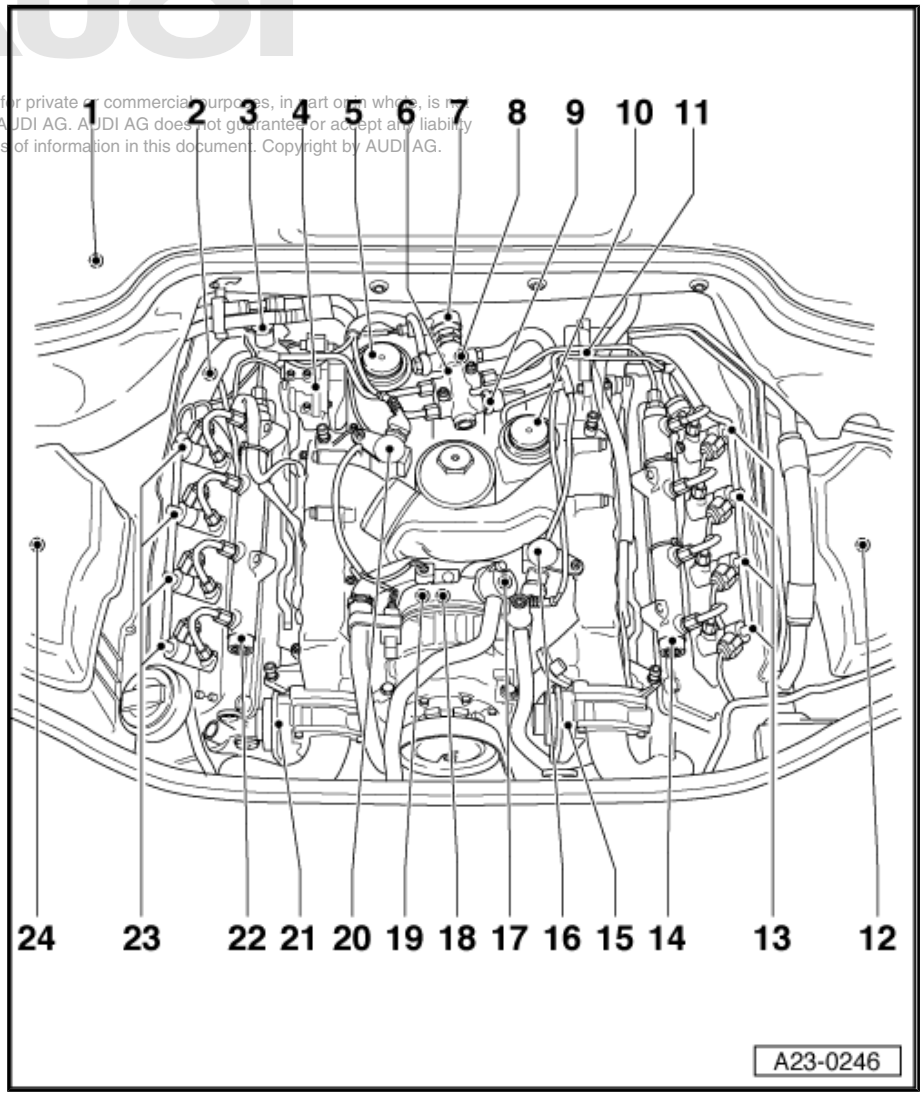
Components A to I are not shown on the exploded view.

1 - Electronics box in plenum chamber

- ❑ Diesel direct injection system control unit - J248- with altitude sensor (for cylinders 1, 4, 6, 7)
- ❑ Diesel direct injection system control unit 2 - J494- (for cylinders 2, 3, 5, 8)
- ❑ Glow plug relay - J52- in relay and fuse holder in electronics box (plenum chamber) ⇒ page 6
- ❑ Glow plug relay 2 - J495- in relay and fuse holder in electronics box (plenum chamber) ⇒ page 6
- ❑ Terminal 30 voltage supply relay - J317-
- ❑ Relay and fuse holder in electronics box, plenum chamber

2 - Connector

- ❑ For Hall sender - G40- (camshaft position sen-



sor)

3 - Fuel temperature sender - G81-

4 - Intake manifold flap motor - V157-

- ❑ Cylinder bank 1

5 - Mechanical exhaust gas recirculation valve

6 - Distributor housing (function block)

7 - Fuel pressure regulating valve - N276-

8 - High-pressure pump

- ❑ With fuel metering valve - N290-
- ❑ With gear-type fuel system pressurisation pump

9 - Fuel pressure sender - G247-

10 - Mechanical exhaust gas recirculation valve

11 - Intake manifold flap 2 motor - V275-

- ❑ Cylinder bank 2

12 - Air mass meter 2 - G246-

- ❑ In air cleaner housing

13 - Injectors

- ❑ Cylinder bank 2

14 - High-pressure reservoir (rail)

- ❑ Cylinder bank 2

15 - Throttle valve module 2 - J544-

16 - EGR valve 2 - N213-

- ❑ Cylinder bank 1

17 - Oil pressure sender - G10-

18 - Oil temperature sender - G8-

19 - Coolant temperature sender - G62-

20 - Exhaust gas recirculation valve - N18-

21 - Throttle valve module - J338-

- ❑ Cylinder bank 2

22 - High-pressure reservoir (rail)

- ❑ Cylinder bank 1

23 - Injectors

- ❑ Cylinder bank 1
- ❑ Removing and installing ⇒ page 35

24 - Air mass meter - G70-

- ❑ In air cleaner housing

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

- ❑ In footwell on brake pedal

B - Accelerator position sender - G79-

- ❑ In footwell on accelerator pedal
- ❑ ⇒ page 6

C - Fuel pump relay - J17-

- ❑ Relay and fuse holder in luggage compartment (right-side), relay position 3
- ❑ ⇒ page 7

D - Terminal 30 voltage supply relay - J317-

- ❑ Relay and fuse holder in electronics box, plenum chamber
- ❑ ⇒ page 6

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

- ❑ In charge air cooler (left-side) ⇒ page 7

F - Charge air cooling pump relay - J536-

- ❑ Relay and fuse holder in front footwell (right-side)
- ❑ ⇒ page 7

G - Starter motor relay - J53- and starter motor relay 2 - J695-

- ❑ Relay and fuse holder in front footwell (right-side)
- ❑ ⇒ page 7

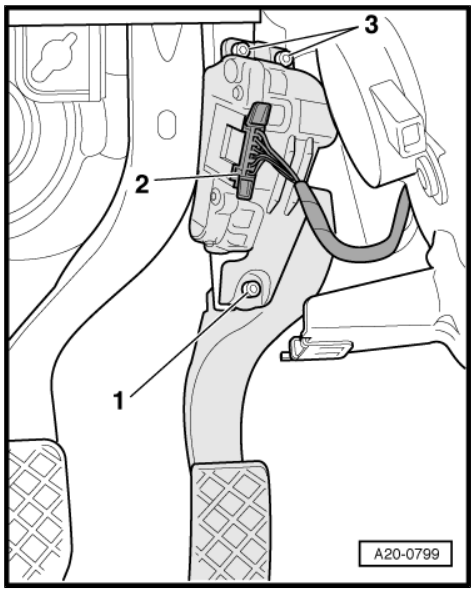
H - Engine speed sender - G28-

- ❑ ⇒ page 7

I - Glow plugs

- ❑ Removing and installing ⇒ page 79

Accelerator position sender - G79-



Relay and fuse holder in electronics box, plenum chamber

Location of relays (model year 2003)

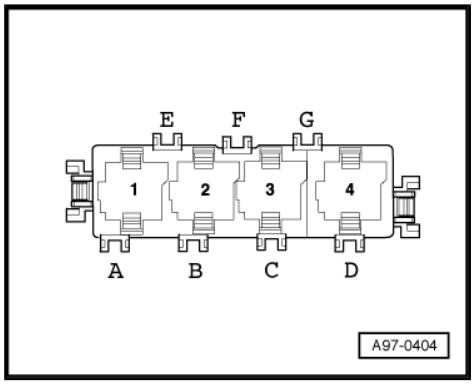
1 - Glow plug relay - J52-

2 - Glow plug relay 2 - J495-

3 - Terminal 30 voltage supply relay - J317-

B - Glow plug fuse

C - Glow plug fuse 2



Location of relays (as of model year 2004)

1 - Glow plug relay - J52-

2 - Terminal 30 voltage supply relay - J317-

3 - Glow plug relay 2 - J495-

B - Glow plug fuse

C - Glow plug fuse 2

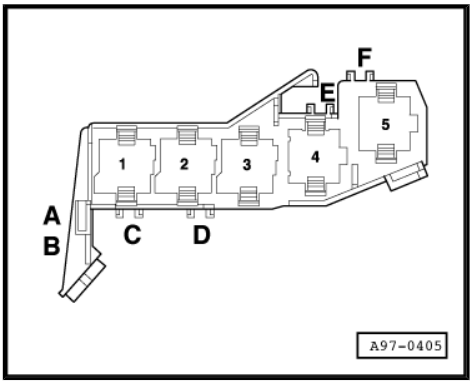
Relay carrier in passenger's footwell

1.1 - Fuel cooling pump relay - J445-

1.2 - Charge air cooling pump relay - J536-

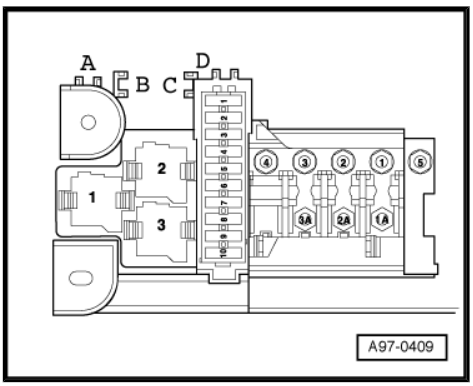
2 - Starter motor relay - J53-

3 - Starter motor relay 2 - J695-



Relay and fuse holder in luggage compartment (right-side)

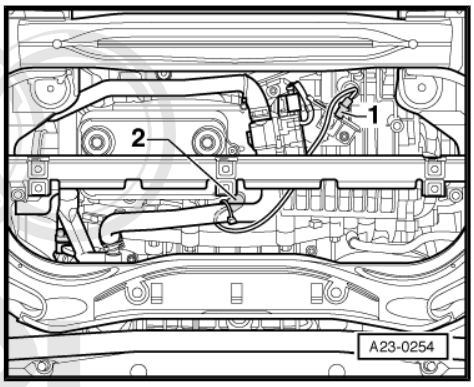
3 - Fuel pump relay - J17-



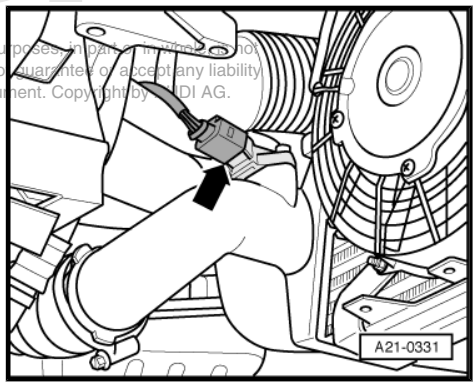
Engine speed sender - G28-

1 - 3-pin connector

2 - Engine speed sender



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



1.6 System layout

Note

- *Always read instructions for working on fuel system.*
- *Follow these instructions before starting work and while working on the fuel system* ⇒ page 2 .

1 - Fuel metering valve - N290-

2 - High-pressure pump with gear-type fuel system pressurisation pump

3 - Fuel pressure sender - G247-

- ❑ 35 Nm
- ❑ Removing and installing ⇒ page 66

4 - Distributor housing (function block)

5 - Fuel pressure regulating valve - N276-

- ❑ Removing and installing ⇒ page 64

6 - Fuel rail

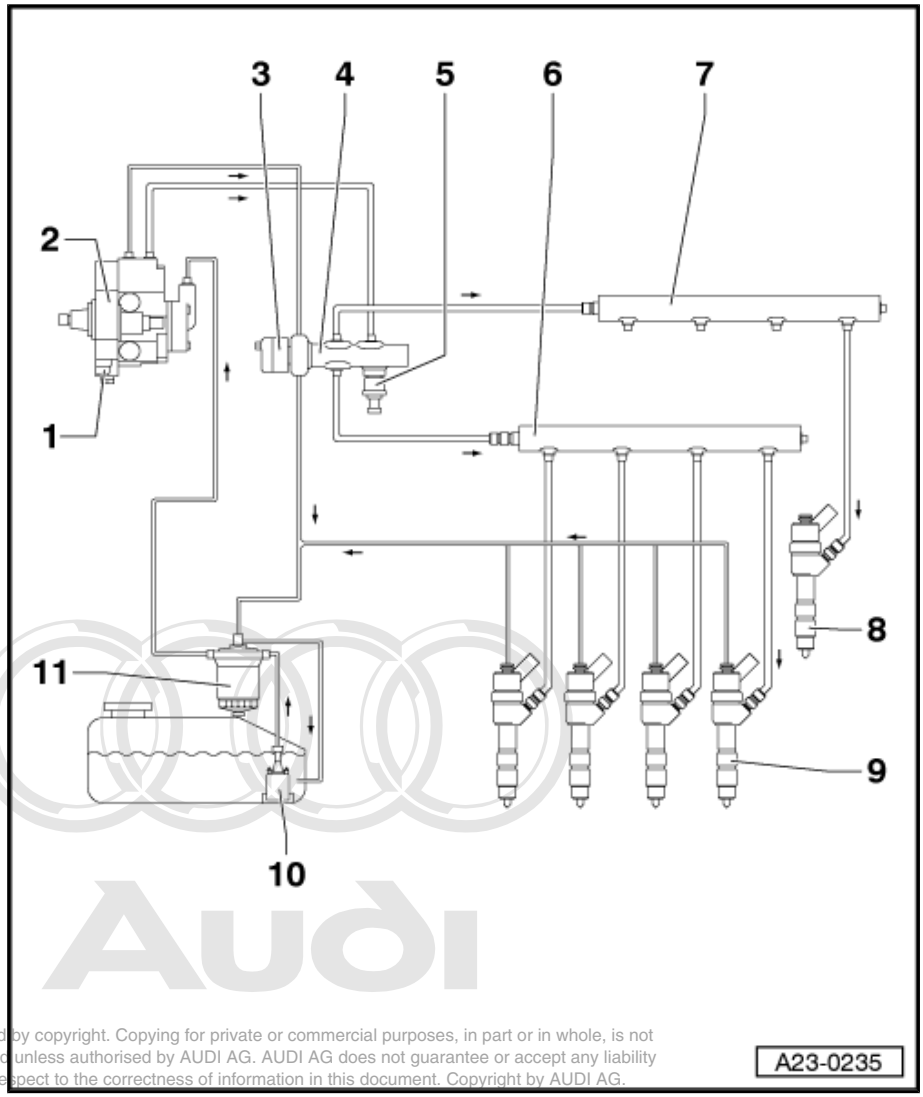
- ❑ For cylinder bank 1

7 - Fuel rail

- ❑ For cylinder bank 2

8 - Injectors

- ❑ 5 ... 8
- ❑ Cylinder bank 2
- ❑ If they are to be re-installed, the injectors and high-pressure fuel pipes must always be re-fitted in their original positions (i.e. on the same cylinder).
- ❑ Removing and installing ⇒ page 35



9 - Injectors

- ❑ 1 ... 4
- ❑ Cylinder bank 1
- ❑ If they are to be re-installed, the injectors and high-pressure fuel pipes must always be re-fitted in their original positions (i.e. on the same cylinder).
- ❑ Removing and installing ⇒ page 35

10 - Fuel system pressurisation pump - G6-

- ❑ Fuel system pressurisation pump

11 - Fuel filter

1.7 Exploded view - fuel system

Note

- *Always read instructions for working on fuel system.*
- *Follow these instructions before starting work and while working on the fuel system ⇒ page 2 .*

1 - Bracket with fuel filter

- ❑ Exploded view - fuel filter ⇒ Rep. gr. 20
- ❑ Renewing ⇒ Rep. gr. 20

2 - Hose clip

3 - Fuel return line

4 - Fuel supply line

5 - Clip

6 - Fuel temperature sender - G81-

7 - Banjo bolt for fuel supply line

- ❑ Fuel supply

8 - Seal

9 - Fuel cooler

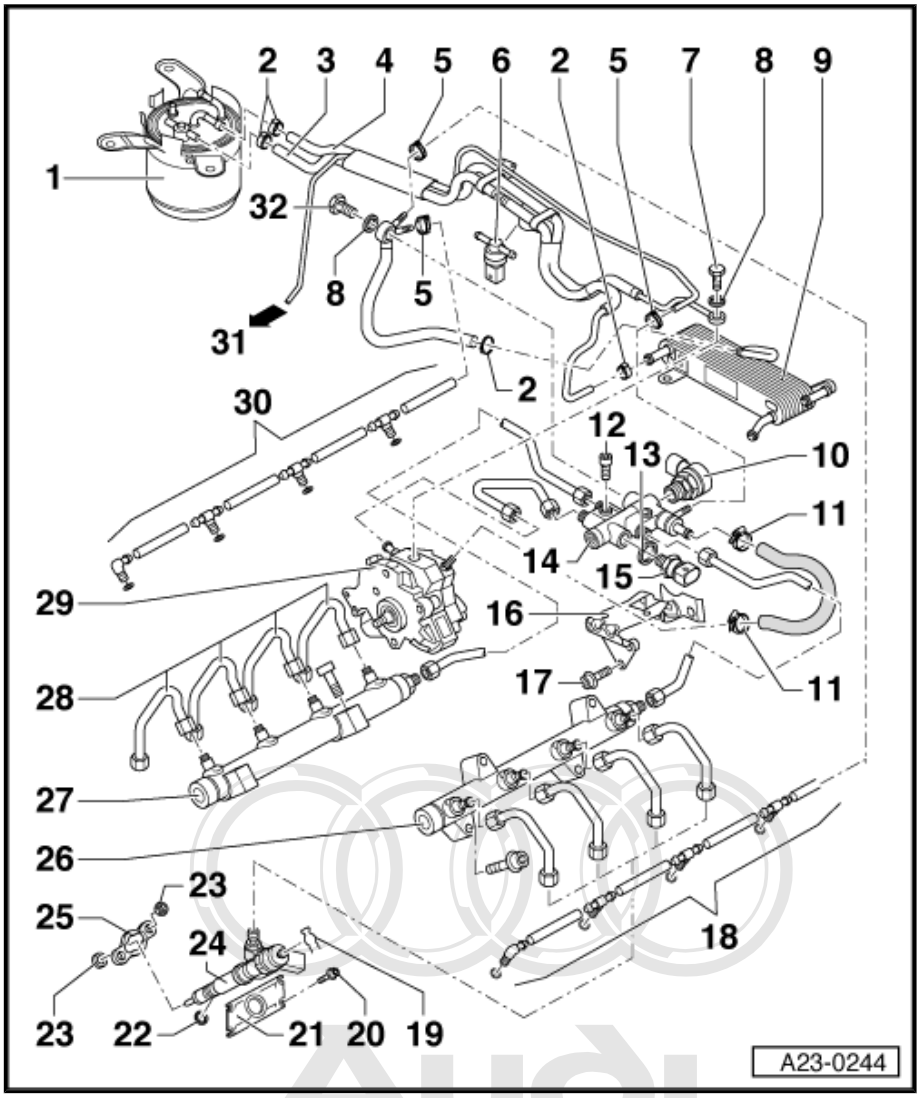
10 - Fuel pressure regulating valve - N276-

- ❑ Cannot be re-installed
- ❑ Removing and installing ⇒ page 64

11 - Hose clip

12 - Bolt

- ❑ For distributor housing



(function block)

- ❑ 9 Nm

13 - Seal

14 - Distributor housing (function block)

15 - Fuel pressure sender - G247-

- ❑ 35 Nm
- ❑ Removing and installing ⇒ page 66

16 - Bracket for distributor housing

17 - Bolt

18 - Return lines

- ❑ Fuel return
- ❑ Cylinder bank 2

19 - Retaining clips

- ❑ For return lines

20 - Bolt

- ❑ Cover for injector on cylinder head cover
- ❑ 5.5 Nm

21 - Cover for injector

22 - Seal

23 - Hexagon flange nut

- ❑ For clamping piece
- ❑ 10 Nm

24 - Injector

- ❑ Use a coloured pen to mark injectors and corresponding high-pressure pipes and cylinder for re-installation; pay attention to markings when installing
- ❑ Always renew copper seal when removing and installing
- ❑ To remove carbon deposits from the injector sealing surface, clean the injector bore in the cylinder head with cleaning kit - VAS 6811- (it is important to do this to avoid leaks)
- ❑ Removing and installing ⇒ page 35

25 - Clamping piece

- ❑ Renew

26 - Fuel rail

- ❑ For cylinder bank 2

27 - Fuel rail

- ❑ For cylinder bank 1

28 - High-pressure pipes

- ❑ For cylinder bank 1 (4x)
- ❑ For cylinder bank 2 (4x)

29 - High-pressure pump with gear-type fuel system pressurisation pump

30 - Fuel return lines (from injectors)

- ❑ Fuel return
- ❑ Cylinder bank 1

31 - Bypass line

- ❑ For fuel return

32 - Banjo bolt

❑ Fuel return

1.8 Exploded view - intake manifold (part 1)

Note

Illustration shows left-side intake manifold

1 - Front air pipe

2 - Bolt
- ❑ 10 Nm

3 - Bolt
- ❑ 10 Nm

4 - Cooler
- ❑ For exhaust gas recirculation
- ❑ Removing and installing exhaust gas recirculation cooler (left-side) ⇒ Rep. gr. 26
- ❑ Removing and installing exhaust gas recirculation cooler (right-side) ⇒ Rep. gr. 26

5 - Seal
- ❑ Renew

6 - Connecting pipe

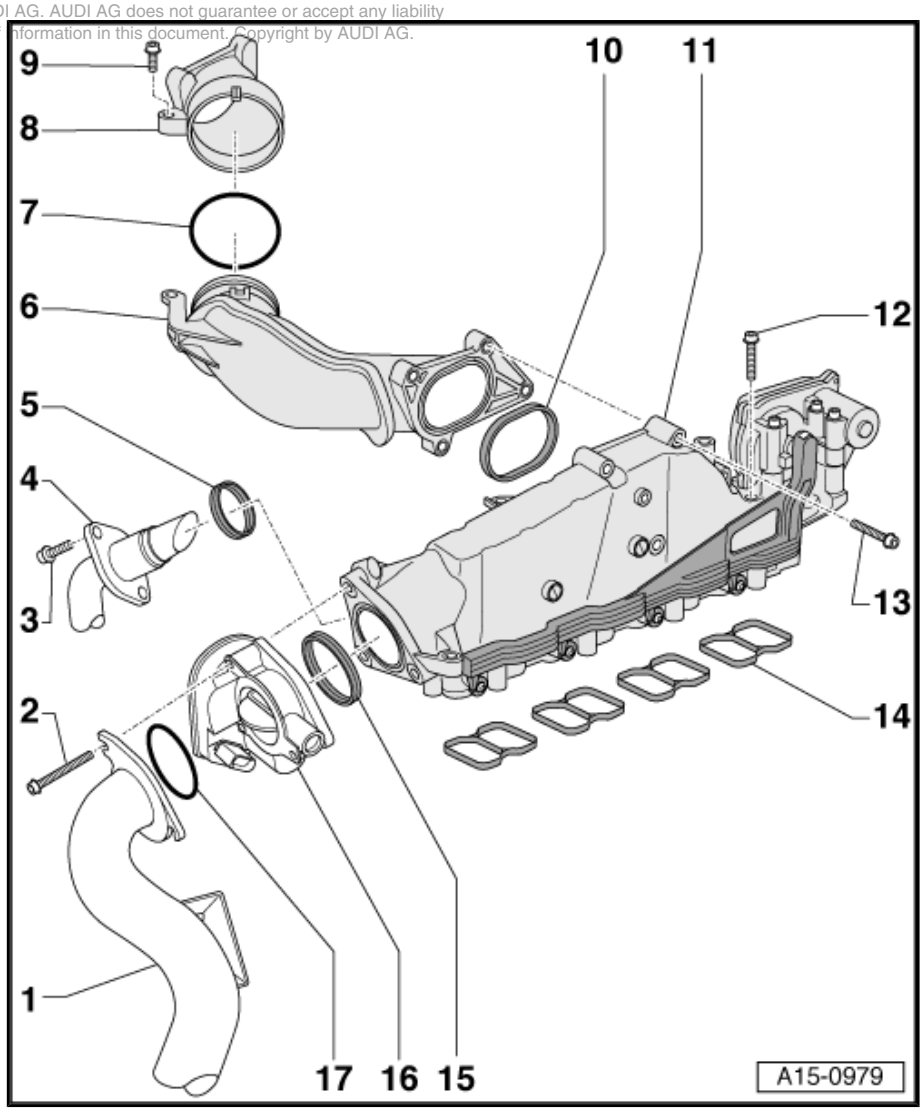
7 - O-ring
- ❑ Renew

8 - Connecting pipe

9 - Bolt
- ❑ 10 Nm

10 - Seal
- ❑ Renew

11 - Intake manifold
- ❑ With intake manifold



flap motor

- ❑ Do not separate components
- ❑ Right-side: intake manifold flap motor - V157-
- ❑ Left-side: intake manifold flap motor 2 - V275-
- ❑ Removing and installing intake manifold (left-side) ⇒ page 13
- ❑ Removing and installing intake manifold (right-side) ⇒ page 17

12 - Bolt

- ❑ Do not unscrew

13 - Bolt

- ❑ 10 Nm

14 - Gasket

- ❑ Renew

15 - Seal

- ❑ Renew

16 - Throttle valve module

- ❑ Left-side: throttle valve module 2 - J544-
- ❑ Right-side: throttle valve module - J338-

17 - O-ring

- ❑ Renew

1.9 Exploded view - intake manifold (part 2)

Note

Removing intake manifold (left-side) ⇒ page 13 ; removing intake manifold (right-side) ⇒ page 17 .

1 - 8 Nm

2 - Bottom section of intake manifold

3 - Gasket

- ❑ Renew

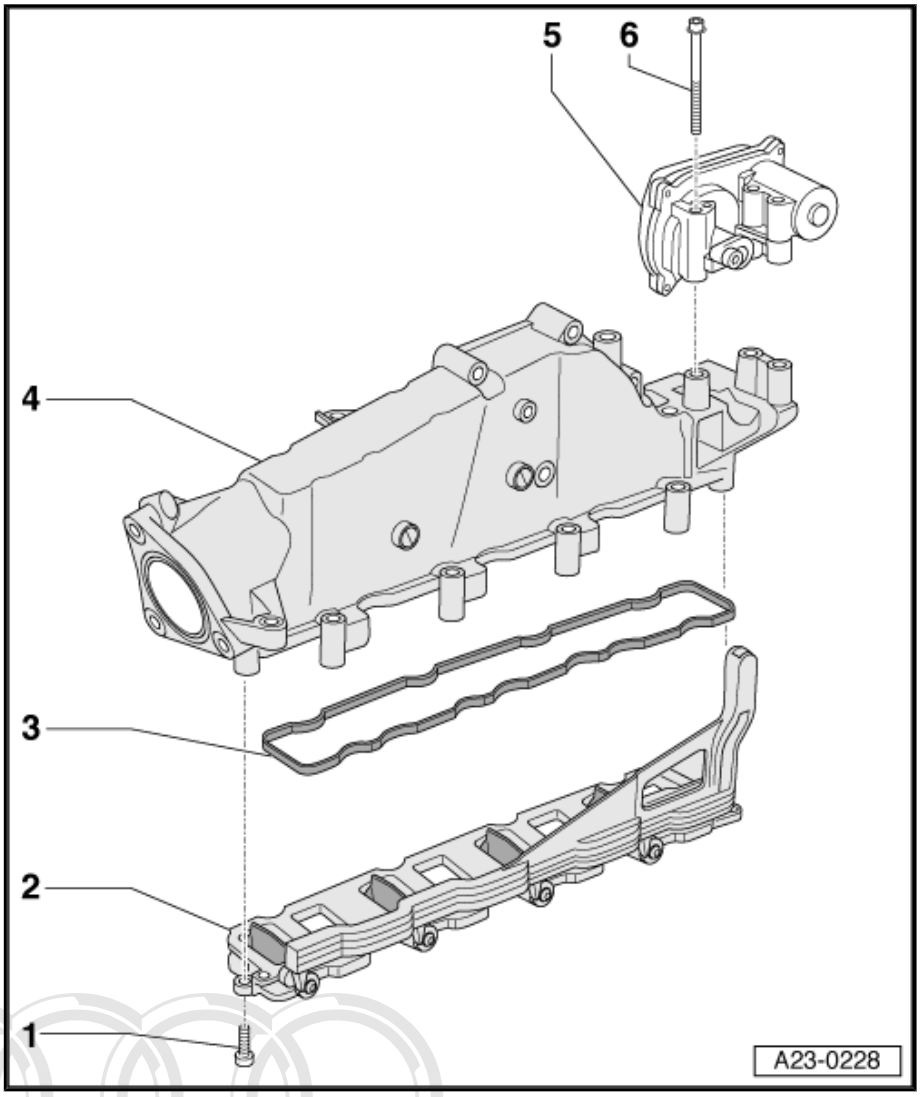
4 - Intake manifold

5 - Intake manifold flap motor

- ❑ Can only be renewed as one unit with intake manifold
- ❑ Right-side: intake manifold flap motor - V157-
- ❑ Left-side: intake manifold flap motor 2 - V275-

6 - Bolt

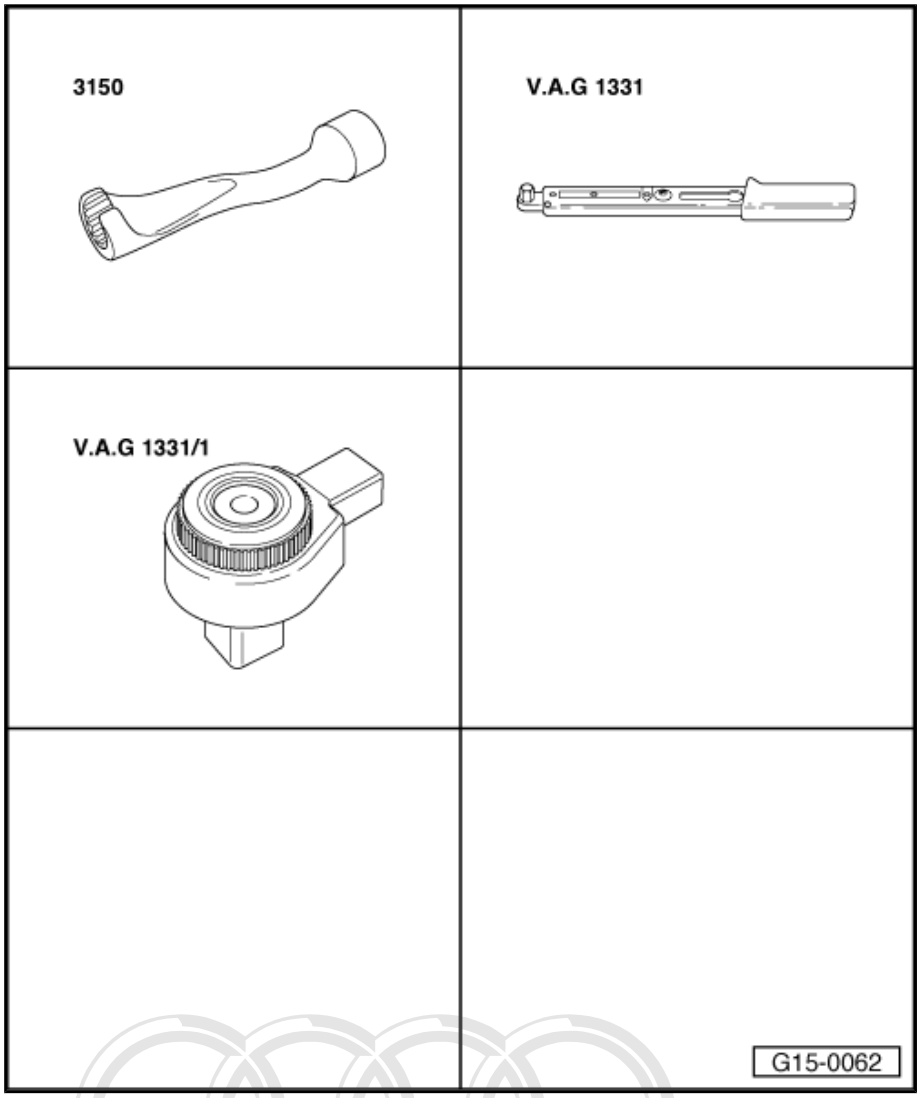
- ❑ Do not unscrew



1.10 Removing and installing intake manifold (left-side)

Special tools and workshop equipment required

- ♦ Socket, 14 mm - 3150-
- ♦ Torque wrench - V.A.G 1331- (5...50 Nm)
- ♦ Ratchet - V.A.G 1331/1-



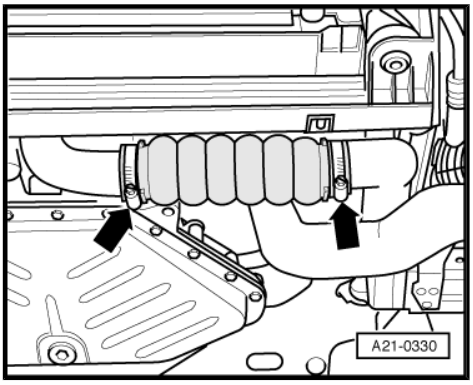
Removing

Note

All cable ties which are released or cut open when removing must be refitted in the same position when installing.

– Remove engine cover panel (refer to instructions for removing and installing ⇒ page 24).
– Move lock carrier to service position ⇒ General body repairs, exterior; Rep. gr. 50 .

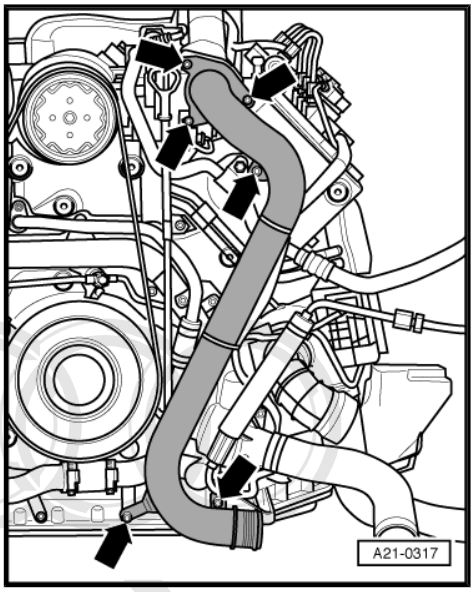
– Remove air hose (front left) -arrows-.



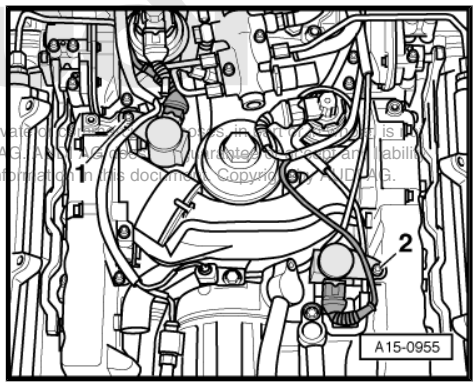
– Detach air intake pipe (front left) from engine -arrows-.
– Pivot air intake pipe away to the side.

Note

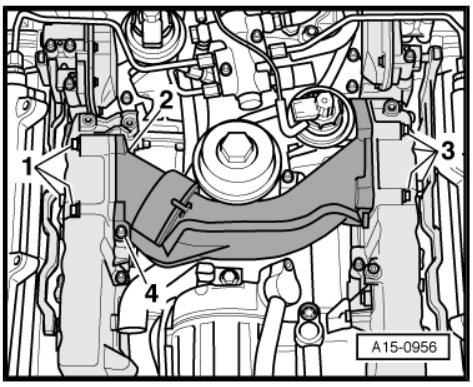
Cable ties do not have to be opened.

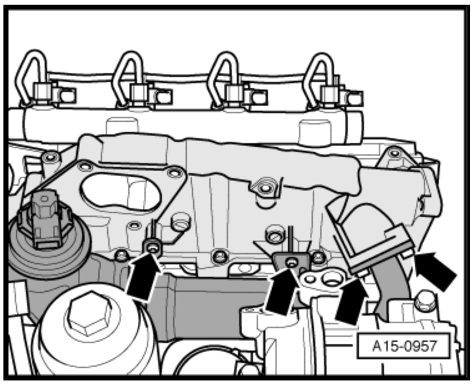


– Unbolt exhaust gas recirculation valve - N18- -1- and exhaust gas recirculation valve 2 - N213- -2- from intake manifolds.



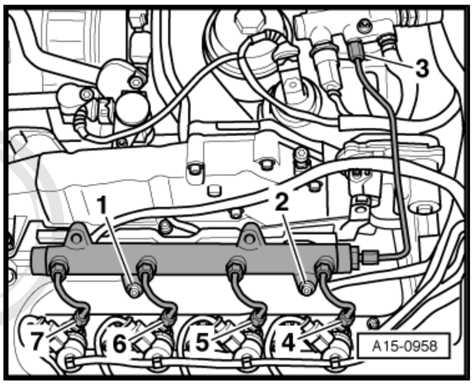
– Unscrew bolts -1 ... 4-.
– Take out connecting pipe between left and right intake manifolds.



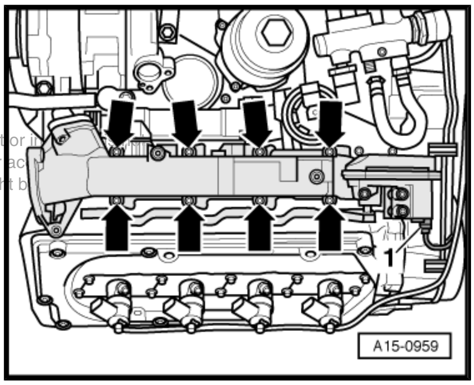


– Remove bolts -arrows-.
– Move electrical wiring clear at rail element and injector pipes.

> **WARNING**
>
> *Observe rules for cleanliness when working on the injection system ⇒ page 2 .*



– Unscrew union nuts -3 ... 8- (counterhold pressure pipe connections).
– Remove bolts -1- and -2-.
– Take off rail element.
– Unplug electrical connector at glow plug on No. 5 cylinder.



– Unplug electrical connector -1- at intake manifold flap 2 motor - V275- .
– Remove bolts -arrows-.
– Take off intake manifold together with intake manifold flap motor.

Note

- *Watch dowel sleeves when removing intake manifold.*
- *Block off intake ports in cylinder head with clean rags.*

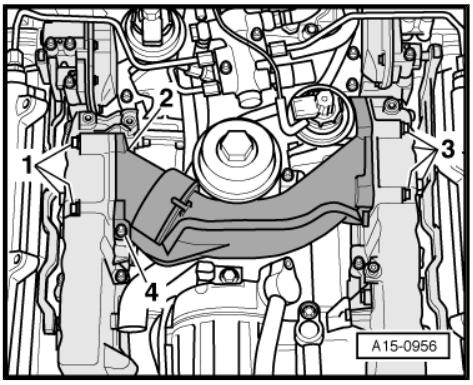
Installing

Note

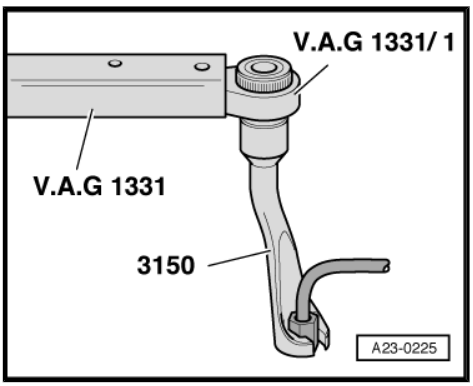
- *Reinstall all cable ties in the same locations when assembling.*
- *Renew gaskets, seals and O-rings.*
- *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*

– Make sure dowel sleeves are in place before installing intake manifold.

– Tighten bolt -4- last when installing connecting pipe between left and right intake manifolds.
– Tighten union nuts on high-pressure pipes hand-tight initially.
– Ensure that high-pressure pipes are not under tension.



– To tighten unions of high-pressure pipes, use torque wrench - V.A.G 1331- with ratchet - V.A.G 1331/1- and socket, 14 mm - 3150- .



– Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .
– Install front bumper ⇒ General body repairs, exterior; Rep. gr. 63 .
– Deactivate jacking mode. ⇒ Rep. gr. 43
– Adjust headlights ⇒ Rep. gr. 94 .

Tightening torques

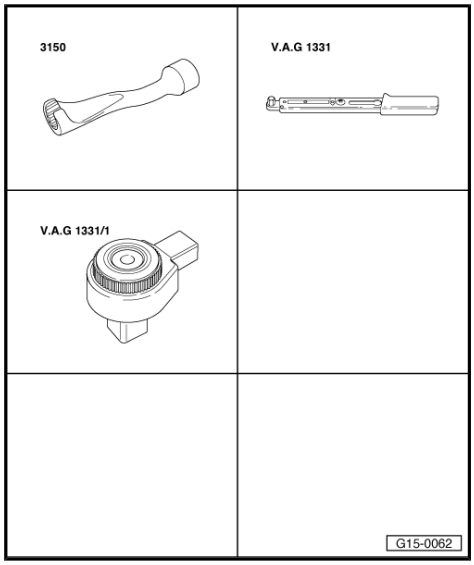
Component	Nm
Intake manifold to cylinder head	10
Rail element to cylinder head	22
Union nut to fuel pipe	25
Exhaust gas recirculation cooler to intake manifold	10
Connecting pipe to intake manifold	10
Front air intake pipe to engine	10
Hose clips for air hoses	5

1.11 Removing and installing intake manifold (right-side)

Special tools and workshop equipment required

- Socket, 14 mm - 3150-
- Torque wrench - V.A.G 1331- (5...50 Nm)

♦ Ratchet - V.A.G 1331/1-



Removing

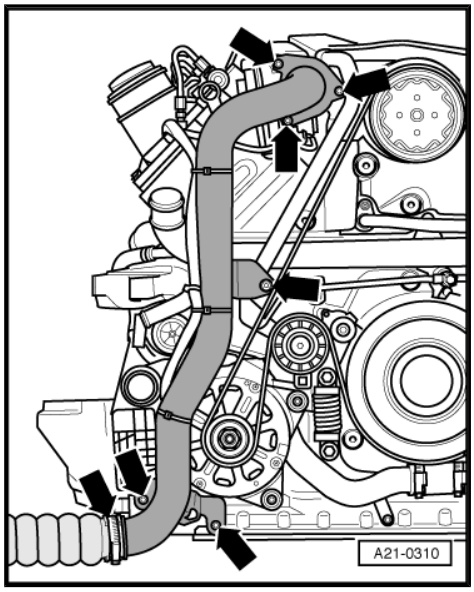
Note

All cable ties which are released or cut open when removing must be refitted in the same position when installing.

– Move lock carrier to service position. ⇒ General body repairs, exterior; Rep. gr. 50

– Detach air intake pipe (front right) from engine -arrows-.

– Pivot air intake pipe away to the side.



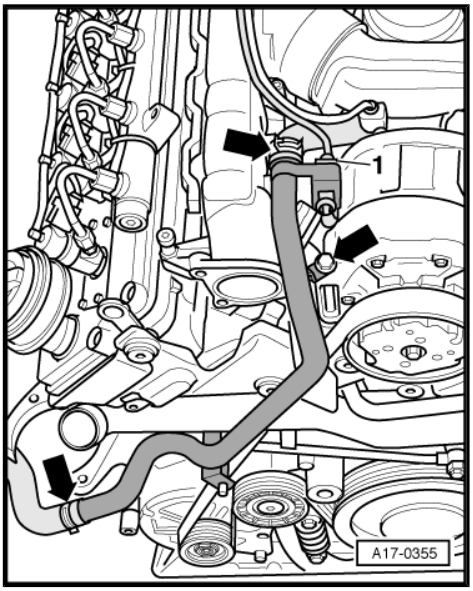
Note

Cable ties do not have to be opened.

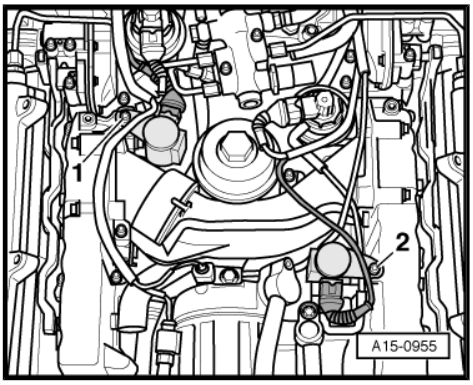
– Unclip electrical connector -1- at crankcase breather pipe.
– Detach crankcase breather pipe -arrows-.
– Pivot crankcase breather pipe to the side.

Note

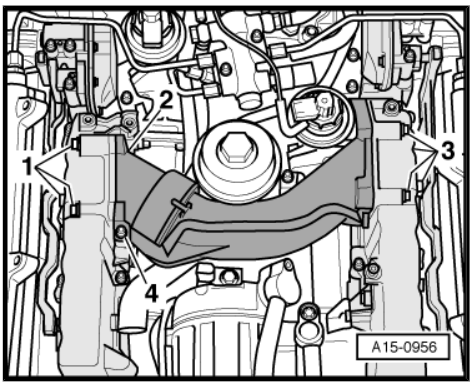
The hose at the bottom does not have to be disconnected.



– Unbolt exhaust gas recirculation valve - N18- -1- and exhaust gas recirculation valve 2 - N213- -2- from intake manifolds.



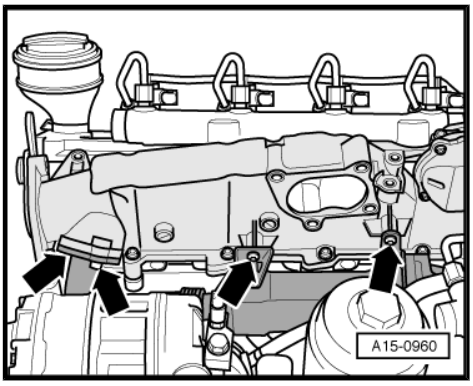
– Unscrew bolts -1 ... 4-.
– Take out connecting pipe between left and right intake manifolds.



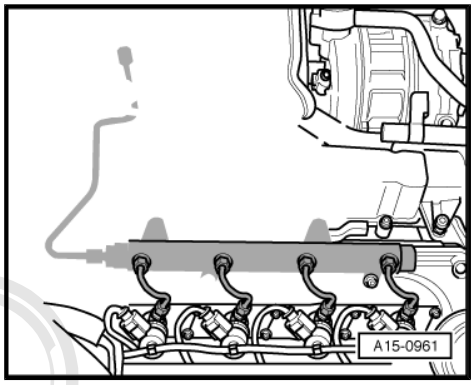
– Remove bolts -arrows-.
– Move electrical wiring clear at rail element and injector pipes.

WARNING

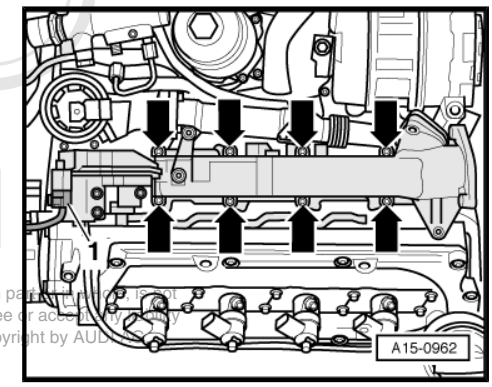
Observe rules for cleanliness when working on the injection system ⇒ page 2 .



– Unscrew union nuts -3 ... 8- (counterhold pressure pipe connections).
– Remove bolts -1- and -2-.
– Take off rail element.



– Detach electrical connector -1- at intake manifold flap motor -V157- .
– Remove bolts -arrows-.
– Take off intake manifold together with intake manifold flap motor.



Note

- *Watch dowel sleeves when removing intake manifold.*
- *Block off intake ports in cylinder head with clean rags.*

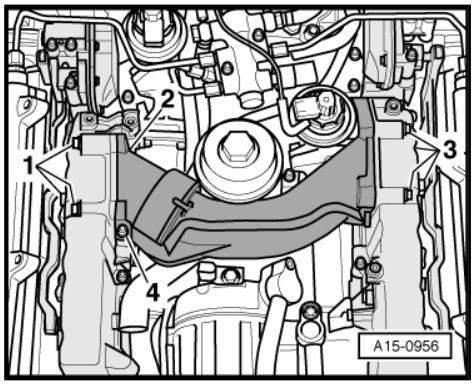
Installing

Note

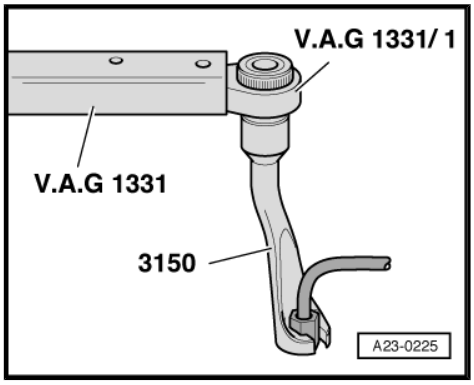
- *Reinstall all cable ties in the same locations when assembling.*
- *Renew gaskets, seals and O-rings.*
- *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*

– Make sure dowel sleeves are in place before installing intake manifold.

– Tighten bolt -4- last when installing connecting pipe between left and right intake manifolds.
– Tighten union nuts on high-pressure pipes hand-tight initially.
– Ensure that high-pressure pipes are not under tension.



– To tighten unions of high-pressure pipes, use torque wrench - V.A.G 1331- with ratchet - V.A.G 1331/1- and socket, 14 mm - 3150- .
– Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .
– Install front bumper ⇒ General body repairs, exterior; Rep. gr. 63 .
– Deactivate jacking mode. ⇒ Rep. gr. 43
– Adjust headlights ⇒ Rep. gr. 94 .



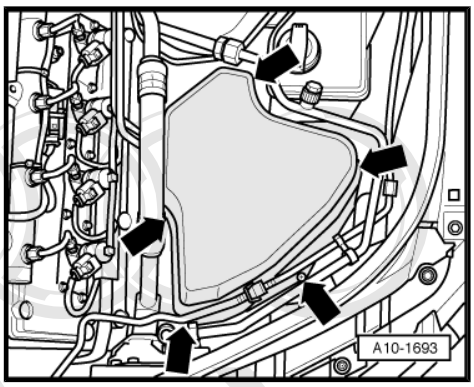
Tightening torques

Component	Nm
Intake manifold to cylinder head	10
Rail element to cylinder head	22
Union nut to fuel pipe	25
Exhaust gas recirculation cooler to intake manifold	10
Connecting pipe to intake manifold	10
Crankcase breather pipe to A/C compressor	25
Front air intake pipe to engine	10
Hose clips for air hoses	5

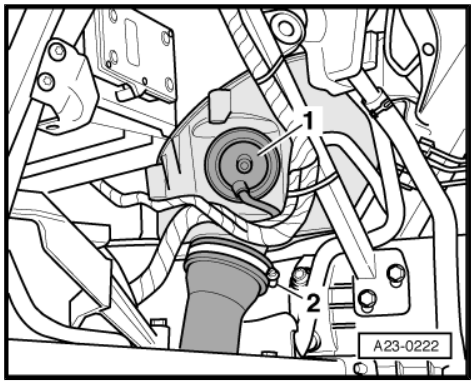
1.12 Removing and installing air cleaner (left-side)

Removing

– Remove bolts -arrows- from top section of air cleaner housing.
– Detach air cleaner housing (top section) and take out air filter element.



– Cover air mass meter -1- with a clean cloth and clean out bottom and top sections of air cleaner housing.



Installing

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

– Blow out water drain hose with compressed air.

– 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 in air duct leading to air filter element.

Note

- *Always use genuine part for air filter element.*
- *Make sure no dirt gets into the air cleaner housing.*
- *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.*
- *Do not use any lubricants containing silicone when assembling.*

– 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).

– Then screw top section of air cleaner back onto bottom section.

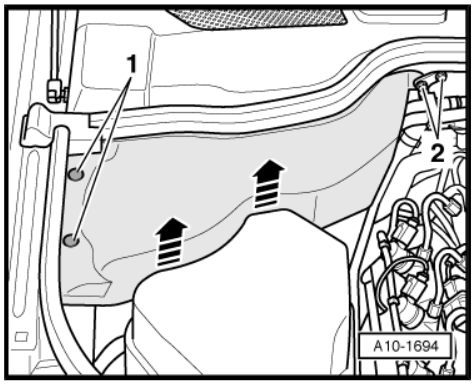
– The remaining installation steps are carried out in the reverse sequence.

1.13 Removing and installing air cleaner (right-side)

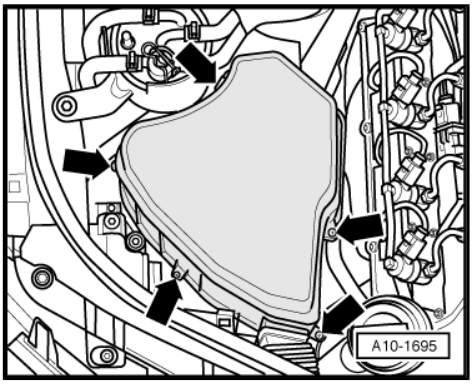
Removing

– Remove cover for right suspension turret; to do so, detach spreader clips -1- and unscrew bolted joint -2-.

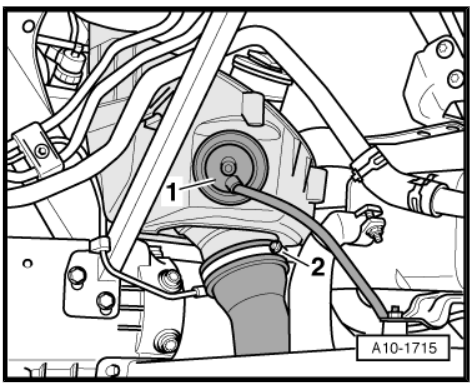
– Pull cover out of retainers -arrows-.



– Remove bolts -arrows-.
– Detach top section of air cleaner housing (right-side) and take out air filter element.



– Cover air mass meter -1- with a clean cloth and clean out bottom and top sections of air cleaner housing.



Installing

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

– Blow out water drain hose with compressed air.
– 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 in air duct leading to air filter element.

Note

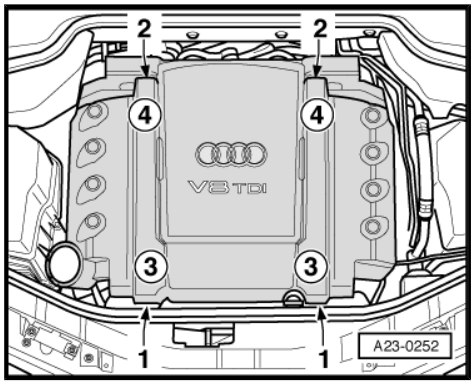
- *Always use genuine part for air filter element.*
- *Make sure no dirt gets into the air cleaner housing.*
- *To prevent malfunctions, cover all critical parts of the engine air intake tract (air mass meter, intake pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- *Do not use any lubricants containing silicone when assembling.*

– 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).
– Then screw top section of air cleaner back onto bottom section.
– The remaining installation steps are carried out in the reverse sequence.

1.14 Removing and installing engine cover panel

Removing

– First pull off the engine cover panel with both hands at the points marked -1-, and then at the points marked -2- (do not jerk the cover panel away, and do not try to pull on one side only).

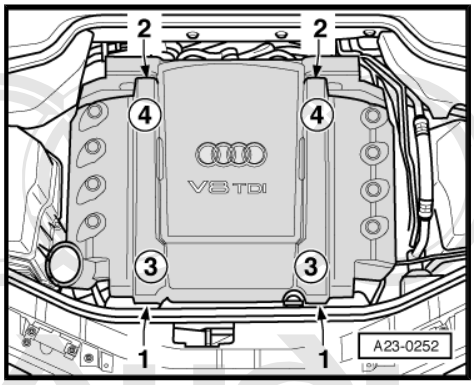


Installing

– 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).

– First press engine cover panel with both hands into its rubber grommets at the points marked -3-, and then at the points marked -4-.



1.15 Checking injectors

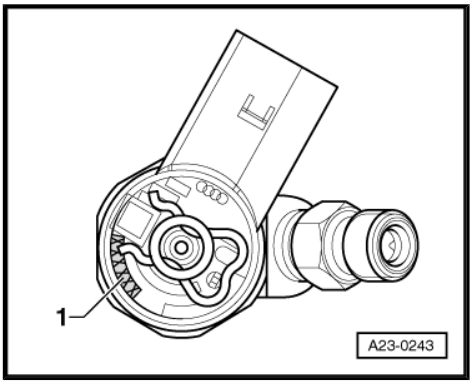
There are four ways of checking the injectors.

- Performing adaption of correction values for injectors ⇒ page 24
- Checking for injectors sticking open ⇒ page 25
- Measuring return flow rate of injectors with engine running ⇒ page 27
- Checking return flow rate of injectors at starter cranking speed ⇒ page 30

1.16 Performing adaption of correction values for injectors

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

The 6-digit adaption values -Item 1- are marked separately on each injector. They may consist of letters and/or numbers (ASCII code).



When a new injector is installed, the adaption value for the new injector must be stored in the corresponding engine control unit.

Cylinders 1, 4, 6 and 7: master engine control unit

Cylinders 2, 3, 5 and 8: slave engine control unit

When one or both engine control units are renewed, the appropriate injector delivery calibration values must be stored in the new control unit(s):

Examples:

If the master engine control unit is renewed, the injector delivery calibration values must be re-adapted for cylinders 1, 4, 6 and 7.

If the slave engine control unit is renewed, the injector delivery calibration values must be re-adapted for cylinders 2, 3, 5 and 8.

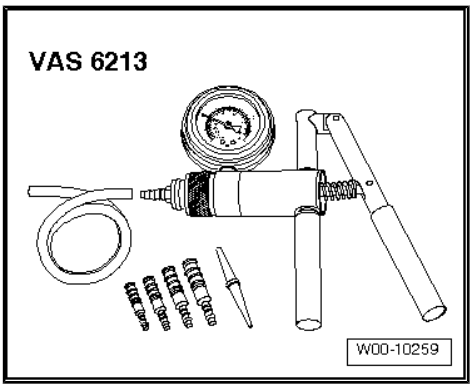
The adaption procedure is described in Guided Fault Finding. (The procedure is also described in Guided Functions)

1.17 Checking for injectors sticking open

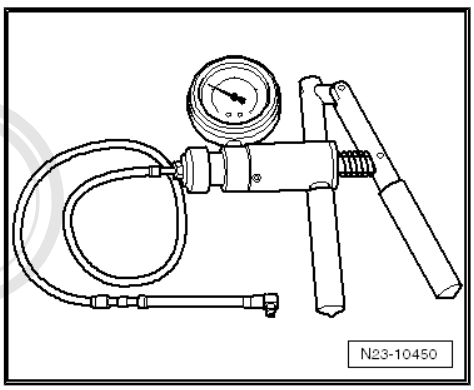
If one of the injectors is sticking open, this means that the injector needle is not closing fully and fuel escapes into the cylinder.

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



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



Procedure

– Remove engine cover panel.

– Clean all fuel rail connections with engine cleaner or brake cleaner and dry.

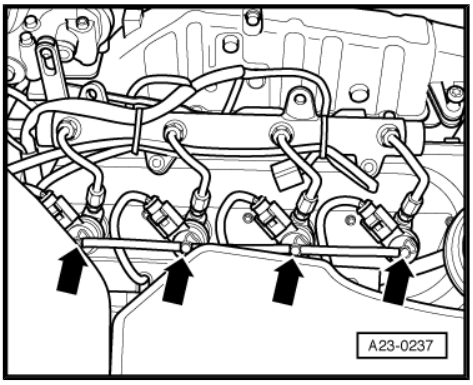
WARNING

Always read instructions for working on fuel system.

Follow these instructions before starting work and while working on the fuel system ⇒ page 2 .

Note

Check all cylinders in turn.



– Pull off retaining clips -arrows- from fuel return lines.
– Disconnect fuel return hoses from injectors.
– Connect adapter to return line connection of injector to be tested after adapter has been cleaned and blown out.
– Generate a vacuum of -500 mbar using the hand vacuum pump - VAS 6213- .

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

In the case of a faulty injector, the vacuum will fall back to 0 bar within 2 to 3 seconds.

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

– Renew faulty injectors ⇒ page 35 .

Installing fuel return lines

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all seals with engine oil or assembly oil before installing.

– Press the return lines firmly onto the injectors from above so that they engage audibly on each injector. Then re-fit the retaining clips. Check that the return lines are seated securely by pulling them by hand from above.

Bleeding fuel system and checking 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 the affected component if leakage occurs.

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

Note

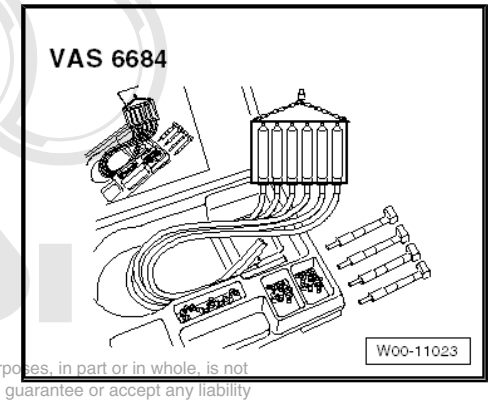
If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

1.18 Measuring return flow rate of injectors with engine running

Checking return flow rate if engine does not start ⇒ page 30

Special tools and workshop equipment required

♦ Return flow meter - VAS 6684- or meter - V.A.G 1348/2B-



WARNING

Always read instructions for working on fuel system.

Follow these instructions before starting work and while working on the fuel system ⇒ page 2 .

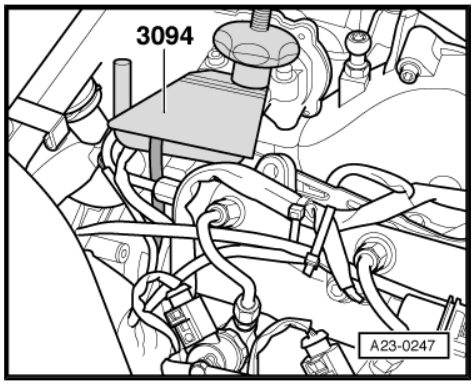
Checking return flow rate of injectors (cylinder bank 1)

A certain amount of excess fuel is returned from every injector (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 (refer to instructions for removing and installing ⇒ page 24).

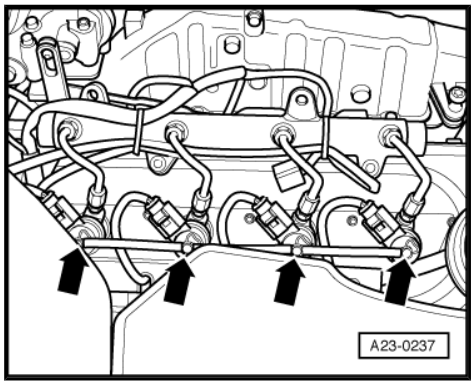
– Clean all return line connections with engine cleaner or brake cleaner and dry.

– Using hose clamp (up to Ø 25 mm) - 3094- , clamp off common return line behind cylinder No. 4 to prevent fuel coming out at the disconnected return lines.



– Pull off retaining clips -arrows- from fuel return lines.

– Pull return lines off all four injectors and connect four test hoses (approx. 90 cm long) to return connections.



Note

Take care to keep all components clean. No dirt must be allowed to get into the disconnected return lines or the open connections on the injectors.

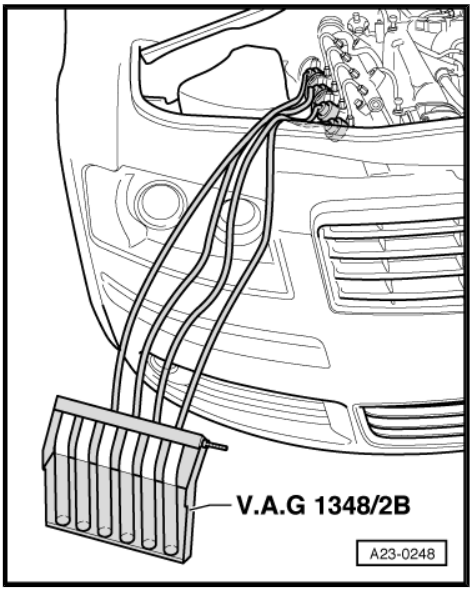
– Secure hoses with retaining clips.

– Feed the four hoses into meter.
– Start engine and let it idle for several minutes.
– If the return flow rate at one or more injectors is so high that the engine will not start (or is difficult to start), this will be apparent while the starter is being operated: the measuring tube belonging to the defective injector will fill up noticeably faster.
– If the engine starts, there should be no significant difference between the return flow rates at the four return connections (with the engine warm and idling at about 650 rpm).

The return flow rate should not exceed 20 ml per minute at each cylinder.

If an injector does not meet this specification, renew the injector concerned ⇒ page 35 .

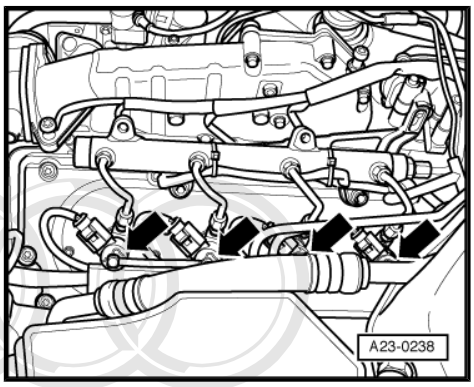
– Press the return lines onto the injectors from above so that they engage audibly on each injector. Then re-fit the retaining clips. Check that the return lines are seated securely by pulling them by hand from above.



If specification is met, check cylinder bank 2.

Checking return flow rate of injectors (cylinder bank 2)

– Pull off retaining clips from fuel return lines.
– Pull return lines off all four injectors and connect four test hoses (approx. 90 cm long) to return connections.

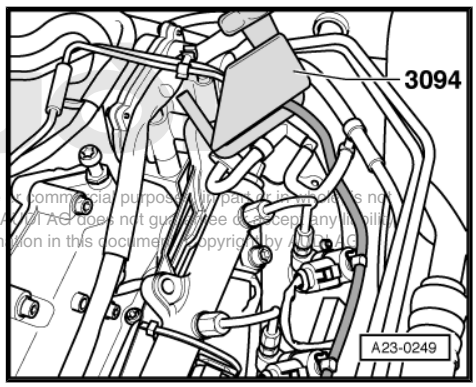


Note

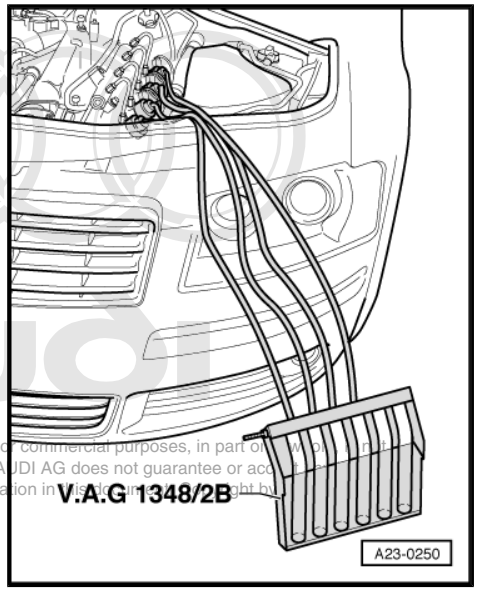
Take care to keep all components clean. No dirt must be allowed to get into the disconnected return lines or the open connections on the injectors.

– Secure hoses with retaining clips.

– Using hose clamp (up to Ø 25 mm) - 3094- , clamp off common return line behind cylinder No. 8 to prevent fuel coming out at the disconnected return lines.



– Feed the four hoses into meter.
– Start engine and let it idle for several minutes.
– If the return flow rate at one or more injectors is so high that the engine will not start (or is difficult to start), this will be apparent while the starter is being operated: the measuring tube belonging to the defective injector will fill up noticeably faster.
– If the engine starts, there should be no significant difference between the return flow rates at the four return connections (with the engine warm and idling at about 650 rpm).



The return flow rate should not exceed 20 ml per minute at each cylinder.

If an injector does not meet this specification, renew the injector concerned ⇒ page 35 .

Installing fuel return lines

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all seals with engine oil or assembly oil before installing.

– Press the return lines firmly onto the injectors from above so that they engage audibly on each injector. Then re-fit the retaining clips. Check that the return lines are seated securely by pulling them by hand from above.

Bleeding fuel system and checking 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 the affected component if leakage occurs.

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

Note

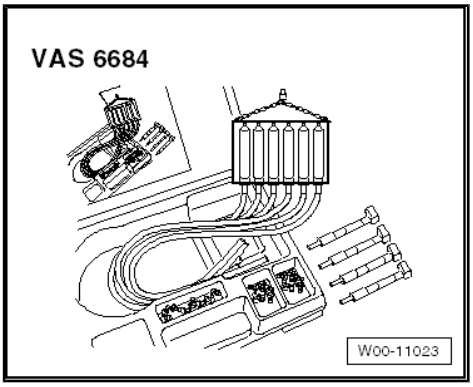
If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

1.19 Checking return flow rate of injectors at starter cranking speed

Only perform this test if the engine does not start at all.

Special tools and workshop equipment required

♦ Return flow meter - VAS 6684- or meter - V.A.G 1348/2B-



♦ Lengths of hose to fit return line connections on injectors

WARNING

Always read instructions for working on fuel system.

Follow these instructions before starting work and while working on the fuel system ⇒ page 2 .

Procedure

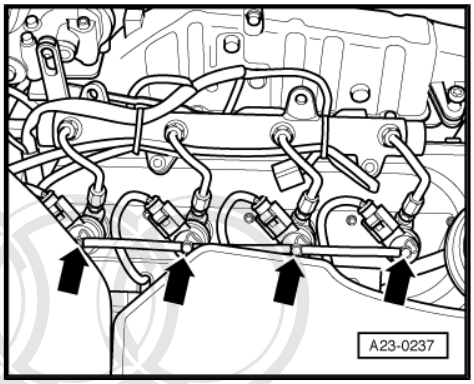
Each injector normally has a relatively low return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

– Remove engine cover panel (refer to instructions for removing and installing ⇒ page 24).

– Clean all return line connections with engine cleaner or brake cleaner and dry.

– Pull off retaining clips -arrows- from fuel return lines.

– Pull return lines off all four injectors and connect four test hoses (approx. 90 cm long) to return connections.



Note

Take care to keep all components clean. No dirt must be allowed to get into the disconnected return lines or the open connections on the injectors.

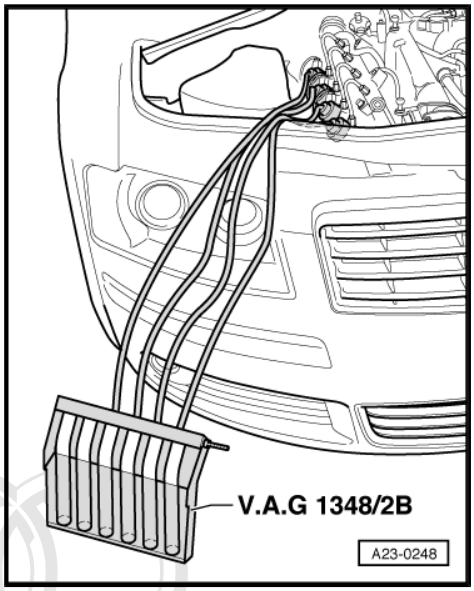
– Secure hoses with retaining clips.

– Feed the four hoses into meter.

– 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 ⇒ page 35 .



Installing fuel return lines

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all seals with engine oil or assembly oil before installing.

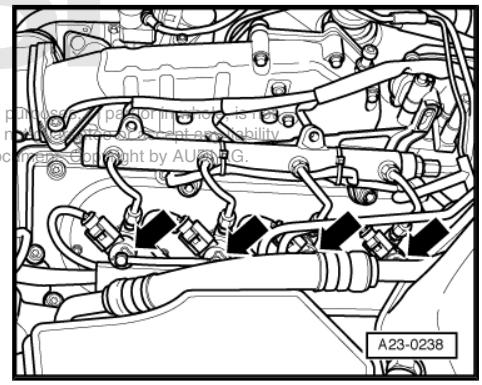
– Push the return line connections carefully over the new seals and onto the injectors. The catch should engage audibly. Then press release pin down carefully.

If specification is met, check cylinder bank 2.

Checking return flow rate of injectors (cylinder bank 2)

– Pull off retaining clips from fuel return lines.

– Pull return lines off all four injectors and connect four test hoses (approx. 90 cm long) to return connections.



Note

Take care to keep all components clean. No dirt must be allowed to get into the disconnected return lines or the open connections on the injectors.

– Secure hoses with retaining clips.

– Feed the four hoses into meter.

– 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 ⇒ page 35 .

Installing fuel return lines

– Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.

Note

Lubricate all seals 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.

– Erase entry in event memory using a diagnostic tester.

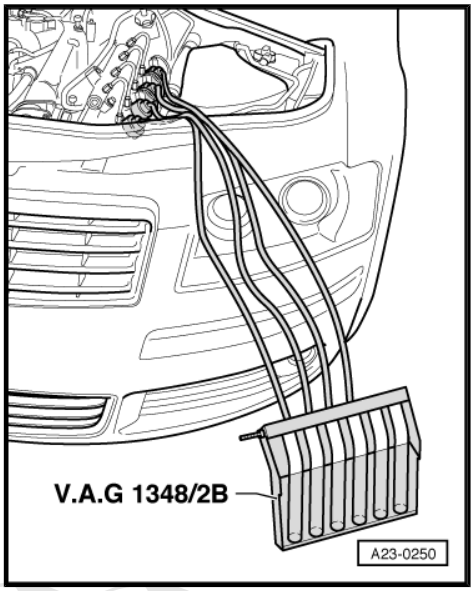
Bleeding fuel system and checking for leaks

– 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 the affected component if leakage occurs.

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



Note

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

1.20 Removing and installing high-pressure pipes between distributor housing (function block) and high-pressure pump / fuel rail

WARNING

Always read instructions for working on fuel system.

Follow these instructions before starting work and while working on the fuel system ***⇒ page 2*** ***.***

Special tools and workshop equipment required

♦ Torque wrench - V.A.G 1331- with ratchet - V.A.G 1331/1-

♦ Socket, 14 mm - 3150-

Removing

– Remove engine cover panel (refer to instructions for removing and installing ⇒ page 24).

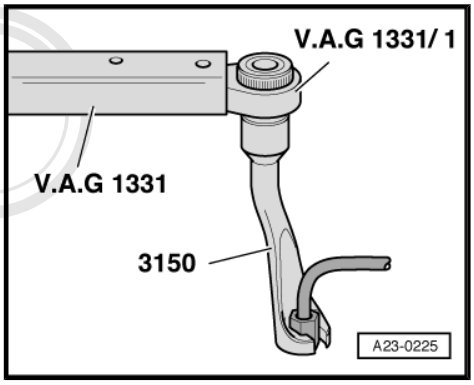
– Using commercial cleaning solution etc., clean connections of all high-pressure pipes that have to be opened before removing.

– Dry all components after cleaning.

Note

- *High-pressure pipes between fuel rail and injectors must be marked on removal. High-pressure pipes must always be reinstalled in the same position.*
- *Counterhold at pressure pipe connections when loosening union nuts.*
- *Seal off open connections on pipes immediately with suitable caps.*

– Open union nuts on the relevant high-pressure pipe using socket (14 mm) - 3150- .



Installing

Note

- *The high-pressure pipes can normally be used again. Before re-installing them in the vehicle, check the taper seats for distortion and cracks.*
- *The bore of the pipe must not be distorted, restricted or otherwise damaged.*

– Blow out high-pressure pipes with compressed air before re-installing.

– Lubricate threads of union nuts with fuel.

– Tighten union nuts hand-tight to start with. Make sure that connections are not under tension.

– Then tighten union nuts to specified torque (counterhold at pressure pipe connection).

Tightening torque

Component	Nm
High-pressure pipes	25

– Run engine at moderate speed for several minutes and then switch off.

– Check the entire fuel system for leaks.

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

– 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.

1.21 Removing and installing injectors

WARNING

Always read instructions for working on fuel system.

Follow these instructions before starting work and while working on the fuel system ⇒ page 2 .

Special tools and workshop equipment required

- Socket, 14 mm - 3150-
- Locking pin - 3242-
- Diesel injection pump locking pin - 3359-

- Torque wrench - V.A.G 1331- (5...50 Nm)
- Ratchet - V.A.G 1331/1-
- Puller - T40059-
- Multi-purpose tool - VW 771-
- Cleaning kit - VAS 6811-

Removing

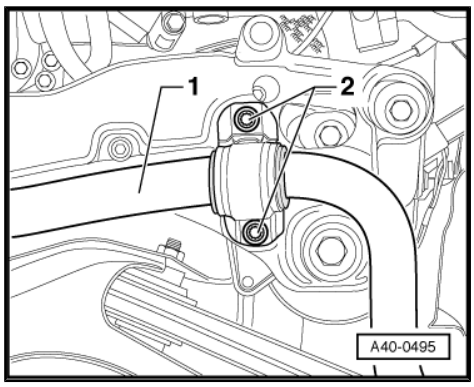
Note

- *Crankshaft must be at TDC position when removing injectors for cylinders 1, 2, 4 (cylinder bank 1) and 5, 6, 7, 8 (cylinder bank 2).*
- *When removing the injector for cylinder 3 the crankshaft must be turned 90° (1/4 turn) further.*

– Remove engine cover panel (refer to instructions for removing and installing ⇒ page 24).
– Move lock carrier to service position. ⇒ General body repairs, exterior; Rep. gr. 50
– Unscrew bolts -2- on anti-roll bar clamps uniformly and remove.
– Pivot anti-roll bar -1- down.

Note

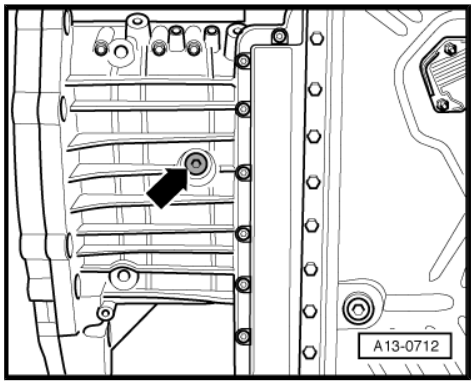
Place a cloth under the engine to catch escaping engine oil.



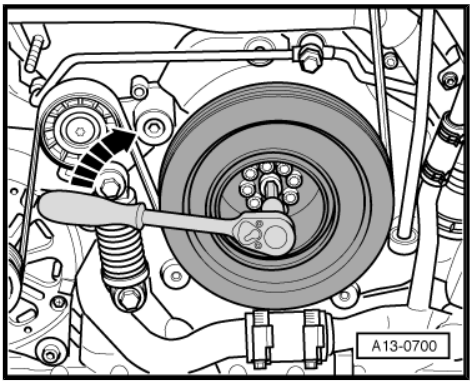
– Unscrew plug from sump (top section).

WARNING

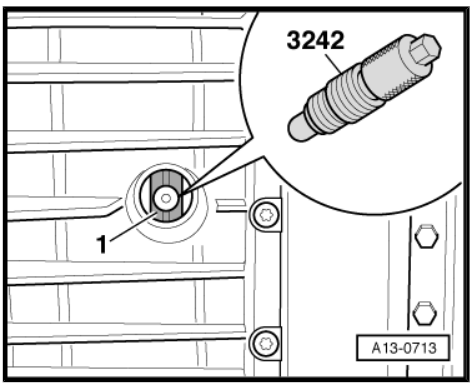
To avoid any risk of injury, do not rotate the crankshaft while feeling for the TDC drilling with your finger.



– Turn crankshaft in direction of engine rotation -arrow- ...



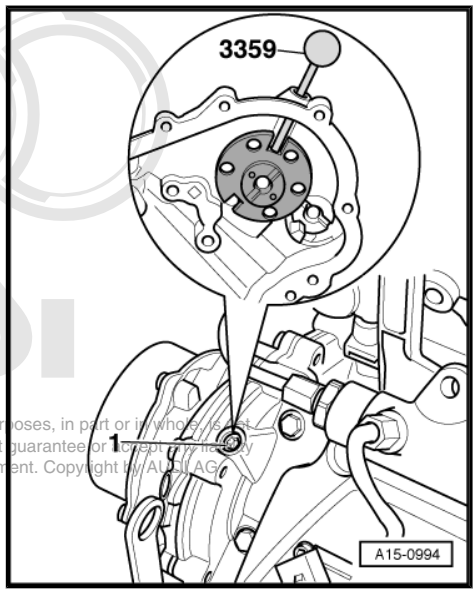
– ... until TDC bore -1- in crank web is visible through inspection hole in top section of sump.
– Screw locking pin - 3242- into bore (20 Nm); if necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



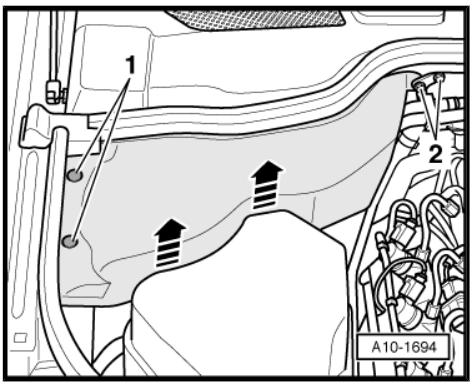
– Unscrew sealing plug -1- from inspection hole for camshaft TDC position from cylinder head (right-side).
– Insert diesel injection pump locking pin - 3359- to check whether TDC slot is located below inspection hole -arrow-.

♦ If diesel injection pump locking pin - 3359- can be inserted approx. 40 mm, camshaft is at TDC position.

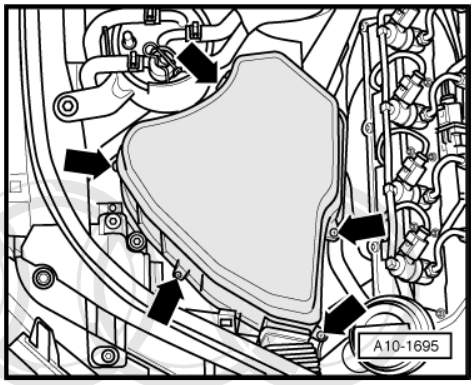
♦ If diesel injection pump locking pin - 3359- can only be inserted 30 mm, camshaft has not reached TDC position. In this case, pull out diesel injection pump locking pin - 3359- , turn crankshaft 1 complete revolution further and insert locking pin again.



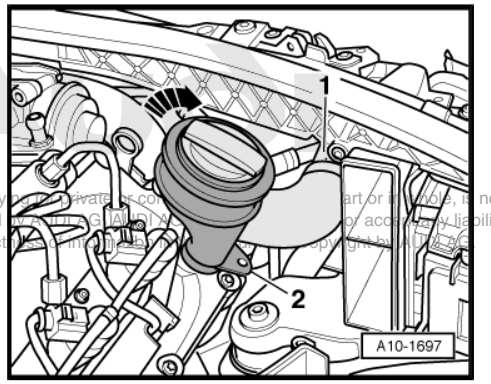
– Remove cover for right suspension turret; to do so, detach spreader clips -1- and unscrew bolted joint -2-.
– Pull cover out of retainers -arrows-.



– Remove bolts -arrows-.
– Detach top section of air cleaner housing (right-side). Cover air mass meter with a clean cloth.



– Detach oil filler neck. To do this, lift tab -2- and turn oil filler neck clockwise -arrow-.



Note

Item -1- can be disregarded.

Cylinder bank 1

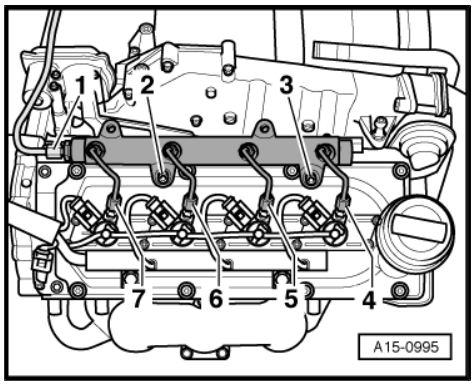
– Move electrical wiring clear of rail element (right-side).

WARNING

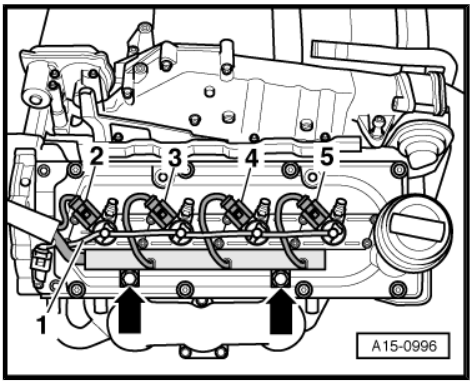
- *Observe rules for cleanliness when working on the injection system ⇒ page 2 .*
- *Identify cylinder numbers on injectors.*
- *Used injectors must always be re-installed on the same cylinder.*

– Unscrew union nut -1- on rail element (right-side).
– Unscrew union nuts -4 ... 7- (counterhold pressure pipe connections).

– Remove bolts -2- and -3-.
– Place rail element on intake manifold.
– Unplug electrical connectors -2 ... 5-.
– Unscrew wiring guide from cylinder head (right-side) -arrows-.



– Pull off retaining clips for return line -1-.
– Pull return line off injectors.



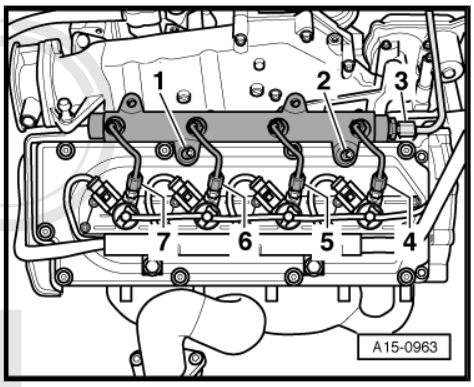
Cylinder bank 2

– Move electrical wiring clear of rail element (left-side).

WARNING

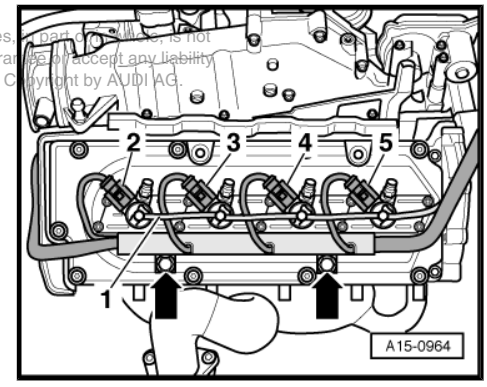
- *Observe rules for cleanliness when working on the injection system ⇒ page 2 .*
- *Identify cylinder numbers on injectors.*
- *Used injectors must always be re-installed on the same cylinder.*

– Unscrew union nut -3- on rail element (left-side).
– Unscrew union nuts -4 ... 7- (counterhold pressure pipe connections).
– Remove bolts -1- and -2-.
– Take off rail element (left-side).
– Unplug electrical connectors -2 ... 5-.
– Unscrew wiring guide from cylinder head (left-side) -arrows-.

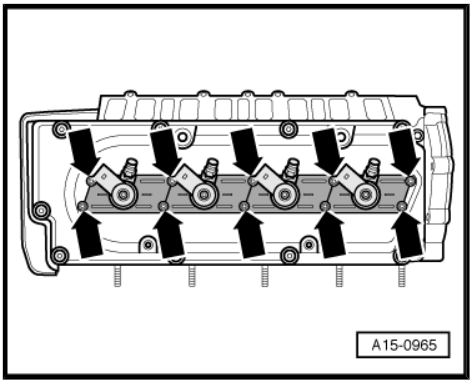


– Pull off retaining clips for return line -1-.
– Pull return line off injectors.

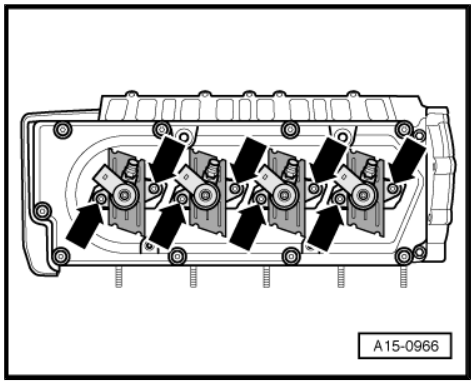
Both cylinder banks:



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



– Remove nuts securing injectors on both cylinder heads -arrows-.

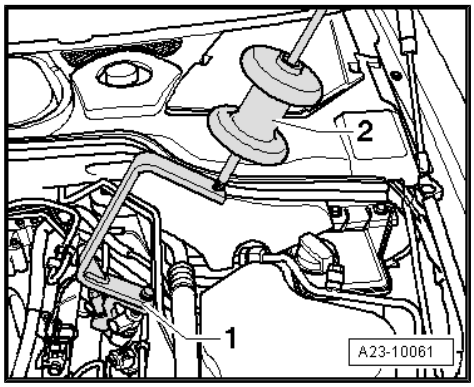


WARNING

- *Identify cylinder numbers on injectors.*
- *Used injectors must always be re-installed on the same cylinder.*

– To remove injectors, use puller - T40059- -1- and multi-purpose tool - VW 771- -2-.

– Screw puller - T40059- -1- onto the injector that is being removed and knock out the injector using multi-purpose tool - VW 771- -2-.

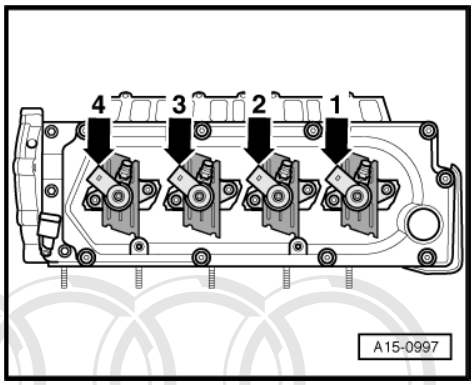


Note

The illustration shows cylinder No. 6 as an example.

– Pull out injectors for cylinders 1, 2 and 4 on cylinder head (right-side)

– Pull out all injectors on cylinder head (left-side).

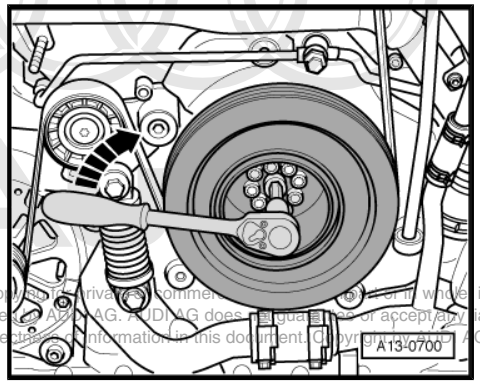


Note

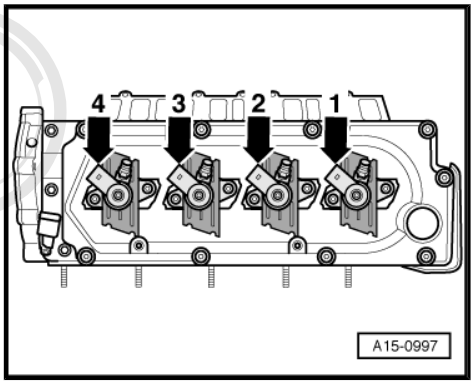
When removing the injector for cylinder 3 the crankshaft must be turned 90° (1/4 turn) further.

– Remove locking pin - 3242- .

– Turn crankshaft 90° (1/4 revolution) in normal direction of rotation -arrow-.



– Pull out injector for No. 3 cylinder on cylinder head (right-side).



Important instructions for installing injectors:

- Clamping piece
- Copper seal
- O-ring for injector bore
- O-ring for fuel return line connection

Note

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

If a used injector is being re-installed:

– Spray tip of injector nozzle with rust-releasing spray. Wait approx. 5 minutes and wipe off soot particles and oil with a cloth.

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

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

– Renew seal for injector.

– To prevent damage to the new O-ring, lubricate it with oil and carefully push it onto the fuel return line connection.

Continued (same procedure for used and new injectors):

Note

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

Caution

Risk of damage to injector sealing surface.

- ***To remove carbon deposits from the injector sealing surface, clean the injector bore in the cylinder head with cleaning kit - VAS 6811- .***

– Install injector.

– Tighten union nuts on high-pressure pipes hand-tight initially.

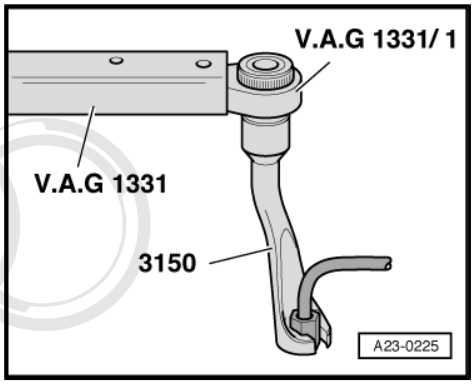
– Ensure that high-pressure pipes are not under tension.

– To tighten unions of high-pressure pipes, use torque wrench - V.A.G 1331- with ratchet - V.A.G 1331/1- and socket, 14 mm - 3150- .

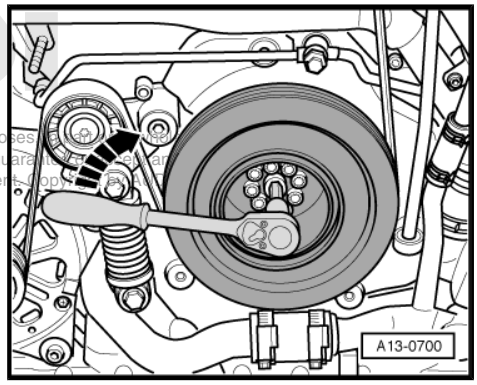
– Install injector for No. 3 cylinder on cylinder head (right-side).

WARNING

To avoid any risk of injury, do not rotate the crankshaft while feeling for the TDC drilling with your finger.

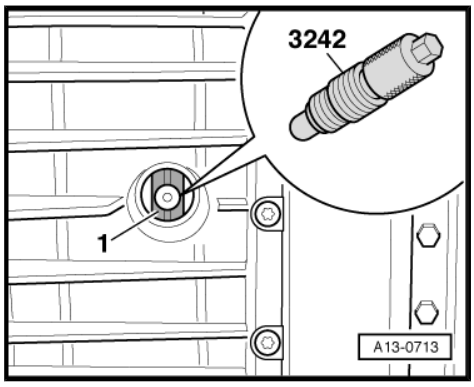


– Turn crankshaft 1 3/4 revolutions in direction of engine rotation -arrow- ...



– ... until TDC bore -1- in crank web is visible again through inspection hole in top section of sump.

– Screw locking pin - 3242- into bore (20 Nm); if necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.

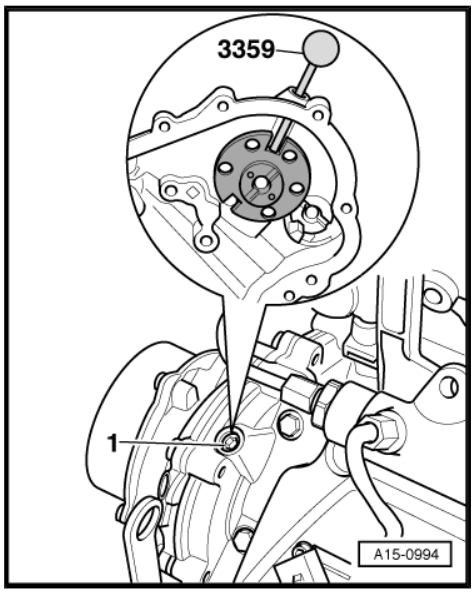


– Insert diesel injection pump locking pin - 3359- in drilling -1- to check whether TDC slot is located below inspection hole.

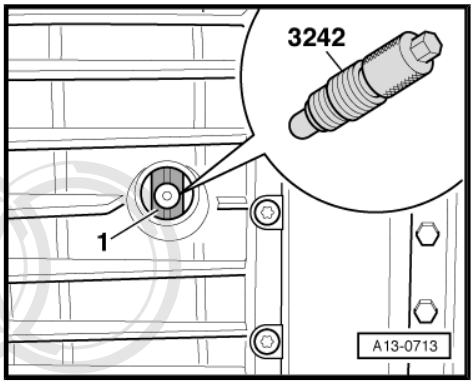
♦ If diesel injection pump locking pin - 3359- can be inserted approx. 40 mm, camshaft is at TDC position.

♦ If diesel injection pump locking pin - 3359- can only be inserted 30 mm, camshaft has not reached TDC position. In this case, pull out locking pin 3359, turn crankshaft 1 complete revolution further and insert pin once again.

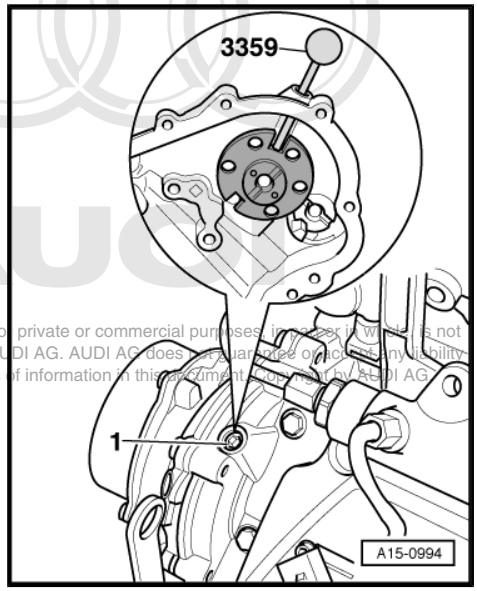
– Install injectors for cylinders 1, 2, 4, 5, 6, 7 and 8.



– Remove locking pin - 3242- from crank web.
– Screw in plug for TDC inspection hole in top section of sump, using new seal.



– Remove diesel injection pump locking pin - 3359- from inspection hole for camshaft TDC position.
– Screw in plug for camshaft TDC inspection hole.
– Install anti-roll bar. ⇒ Rep. gr. 40
– Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .
– Install front bumper ⇒ Rep. gr. 63 .
– Deactivate jacking mode. ⇒ Rep. gr. 43
– Adjust headlights ⇒ Rep. gr. 94 .



Tightening torques

Component	Nm
Injector in cylinder head	10
Cover for injector to cylinder head	5 renew
Rail element to cylinder head	22
High-pressure pipes	25
Screw plug in top section of sump	35
Screw plug in cylinder head	18

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

Additionally, check that the correct “Injector delivery calibration values” for all the remaining injectors are stored in the corresponding control unit. Do not enter new values for the “Injector delivery calibration” if the correct values are already stored.

- The values of the injectors for cylinders 1, 4, 6 and 7 are stored in the master engine control unit.
- The values of the injectors for cylinders 2, 3, 5 and 8 are stored in the slave engine control unit.

Bleeding fuel system and checking for leaks

– Run engine at moderate speed for several minutes and then switch off.

Note

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

– Switch off ignition.
– Carefully check the entire fuel system including all 6 return line connections for leaks (the fuel return lines can only be renewed together with the pressure retention valve as one unit).

Renew the affected component if leakage still occurs after tightening to the 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.

1.22 Exploded view - high-pressure pump

1 - 22 Nm

2 - Toothed belt sprocket

- ❑ For high-pressure pump
- ❑ Remove using puller - T40064- ⇒ page 46

3 - 70 Nm

- ❑ Use counterhold tool - T40053- to loosen and tighten ⇒ page 46

4 - 22 Nm

5 - Idler roller

6 - Front bracket

- ❑ For high-pressure pump

7 - Fuel return hose

8 - Seals

- ❑ Renew

9 - Banjo bolt

- ❑ 22 Nm

10 - Fuel supply line

11 - High-pressure pump

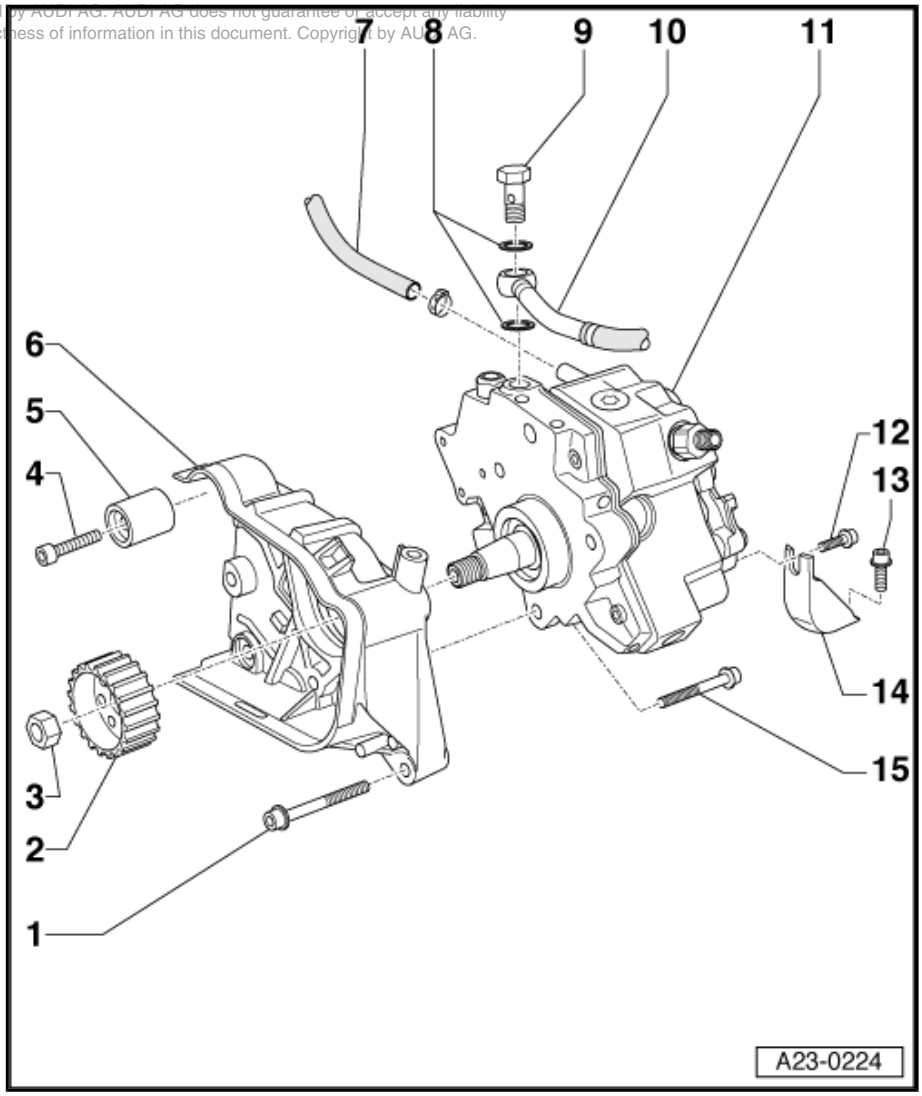
- ❑ Removing and installing ⇒ page 46

12 - 22 Nm

13 - 22 Nm

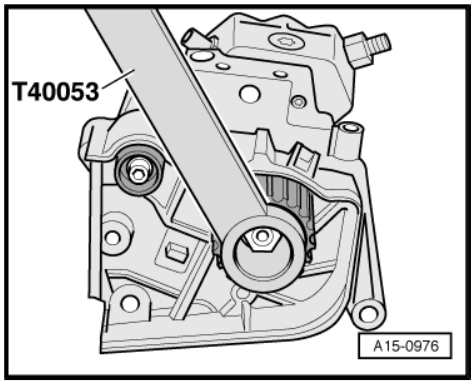
14 - Bracket

15 - 22 Nm



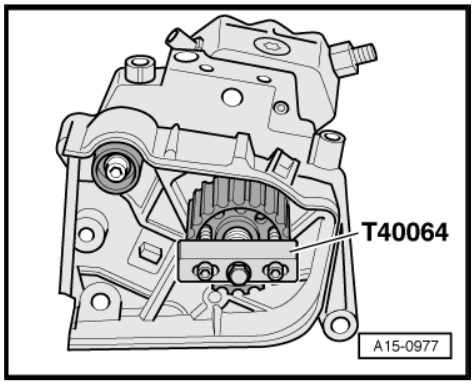
Loosening toothed belt sprocket

– Use counterhold tool - T40053- when loosening and tightening central nut.



Pulling off toothed belt sprocket

– Use puller -T40064- to pull off belt sprocket.



1.23 Removing and installing high-pressure pump and gear-type fuel system pressurisation pump

The high-pressure pump and gear-type fuel system pressurisation pump are combined as one unit.

WARNING

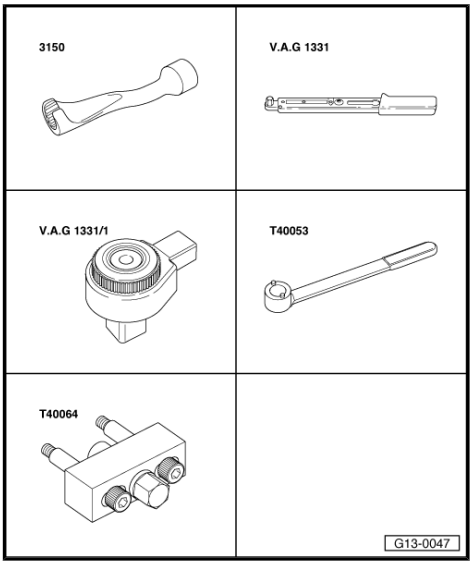
Always read instructions for working on fuel system.

Follow these instructions before starting work and while working on the fuel system ⇒ page 2 .

Special tools and workshop equipment required

- Socket, 14 mm - 3150-
- Torque wrench - V.A.G 1331- (5...50 Nm)
- Ratchet - V.A.G 1331/1-
- Counterhold tool - T40053-

♦ Puller -T40064-



Removing

– Remove engine cover panel (refer to instructions for removing and installing ⇒ page 24).

– Drain cooling system. ⇒ Rep. gr. 19

– Move lock carrier to service position. ⇒ General body repairs, exterior; Rep. gr. 50

– Remove intake manifold (left-side). ⇒ Rep. gr. 15

– Remove mechanical exhaust gas recirculation valve (left-side). ⇒ Rep. gr. 26

– Remove cooler (left-side) for exhaust gas recirculation. ⇒ Rep. gr. 26

– Unplug electrical connectors -4- and -6-.

– Remove high-pressure pipes -1- and -2- (counterhold at pipe connections on high-pressure pump).

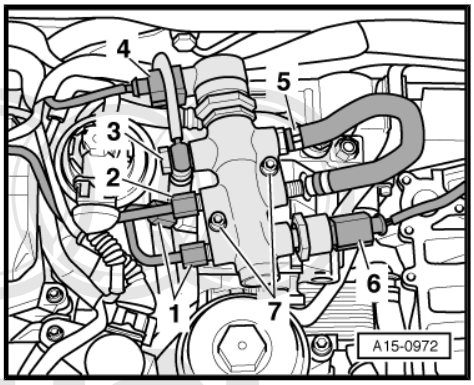
– Remove banjo bolt -3-.

– Disconnect fuel return hose -5- at fuel distributor housing.

– Remove bolts -7- and take off fuel distributor housing.

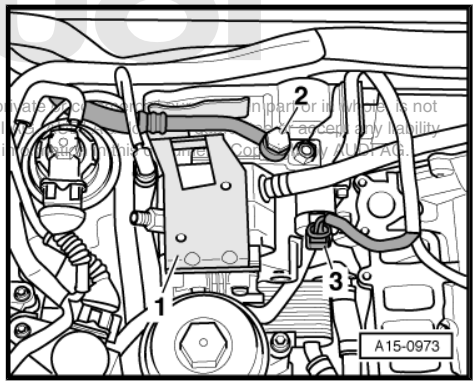
– Unplug electrical connector -3-.

– Remove banjo bolt -2-.

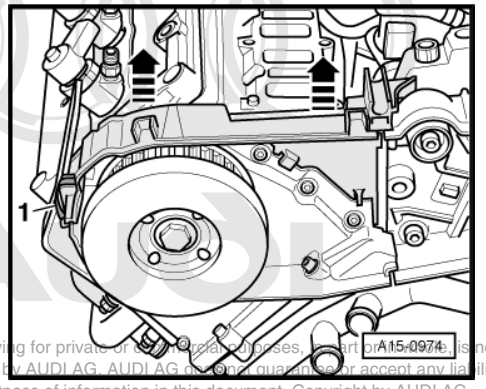


– Remove bracket -1- for fuel distributor housing.

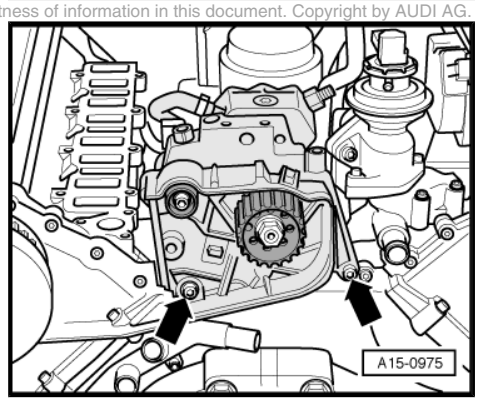
– Remove toothed belt for high-pressure pump ⇒ page 53 .



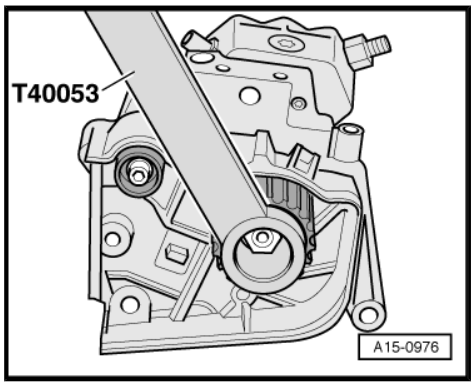
– Release clamps -arrows- and lift off rear toothed belt cover -1-.



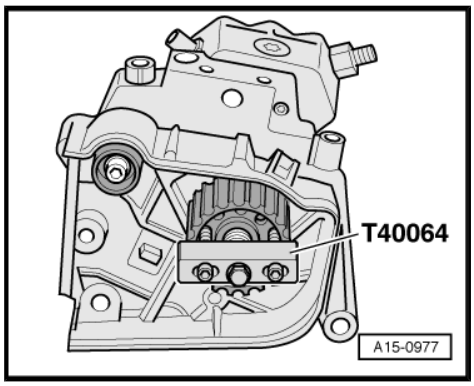
– Remove bolts -arrows-.
– Take off high-pressure pump together with front bracket.



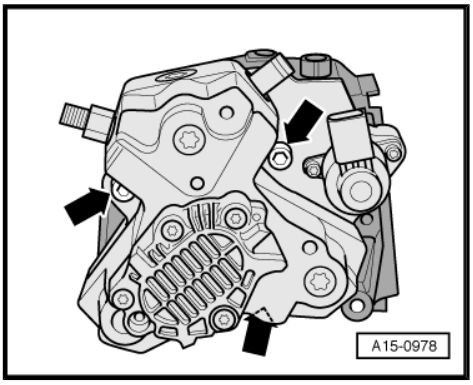
– Remove central nut for high-pressure pump (use counterhold tool - T40053-).



– Pull toothed belt sprocket off high-pressure pump using puller -T40064- .



– Remove bolts -arrows-.
– Take high-pressure pump off front bracket.



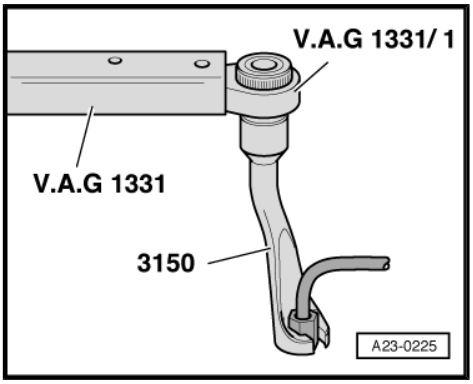
Installing

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

Note

- *Renew seals.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*

– Tighten union nuts on high-pressure pipes hand-tight initially.
– Ensure that high-pressure pipes are not under tension.



– To tighten unions of high-pressure pipes, use torque wrench - V.A.G 1331- with ratchet - V.A.G 1331/1- and socket, 14 mm - 3150- .
– Install toothed belt for high-pressure pump ⇒ page 53 .
– Install cooler (left-side) for exhaust gas recirculation. ⇒ Rep. gr. 26
– Install mechanical exhaust gas recirculation valve (left-side). ⇒ Rep. gr. 26
– Install intake manifold (left-side). ⇒ Rep. gr. 15
– Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .
– Install front bumper ⇒ General body repairs, exterior; Rep. gr. 63 .
– Fill cooling system. ⇒ Rep. gr. 19
– Deactivate jacking mode. ⇒ Rep. gr. 43
– Adjust headlights ⇒ Rep. gr. 94 .
– Bleed fuel system before first engine start ⇒ page 50 .
– Check fuel system for leaks ⇒ page 51 .

Tightening torques

Component	Nm
High-pressure pump to front bracket	22
Toothed belt sprocket to high-pressure pump	70
Bracket for high-pressure pump to	
High-pressure pump	22
Cylinder block	22
Bracket for fuel distributor housing to high-pressure pump	10
Fuel supply line to high-pressure pump	25
Fuel distributor housing to bracket	10
Banjo bolt to fuel distributor housing	9
High-pressure pipe to fuel distributor housing	25

1.24 Bleeding fuel system after installing high-pressure pump

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).

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.*

Bleeding fuel system

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

– Connect battery charger ⇒ Rep. gr. 27

– Switch on ignition for 100 seconds.

– Switch off ignition.

– Switch on ignition again for 100 seconds.

Note

- *The fuel pump is activated for 100 seconds each time the ignition is switched on.*
- *This ensures that a supply of fuel without air bubbles is present at the high-pressure pump intake.*

– Unplug connector from fuel pressure regulating valve - N276- so that engine does not start when starter motor is operated. Overview of fitting locations ⇒ page 4

– Operate starter motor for 3 x 13 seconds. (Wait approx. 20 seconds each time after operating starter to prevent it from overheating.)

– Re-attach connector on fuel pressure regulating valve - N276- .

– Erase fault in fault memory using diagnostic tester.

– Start engine.

– After bleeding fuel system, leave engine running at moderate speed for a few minutes and then switch off again.

– Check fuel system for leaks.

– 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.

– Interrogate event memory.

1.25 Checking for leaks in fuel system

– Start the engine and let it run at medium speed for a few minutes.

– Switch off ignition.

– Check fuel system for leaks.

– If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.

– 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.

1.26 Exploded view - toothed belt for high-pressure pump

1 - 22 Nm

2 - 150 Nm

- ❑ Use counterhold tool -T40063- when loosening and tightening ⇒ page 52

3 - Damper weight

4 - Toothed belt

- ❑ For high-pressure pump
- ❑ Removing and installing ⇒ page 53

5 - Toothed belt sprocket

6 - 22 Nm

7 - Idler roller

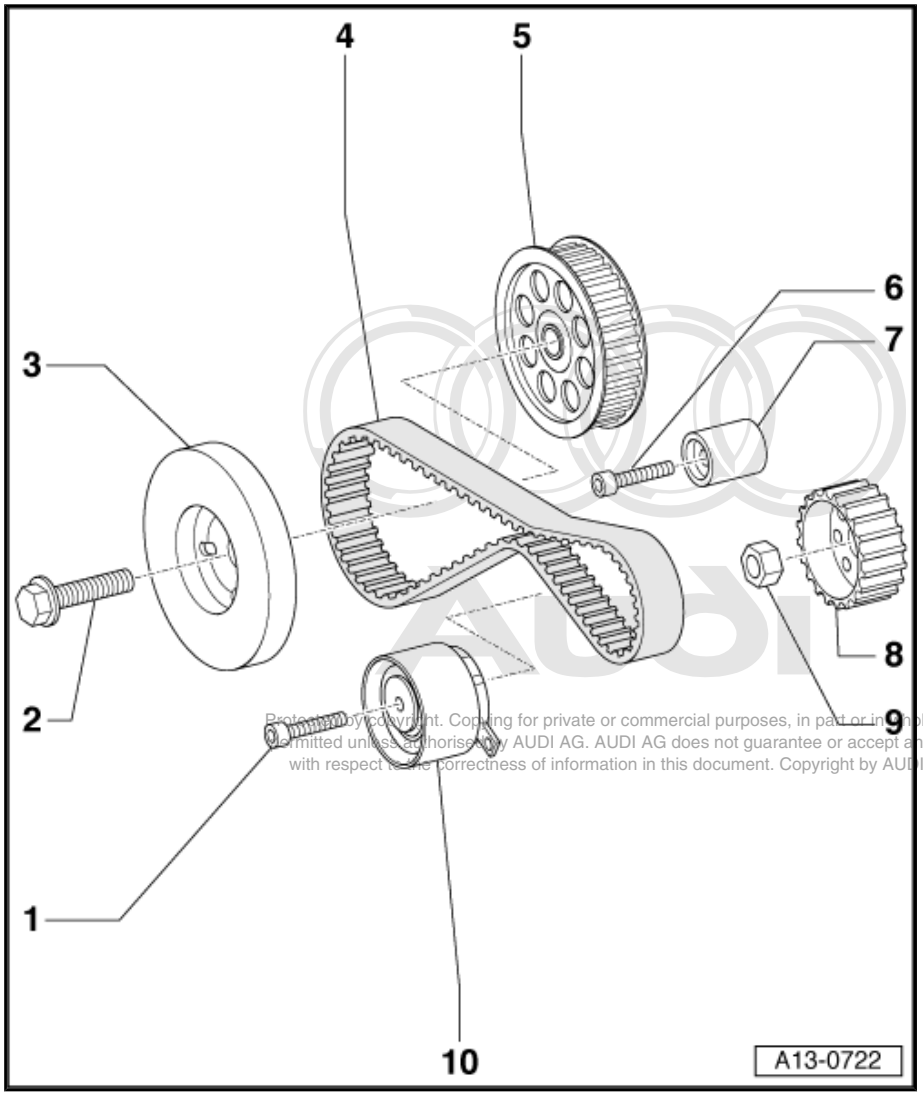
8 - Toothed belt sprocket

- ❑ For high-pressure pump
- ❑ Remove using puller -T40064- ⇒ page 53

9 - 70 Nm

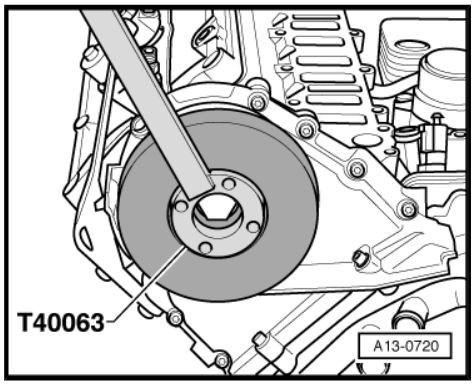
- ❑ Use counterhold tool -T40053- when loosening and tightening ⇒ page 53

10 - Tensioning roller



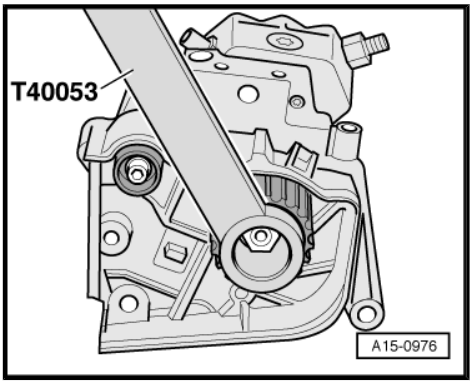
Unbolting damper weight

– Use counterhold tool -T40063- when loosening and tightening central bolt.



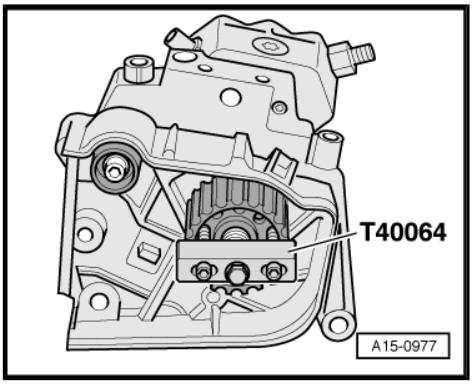
Loosening toothed belt sprocket

– Use counterhold tool - T40053- when loosening and tightening central nut.



Pulling off toothed belt sprocket

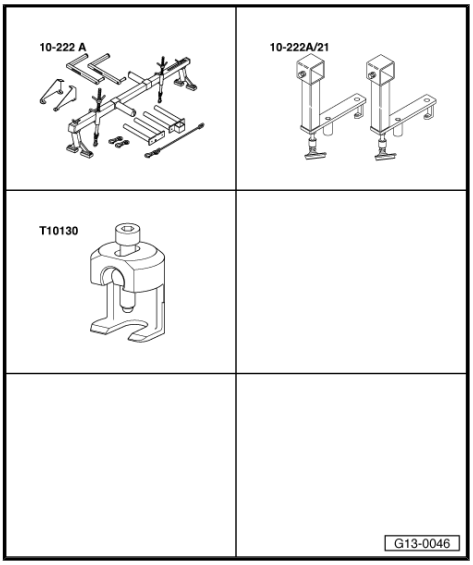
– Use puller -T40064- to pull off belt sprocket.



1.27 Removing and installing toothed belt for high-pressure pump

Special tools and workshop equipment required

- Support bracket - 10 - 222 A-
- Adapters - 10 - 222 A /21-
- Drill bit, ∅ 4.5 mm

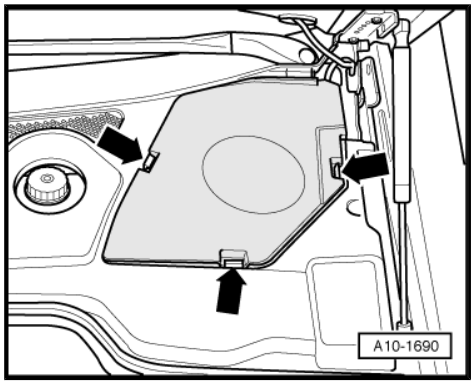


Removing

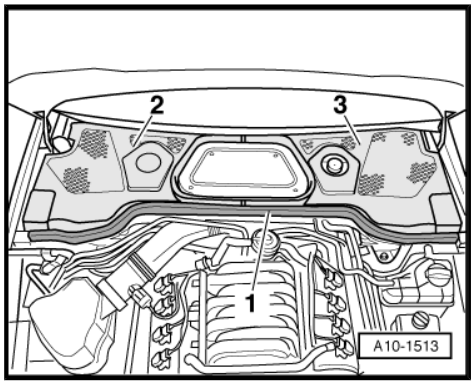
Note

All cable ties which are released or cut open when removing must be refitted in the same position when installing.

– Move lock carrier to service position. ⇒ General body repairs, exterior; Rep. gr. 50
– Remove cover above coolant expansion tank -arrows-.
– Pull off rubber seal -1- on plenum chamber covers.



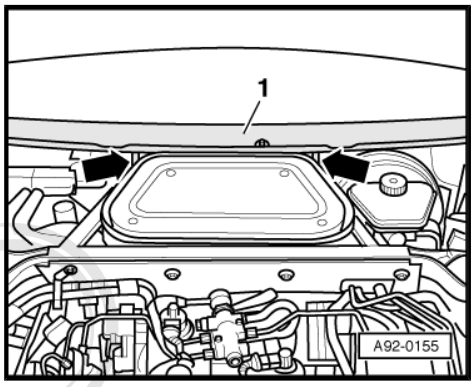
– Detach plenum chamber covers -2- and -3-.
– Use screwdriver to pry off cover caps on wiper arms and unscrew hexagon nuts.
– Pull wiper arms off wiper shafts.
– Remove dust and pollen filter. ⇒ Rep. gr. 87



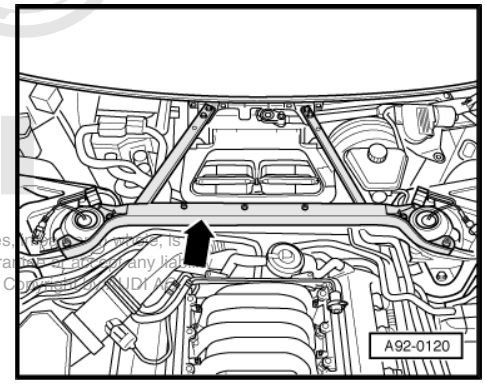
Note

Cover air duct at air conditioner housing with clean cloth to prevent anything falling in.

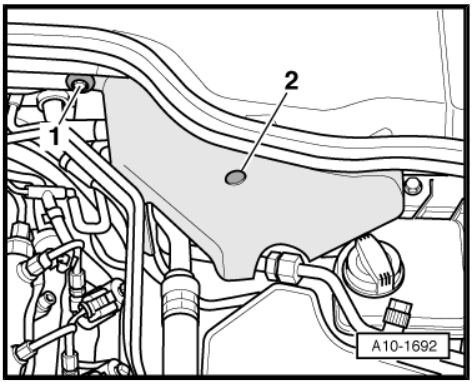
– Unscrew bolts on left and right -arrows- for cowl panel grille -1-.
– Carefully pull cowl panel grille off retainer at windscreen.



– Unscrew body brace -arrow-.



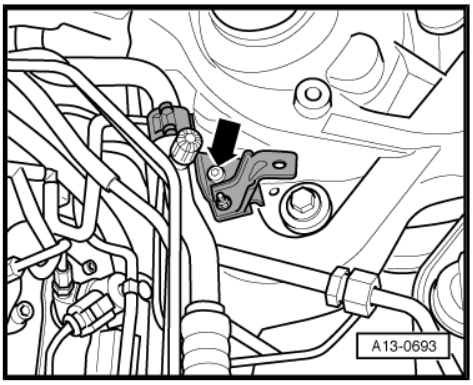
– Remove cover for suspension turret (left-side); to do so, remove nut -1- and detach spreader clip -2-.



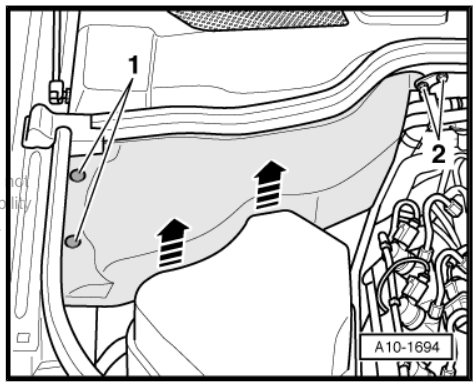
– Remove bolt -arrow-.
– Pivot bracket for air conditioner pipe to one side.

Note

To prevent damage to the air conditioner compressor and refrigerant pipes/hoses, ensure that the pipes and hoses are not stretched, kinked or bent.



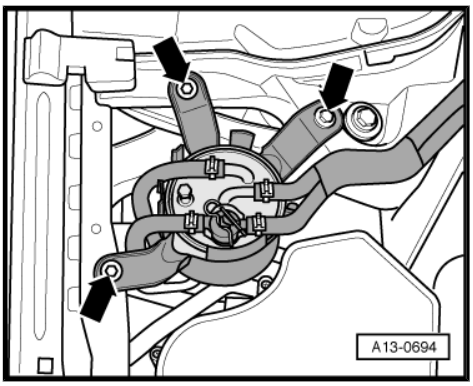
– Remove cover for right suspension turret; to do so, detach spreader clips -1- and unscrew bolted joint -2-.
– Pull cover out of retainers -arrows-.



– Remove bolts -arrows- on fuel filter bracket.

Note

Fuel filter remains in engine compartment with fuel lines connected.



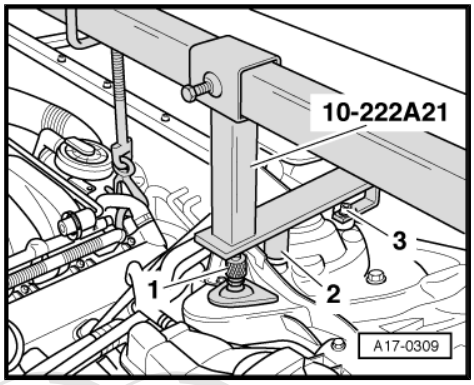
– Attach support bracket - 10 - 222 A- with adapters - 10 - 222 A /21- onto suspension turrets.

♦ Adapters are marked for left and right side of vehicle.

♦ The adapters - 10 - 222 A /21- are attached by means of the rear securing bolts -3- for the body brace.

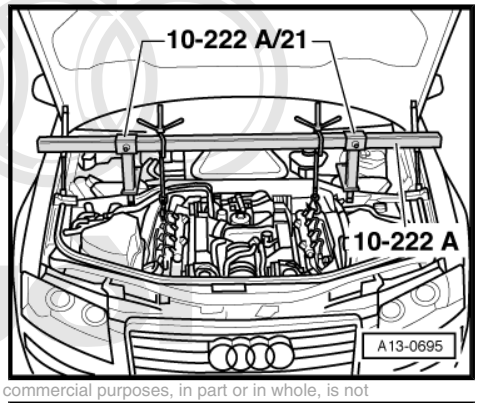
♦ The centre support points of the adapters are positioned on the front bolts for the body brace.

♦ The knurled screw -1- must be screwed down until the support plate rests on the suspension turret.

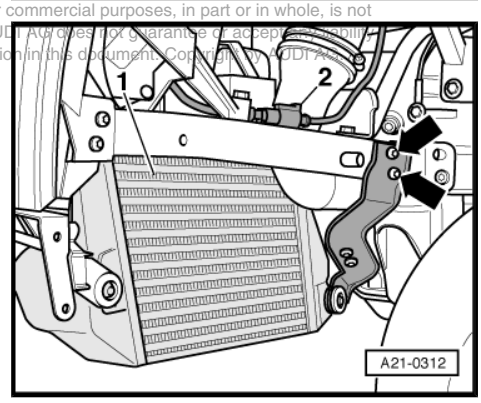


– Secure spindles of support bracket - 10 - 222 A- to rear engine lifting eyes.

– Take up weight of engine on spindles of support bracket (considerable weight has to be supported).



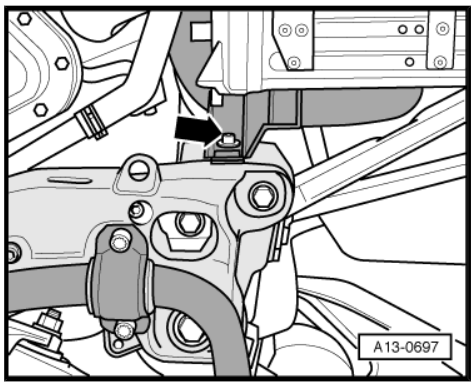
– Remove bolts -arrows- and detach bracket for charge air cooler (left-side).



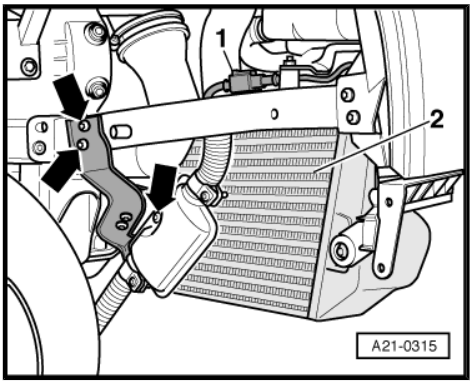
Note

Items -1- and -2- can be disregarded.

– Remove bolt -arrow- for air intake pipe (left-side).



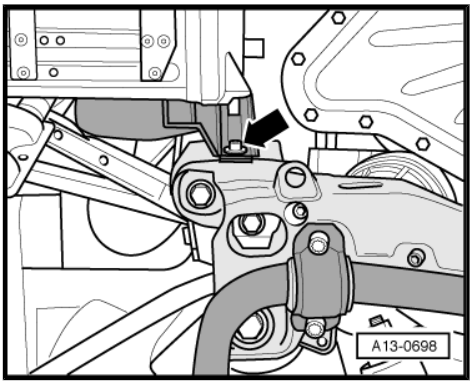
– Remove bolts -arrows- and detach bracket for charge air cooler (right-side).



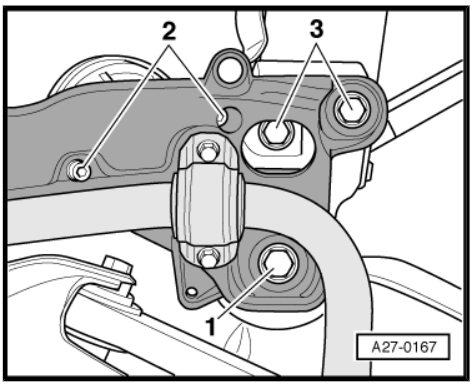
Note

Items -1- and -2- can be disregarded.

– Remove bolt -arrow- for air intake pipe (right-side).



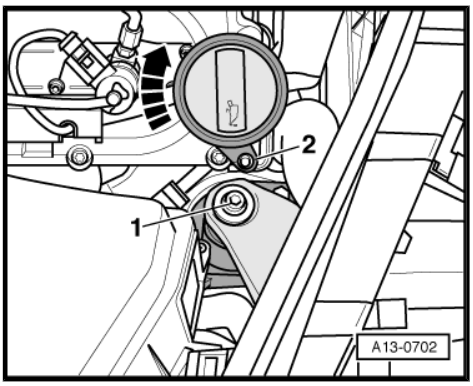
– Unscrew subframe bolts -1- and -3-.



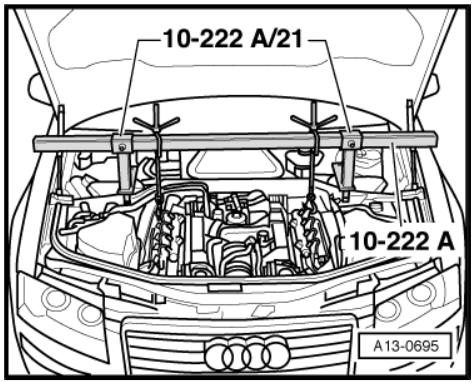
Note

Bolts -Item 2- for engine mounting do not have to be loosened.

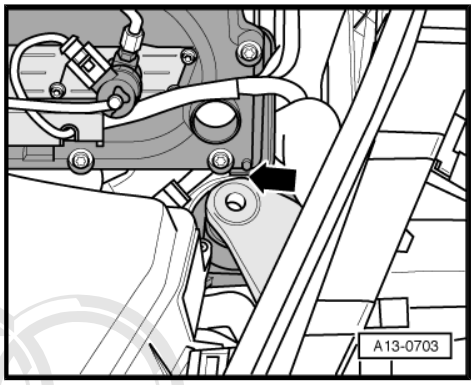
– Detach oil filler neck. To do this, lift tab -2- and turn oil filler neck clockwise -arrow-.
– Remove bolt -1- on mounting for torque reaction support.



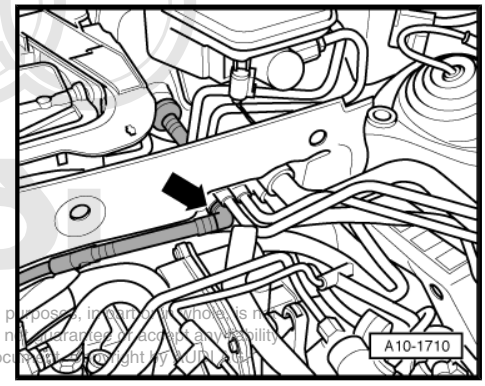
– Lower engine on spindles of support bracket ...



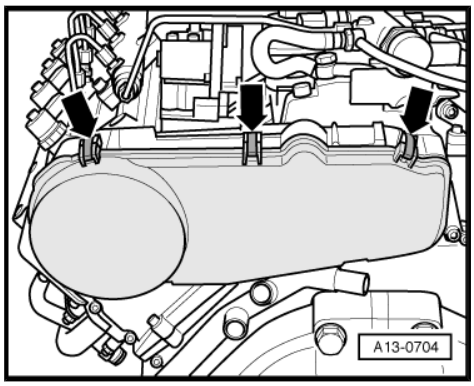
– ... until cylinder head cover is just slightly above bracket for torque reaction support -arrow-.



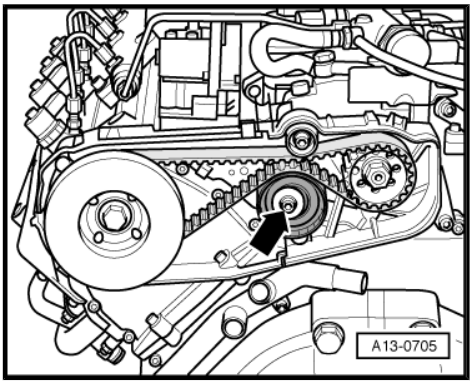
– Disconnect vacuum hose -arrow- leading to brake servo.
– Move vacuum hose clear towards right side of vehicle (first disconnect the thin hose located below).
– Move electrical wiring clear at rear of engine.



– Release clamps -arrows- and detach toothed belt cover.
– Pivot toothed belt cover to the rear and disengage retaining pegs on bottom side of toothed belt cover.



– Unscrew bolt -arrow- for tensioning roller.
– Take off tensioning roller and toothed belt for high-pressure pump.



Installing

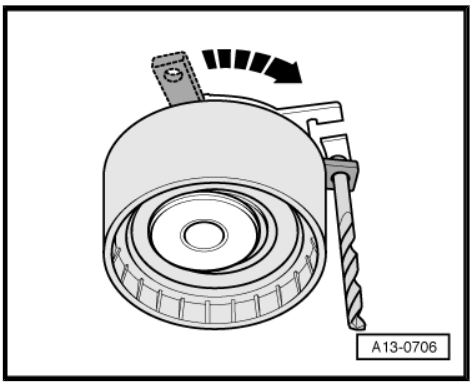
Installation is carried out in the reverse order; note the following:

Note correct tightening torques.

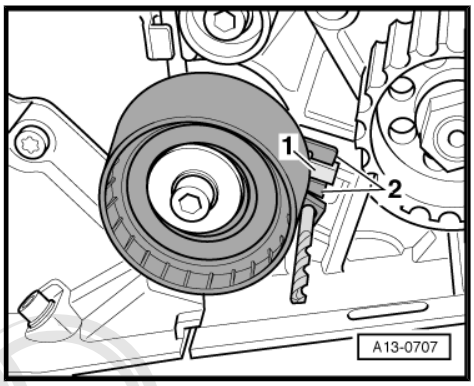
Note

Reinstall all cable ties in the same locations when assembling.

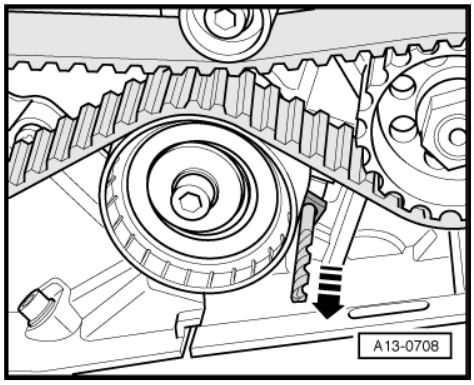
– Apply pressure to tensioning roller by hand and lock in position with a 4.5 mm ∅ drill bit.



– Note correct installation position when securing tensioning roller.
♦ Retaining lugs -2- on tensioning roller must contact cast projection -1- on front bracket for high-pressure pump, as illustrated.
– Fit toothed belt for high-pressure pump on sprockets.



– Pull drill bit out of locating holes -arrow-.



– Install subframe. ⇒ Rep. gr. 40
– Install body brace. ⇒ Rep. gr. 40
– Install lock carrier with attachments ⇒ General body repairs, exterior; Rep. gr. 50 .
– Install front bumper ⇒ General body repairs, exterior; Rep. gr. 63 .
– Deactivate jacking mode. ⇒ Rep. gr. 43
– Install wiper arms. ⇒ Rep. gr. 92
– Adjust headlights ⇒ Rep. gr. 94 .

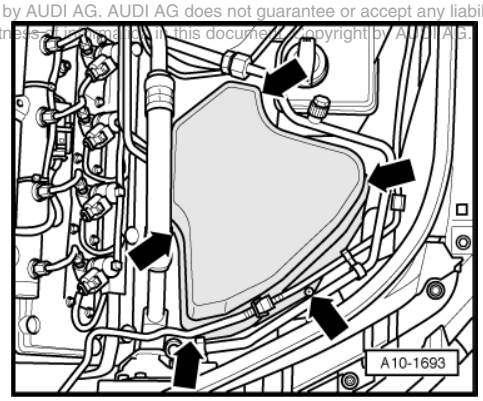
Tightening torques

Component	Nm
Tensioning roller to high-pressure pump	22
Engine cross member to longitudinal member	68
Bracket for torque reaction support to subframe	40
Mounting for torque reaction support	23

1.28 Removing and installing air mass meter (left-side)

Removing

– Remove bolts -arrows-.



– Detach top section of air cleaner housing (left-side).

Note

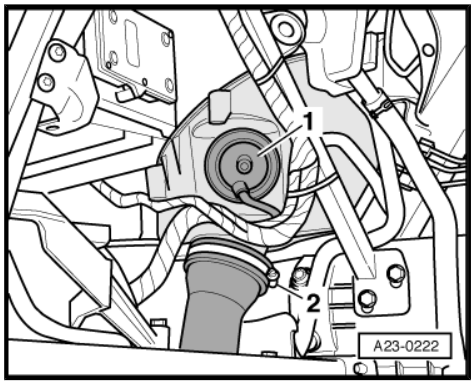
Make sure components are kept clean; cover air mass meter with a clean cloth. Keep dirt away from air mass meter.

– Remove front left wheel.

Note

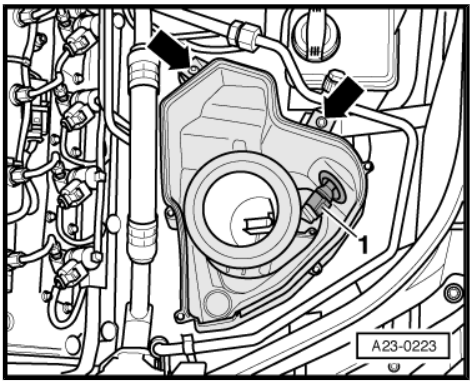
Secure brake disc with one wheel bolt.

– Remove front section of wheel housing liner (front left). ⇒ Rep. gr. 66

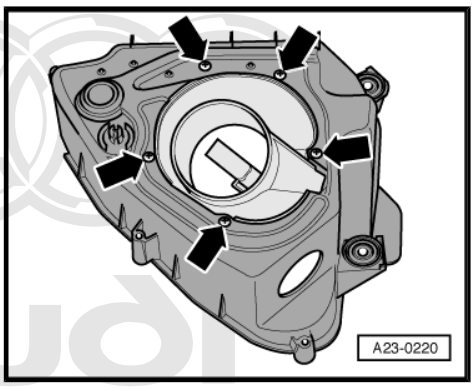


– Working from wheel housing (left-side), pull rubber grommet -1- off bottom section of air cleaner housing.
– Disconnect air intake hose -2- from bottom section of air cleaner housing.

– Detach electrical connector -1- at air mass meter.
– Remove bolts -arrows-.
– Detach bottom section of air cleaner housing (left-side).

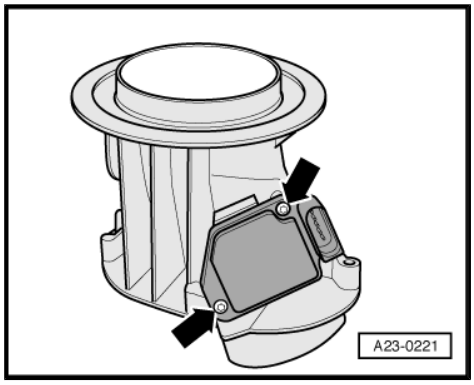


– Remove bolts -arrows-.
– Detach air duct from top section of air cleaner housing.



– Remove bolts -arrows-.

– Detach air mass meter from air duct.



Installing

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

Note

- *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.*
- *Always use genuine part for air filter element.*
- *Do not use any lubricants containing silicone when assembling.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*

– Blow out water drain hose with compressed air.

– 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 in air duct leading to air filter element.

– 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 (to prevent air leaks).

– Then screw top section of air cleaner back onto bottom section.

– Installation is performed in the reverse sequence.

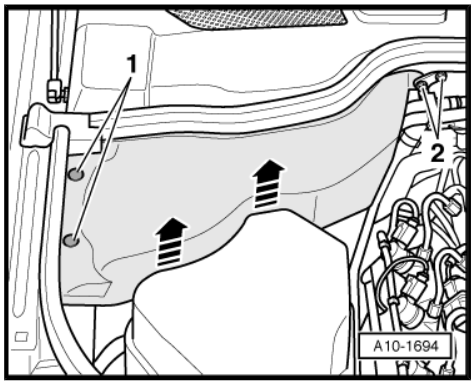
1.29 Removing and installing air mass meter (right-side)

Removing

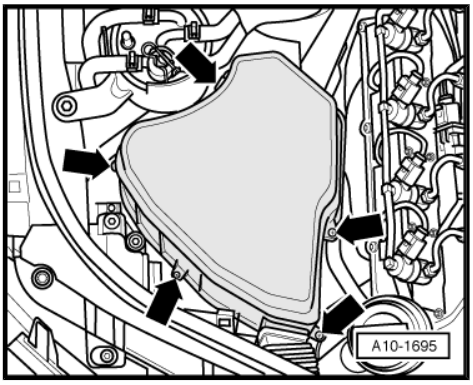
– Remove engine cover panel (refer to instructions for removing and installing ⇒ page 24).

– Remove cover for right suspension turret; to do so, detach spreader clips -1- and unscrew bolted joint -2-.

– Pull cover out of retainers -arrows-.



– Remove bolts -arrows-.
– Detach top section of air cleaner housing (right-side).



Note

Make sure components are kept clean; cover air mass meter with a clean cloth. Keep dirt away from air mass meter.

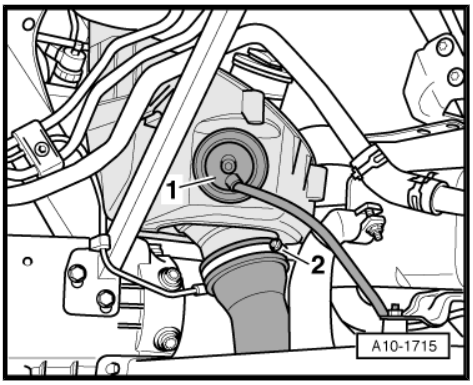
– Remove front right wheel.

Note

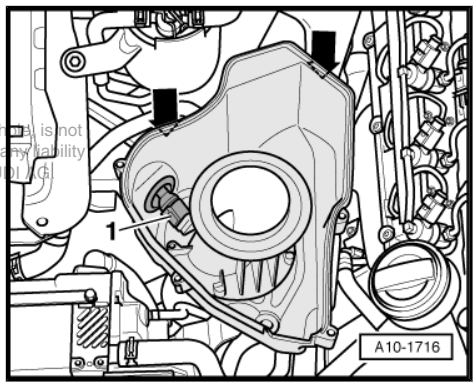
Secure brake disc with one wheel bolt.

– Remove front section of wheel housing liner (front right). ⇒ Rep. gr. 66

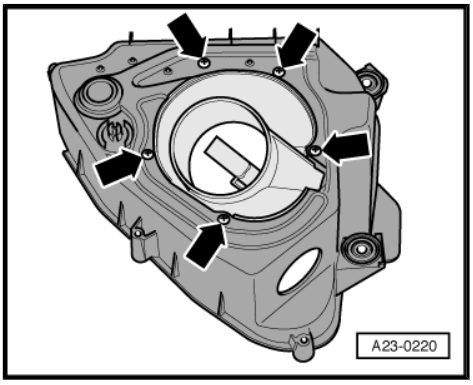
– Working from wheel housing (right-side), pull rubber grommet -1- off bottom section of air cleaner housing
– Disconnect air intake hose -2- from bottom section of air cleaner housing.



– Detach electrical connector -1- at air mass meter.
– Remove bolts -arrows-.
– Detach bottom section of air cleaner housing (right-side).

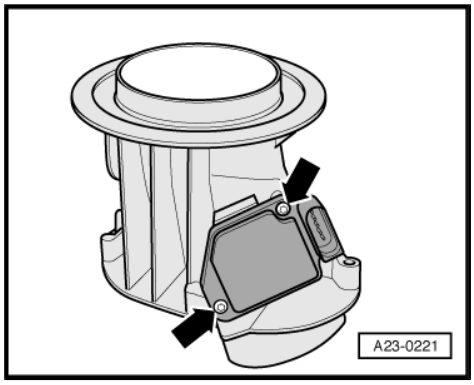


– Remove bolts -arrows-.
– Detach air duct from top section of air cleaner housing.



– Remove bolts -arrows-.

– Detach air mass meter from air duct.



Installing

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

Note

- *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.*
- *Always use genuine part for air filter element.*
- *Do not use any lubricants containing silicone when assembling.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*

– Blow out water drain hose with compressed air.

– 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 in air duct leading to air filter element.

– 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 (to prevent air leaks).

– Then screw top section of air cleaner back onto bottom section.

– Installation is performed in the reverse sequence.

1.30 Removing and installing fuel pressure regulating valve - N276-

Special tools and workshop equipment required

- Torque wrench
- Open-end spanner insert, 30 mm
- Pliers (e.g. water pump pliers)

The fuel pressure regulating valve is located in the fuel distributor housing (function block). It maintains a constant pressure in the rail and the injector pipes (high-pressure circuit).

If the pressure in the rail is too high, the regulator valve opens to allow some of the fuel to flow back from the rail to the fuel tank via a return line.

If the pressure in the distributor housing is too low, the valve closes and thus seals off the high-pressure section of the system from the low-pressure section.

Overview of fitting locations ⇒ page 4

Note

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

Removing

– Remove engine cover panel (refer to instructions for removing and installing ⇒ page 24).

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

Note

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

– Dry off fuel pressure regulating valve.

– Detach electrical connector.

– Slacken union nut (counterhold at hexagon flats on housing). Then unscrew and remove by hand.

– Extract dirt from opening in rail (threads and sealing surface). Do not use metal tools, etc.

Note

Seal off opening in rail immediately with a suitable plug.

Installing

Note

Check that the sealing surfaces and threads on the new fuel pressure regulating valve are not damaged. Check sealing surface at opening in rail.

– Lubricate O-ring on regulating valve with fuel.

– Screw on union nut by hand.

– Align 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 pliers (water pump pliers or similar).

– Use suitable torque wrench with an open-end spanner insert (30 mm) to tighten union nut.

Tighten union nut in 2 stages.

Stage 1: 60 +/-5 Nm (counterhold hexagon flats on housing)

Then back off union nut 90° (counterhold hexagonal flats on housing).

Stage 2: 80 + 5 Nm (counterhold hexagon flats on housing)

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

– Check fuel system for leaks.
– 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.

1.31 Removing and installing fuel pressure sender - G247-

The fuel pressure sender - G247- continuously measures the pressure in the high-pressure system and sends a voltage signal to the diesel direct injection system control unit - J248- (master control unit).

Overview of fitting locations ⇒ page 4

Removing

– Remove engine cover panel (refer to instructions for removing and installing ⇒ page 24).
– Before removal, clean area around thread for fuel pressure sender using commercial cleaning solution etc. (no dirt must enter the opening in the rail).

Note

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

– Dry off fuel pressure sender.
– Detach electrical connector.
– Unscrew and remove fuel pressure sender.
– Extract dirt from opening in rail (threads and sealing surface). Do not use metal tools, etc.

Note

Seal off opening in 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.*
- *Also check sealing surface at opening in rail.*
- *The beginning of the thread and the deformable sealing lip of the fuel pressure sender - G247- must be lubricated with Molykote grease.*

– If the old fuel pressure sender is being re-installed, twist off the old seal with pliers.

– Fit the new seal using the grease supplied to hold seal in place.
– Screw in fuel pressure sender by hand.
– Then tighten fuel pressure sender - G247- to specified torque.

♦ Tightening torque: 35 +/-3 Nm

Bleeding fuel system and checking for leaks

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

Note

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

– Interrogate fault memory and erase, if necessary.
– Switch off ignition.
– Carefully check the entire fuel system for leaks.

Renew the affected component if leakage still occurs after tightening to the 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.

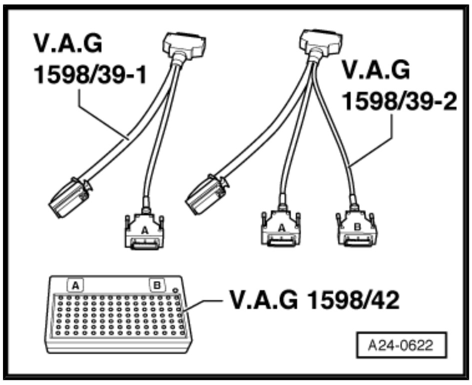
Note

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 the fault memory again.

2 Removing and installing engine control units

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



Note

- *The test box has 105 contacts. 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 irreparable damage to the electronic components, select appropriate measuring range before connecting the measuring cables and observe the test requirements.

– Switch off ignition and remove ignition key.

– Remove cover from plenum chamber (right-side).

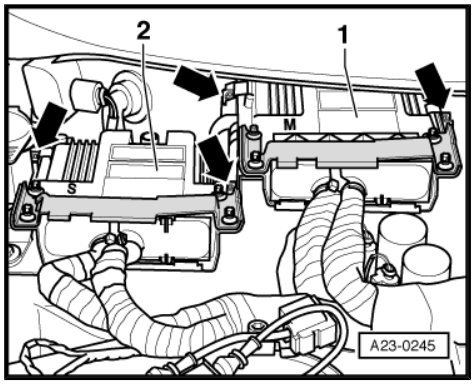
Note

- *The two engine control units are identical from the outside. However, if both control units are removed, they must be marked before removal so they are not interchanged on re-installation.*
- *Master engine control unit 1: mark “M” (for example)*
- *Slave engine control unit 2: mark “S” (for example)*

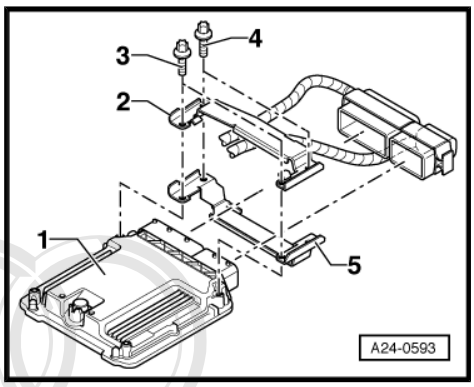
Item -1- is the diesel direct injection system control unit - J248- (master control unit 1).

Item -2- is the diesel direct injection system control unit 2 - J494- (slave control unit 2).

The removal procedure is the same for both engine control units.

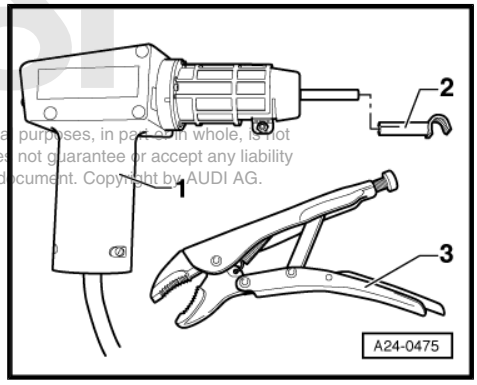


To help prevent unauthorised access to the connectors on the engine control units, the control unit -1- is bolted to a metal casing -5- by means of shear bolts -3- and -4- and a locking plate -2-.



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 mole grips -3-

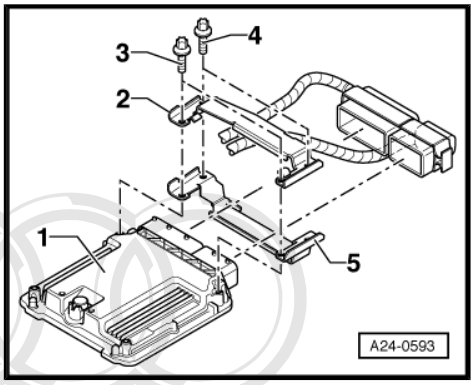


WARNING

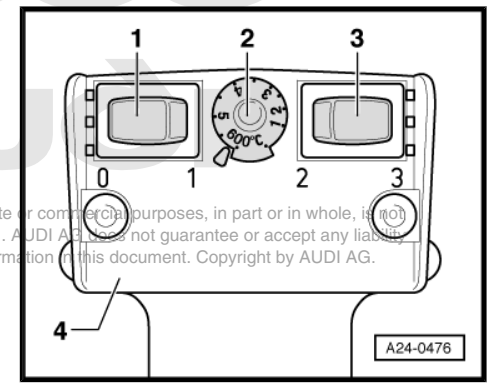
Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

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.

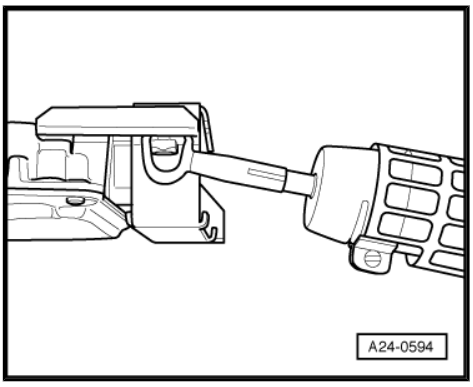
The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.



– 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.



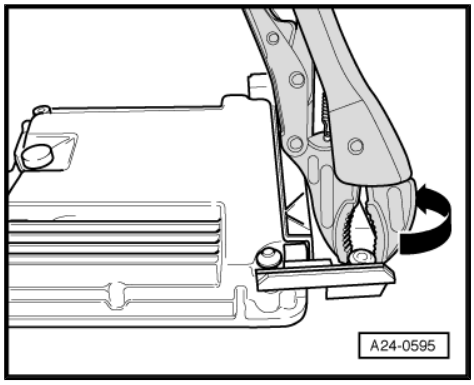
– Apply heat to the threads of the shear bolts on the connector side as shown in the illustration for approx. 25 to 30 seconds.



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.

– Unscrew shear bolts using mole grips (see arrow in illustration).
– The two shear bolts screwed into the control unit do not need to be heated. They should be removed without being heated.
– Detach metal locking plate from control unit connectors.
– Release connectors on engine control unit and unplug connectors.
– Connect test box - V.A.G 1598/42- to wiring harness connector. The earth clip on the test box must be connected to the negative battery terminal. 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. Use new shear bolts.

Note

After completion of the Guided Fault Finding routine, the tester will attempt to erase the fault memories of all control units. If this is not successful, the remaining faults registered in the memories must be rectified until all faults can be erased.

2.2 Renewing diesel direct injection system control unit - J248- (master control unit)

Engine management for the V8-TDIR (common rail) is handled by two engine control units.

The two engine control units communicate via a separate CAN bus.

The diesel direct injection system control unit - J248- (master control unit) informs diesel direct injection system control unit 2 - J494- (slave control unit) which functions it has to perform.

The two engine control units are identical from the outside. However, if both control units are removed, they must be marked before removal so they are not interchanged on re-installation.

Master engine control unit 1: mark “M” (for example)

Slave engine control unit 2: mark “S” (for example)

Removing

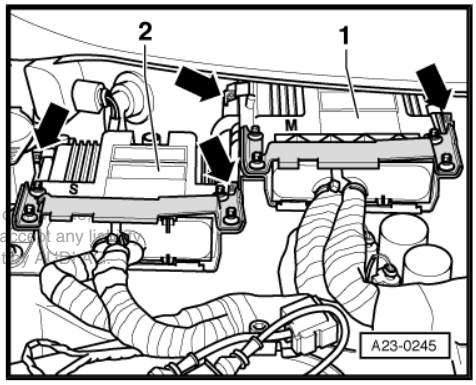
– Connect vehicle diagnostic, testing and information system - VAS 5051B- and select vehicle system “01 - Engine electronics” from list. When doing this, the ignition must be switched on.

The display on vehicle diagnostic, testing and information system - VAS 5051B- will show the control unit identification and the coding -2-.

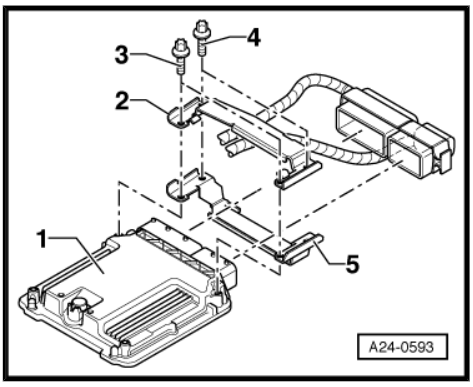
– Always start by displaying the control unit identification and printing it out.
– Remove cover from plenum chamber (right-side).

Item -1- is diesel direct injection system control unit - J248- (master control unit).

Item -2- is diesel direct injection system control unit 2 - J494- (slave control unit).

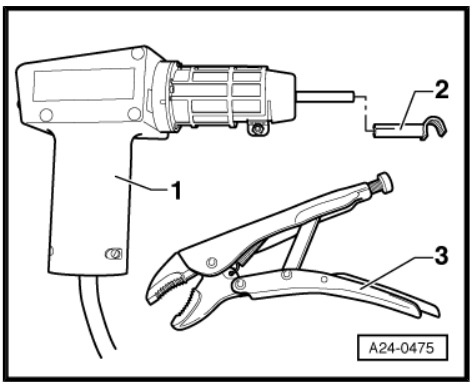


To help prevent unauthorised access to the connectors on the engine control units, the engine control unit -1- is bolted to a metal casing -5- by means of shear bolts -3- and -4- and a locking plate -2-.



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 mole grips -3-

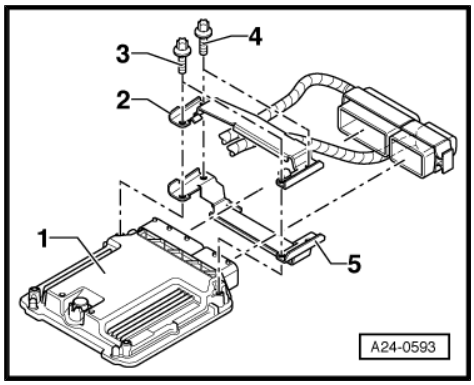


WARNING

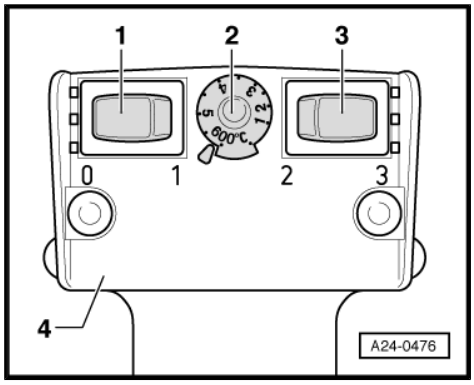
Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

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.

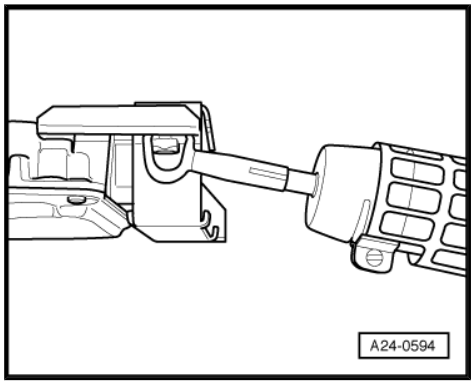
The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.



– 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.



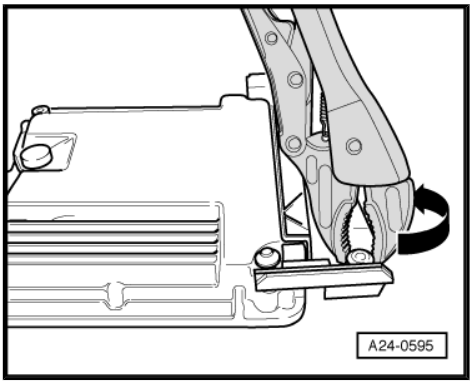
– Apply heat to the threads of the shear bolts on the connector side as shown in the illustration for approx. 25 to 30 seconds.



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.

– Unscrew shear bolts using mole grips (see arrow in illustration).



– The two shear bolts screwed into the control unit do not need to be heated. They should be removed without being heated.
– Detach metal locking plate from control unit connectors.
– Remove two bolts securing diesel direct injection system control unit - J248- (master control unit) and pull control unit forwards.
– Release connectors on diesel direct injection system control unit - J248- and unplug connectors.
– Take out old diesel direct injection system control unit - J248- and install new control unit.

Installing

Note

- *Installation is performed in the reverse sequence. After installation, the locking plate must be re-fitted on the control unit. Use new shear bolts.*
- *After renewing the engine control unit you must also adapt the injector delivery calibration values for the new engine control unit (injector delivery calibration values influence engine power output and exhaust emissions).*
- *If only the master control unit (diesel direct injection system control unit - J248-) is renewed, the following injectors must be re-adapted: cylinders 1, 4, 6 and 7.*

The procedure to follow after connecting the new engine control unit is described in Guided Fault Finding.

– Activate engine control unit in “Guided Functions” mode, “Renew engine control unit” ⇒ Vehicle diagnostic tester.

2.3 Renewing diesel direct injection system control unit 2 - J494- (slave control unit)

Engine management for the V8-TDIR (common rail) is handled by two engine control units.

The two engine control units communicate via a separate CAN bus.

The diesel direct injection system control unit - J248- (master control unit) informs diesel direct injection system control unit 2 - J494- (slave control unit) which functions it has to perform.

The two engine control units are identical from the outside. However, if both control units are removed, they must be marked before removal so they are not interchanged on re-installation.

Master engine control unit 1: mark “M” (for example)

Slave engine control unit 2: mark “S” (for example)

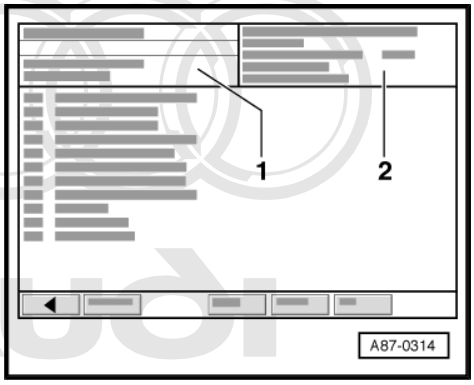
Removing

– Connect vehicle diagnostic, testing and information system - VAS 5051B- and select vehicle system “11 - Engine electronics 2” from list. When doing this, the ignition must be switched on.

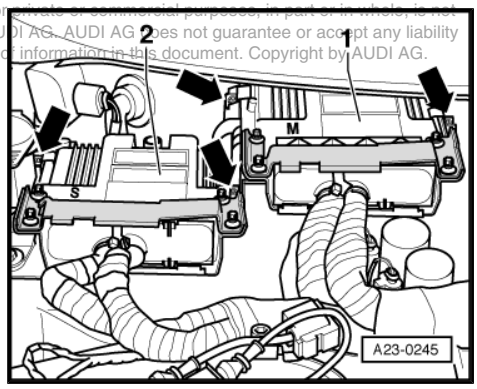
The display on vehicle diagnostic, testing and information system - VAS 5051B- will show the control unit identification and the coding -2-.

– Always start by displaying the control unit identification and printing it out.
– Remove cover from plenum chamber (right-side).

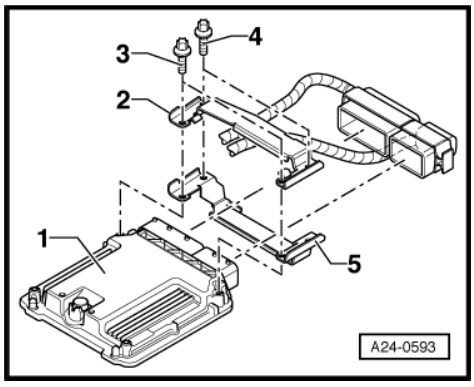
Item -1- is diesel direct injection system control unit - J248- (master control unit).



Item -2- is diesel direct injection system control unit 2 - J494- (slave control unit).

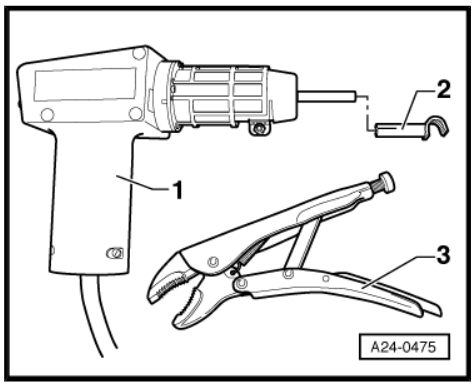


To help prevent unauthorised access to the connectors on the engine control units, the engine control unit -1- is bolted to a metal casing -5- by means of shear bolts -3- and -4- and a locking plate -2-.



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 mole grips -3-

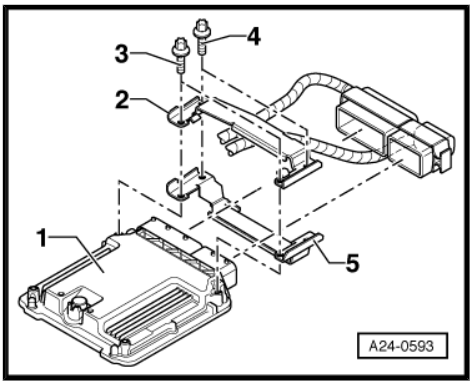


WARNING

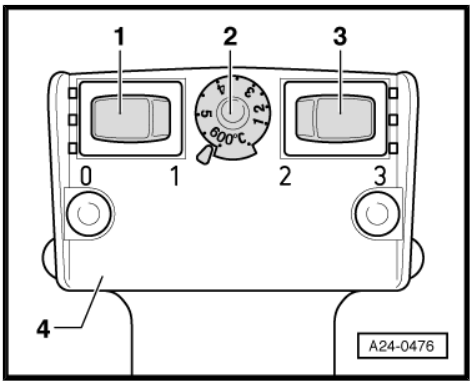
Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

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.

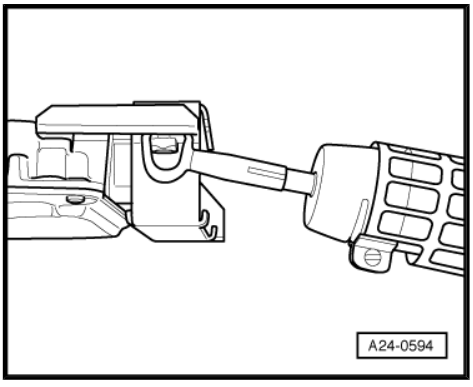
The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.



– 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.



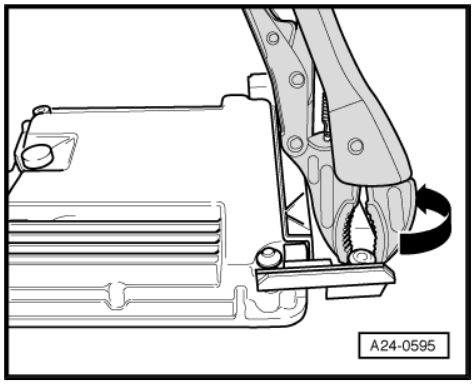
– Apply heat to the threads of the shear bolts on the connector side as shown in the illustration for approx. 25 to 30 seconds.



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.

– Unscrew shear bolts using mole grips (see arrow in illustration).
– The two shear bolts screwed into the control unit do not need to be heated. They should be removed without being heated.
– Detach metal locking plate from control unit connectors.
– Remove two bolts securing diesel direct injection system control unit 2 - J494- and pull control unit forwards.
– Release connectors on diesel direct injection system control unit 2 - J494- and unplug connectors.
– Take out the old diesel direct injection system control unit 2 - J494- and install the new control unit.



Installing

Note

- *Installation is performed in the reverse sequence. After installation, the protective housing must be re-fitted on the control unit. Use new shear bolts.*
- *After renewing the engine control unit you must also adapt the injector delivery calibration values for the new engine control unit (injector delivery calibration values influence engine power output and exhaust emissions).*
- *If only the slave control unit (diesel direct injection system control unit 2 - J494-) is renewed, the following injectors must be re-adapted: cylinders 2, 3, 5 and 8.*

The procedure to follow after connecting the new engine control unit is described in Guided Fault Finding.

– Activate engine control unit in “Guided Functions” mode, “Renew engine control unit” ⇒ Vehicle diagnostic tester.

28 – Glow plug system

1 Checking glow plug system

– Detach glow plug connectors from glow plugs.

– Connect portable multimeter (voltage test range) to one glow plug connector and engine earth.

– Start final control diagnosis and activate glow plug relay.

Specification: approx. battery voltage (every 5 seconds)

If specification is not obtained:

– Rectify any open/short circuit as necessary. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

1.1 Checking glow plugs

• Battery voltage at least 11.5 Volt.

– Switch off ignition.

– Detach glow plug connectors from glow plugs.

– Connect diode test lamp wire using auxiliary clips from auxiliary measuring set - V.A.G 1594C- to battery positive (+).

– Place test probe of diode test lamp on each glow plug in turn.

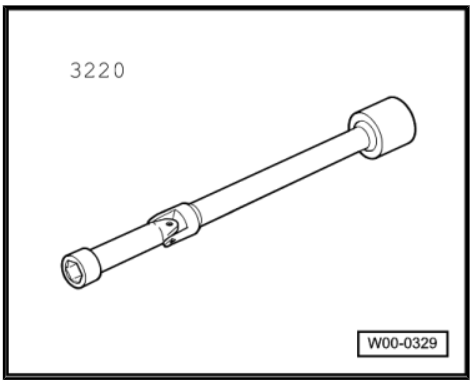
If diode lights up: glow plug OK.

If diode does not light up: fit a new glow plug

1.2 Removing and installing glow plugs

Special tools and workshop equipment required

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



Removing

– Switch off ignition.

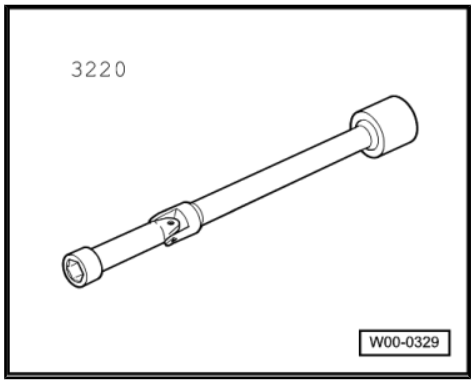
– Detach glow plug connectors from glow plugs.

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

Note

- *Cleaning procedure:*
- *Glow plugs must still be fitted.*
- *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

Note

Before installing, coat threads of glow plugs with high-temperature paste ⇒ Parts catalogue , servicing materials.

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

- Tightening torque: 18 Nm

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