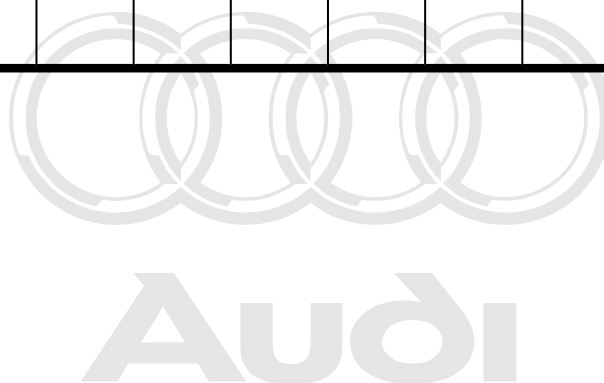


Workshop Manual Audi A5 Coupé 2008 ➤

**Direct petrol injection and ignition system (4-cyl. 1.8 ltr.
4-valve turbo with timing chain)**

Engine ID	CAB D								
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Edition 10.2007



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List of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



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

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Audi A5 Coupé 2008 ➤

Direct petrol injection and ignition system (4-cyl. 1.8 ltr. 4-valve turbo with timing chain) - Edition
10.2007



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24 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

1.1 General notes on self-diagnosis

- ◆ The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding the fault memory must be interrogated. The vacuum hoses and connections must also be checked (unmetered air).
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. Clamping-type or screw-type clips must not be used.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda probe.
- ◆ The vehicles are fitted with a crash/fuel shut-off system. This system is designed to reduce the risk of a vehicle fire after a crash by deactivating the fuel pump via the fuel pump relay.
- ◆ At the same time, this system also improves the engine's starting performance. When the driver's door is opened, the fuel pump is activated for 2 seconds in order to build up pressure in the fuel system ➔ [page 1](#).

1.2 Safety precautions



WARNING

The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ➔ [page 3](#).

The connection must be opened immediately after reducing the pressure; wrap a cloth around the connection and allow the residual pressure (approx. 7 bar) to dissipate.

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



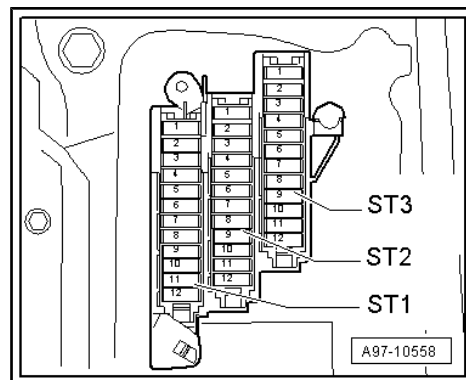
WARNING

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- ◆ *Test equipment must always be secured on the rear seat and operated from that position by a second person.*
- ◆ *If test and measuring instruments are operated from front passenger's seat and the vehicle is involved in an accident, the person sitting in this seat could be seriously injured when the airbag is triggered.*

To avoid any risk of injuries to persons and/or damage to the fuel injection and ignition system, always observe the following safety precautions.

- ◆ If the battery is not disconnected, the fuse for the fuel pump control unit -J538- (located in the fuse carrier in the driver's side of the dash panel) must be removed as a precaution before opening the fuel system, because the fuel pump will otherwise be activated by the contact switch on the driver's door.
- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and gas-discharge headlights.
- ◆ 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.
- ◆ If engine is to be operated at cranking speed without it starting (e.g. compression test), unplug connectors from ignition coils and remove fuse for electric fuel pump.
- ◆ 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.
- ◆ If the fault memory has been erased, you must generate the readiness code again.
- ◆ Always switch off the ignition before cleaning the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- ◆ If the engine has to be operated at the starting speed without actually starting (e.g. to test compression pressure), detach the four connectors from the ignition coils using assembly tool -T40039- ➔ [page 57](#) . Also remove fuse for fuel pump control unit -J538- .



Note

- ◆ The fuse is located in the fuse holder in the dash panel.
- ◆ Removing the fuse (located in fuse carrier in dash panel on driver's side) will interrupt the power supply from "terminal 30" for the fuel pump control unit -J538- . ➔ [Current flow diagrams](#), [Electrical fault finding](#) and [Fitting locations](#)

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1.3 Rules for cleanliness and instructions for working on fuel system

Even small amounts of dirt can cause faults in the injection system. When working on the fuel supply/injection system, pay careful attention to the following basic rules:

- ◆ Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- ◆ Plug open lines and connections with suitable protective caps immediately.
- ◆ Place parts that have been removed on a clean surface and cover them over. Use only lint-free cloths.

- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- ◆ When the system is open: Do not work with compressed air. Do not move the vehicle unless absolutely necessary.

1.4 Important: Required procedure prior to opening high-pressure injection system



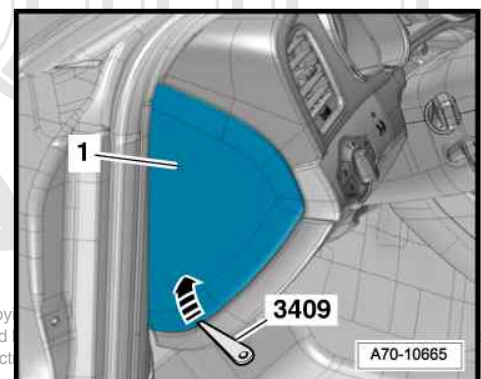
Caution

The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 6 bar).

Prior to opening the high-pressure section (e.g. when removing the high-pressure pump, fuel rail, injectors, fuel pipes, etc.) the fuel pressure in the high-pressure section must be reduced. The procedure is described below.

Reducing fuel pressure in high-pressure section

- Connect up the vehicle diagnostic, testing and information system -VAS 5051B-.
 - Start engine and run at idling speed.
 - Select “Engine electronics” in vehicle self-diagnosis.
 - Then select “Measured values”.
 - Select “Fuel pressure” from the list.
 - With the engine idling, the fuel pressure displayed will be between 27 and 43 bar.
-
- Pry off cover -1- -arrow- on left side of dash panel using removal wedge -3409- or similar.



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- With engine idling, pull out fuse for fuel pump control unit - J538- in fuse carrier in dash panel (driver's side), see ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe fuel pressure in display zone.
- The fuel pressure will decrease very quickly because the mechanical high-pressure pump is no longer being supplied with fuel by the fuel system pressurisation pump -G6- .
- Switch off ignition as soon as fuel pressure has dropped to approx. 8 bar.



Note

Fuel pressure must not fall below 6 bar, otherwise the engine will stall (this could damage the catalytic converter).



WARNING

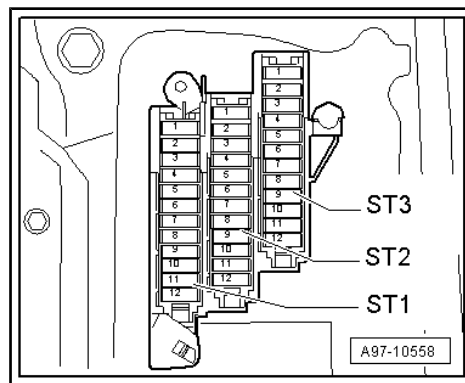
The fuel lines are still filled with fuel, however the fuel is no longer under high pressure. Wear safety goggles and protective clothing when opening the fuel system to avoid possible injury and skin contact.

Before opening the high-pressure section, wrap a cloth around the connection.

- The high-pressure system must be opened "immediately" after reducing the fuel pressure; wrap a clean cloth around the connection. Catch the escaping fuel.

The following operations must be performed after completing repair work:

- Refit fuse.
- Erase fault memory and generate readiness code in engine control unit using "Guided Functions" mode of vehicle diagnostic, testing and information system -VAS 5051B-



2 Injection system

2.1 Technical data

Engine data		1.8 ltr. turbo FSI engine
Idling speed is not adjustable; controlled by the idling speed stabilisation		640 ... 800 rpm
Maximum rpm governed by deactivation of fuel injectors		6500 rpm
Fuel pressure	Initial fuel pressure up to high-pressure pump (generated according to requirements by electric fuel pump in fuel tank)	3.0 ... 10.5 bar
	Pressure in high-pressure fuel circuit (generated by mechanical single-plunger pump) at a coolant temperature of approx. 85°C.	25 ... 150 bar

2.2 Overview of fitting locations

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

1 - Lambda probe -G39- and Lambda probe heater -Z19-

- ☐ Fitting location
⇒ [page 14](#)
- ☐ Removing and installing
⇒ [page 46](#)

2 - Lambda probe, after catalytic converter -G130- and Lambda probe heater 1, after catalytic converter -Z29-

- ☐ Fitting location
⇒ [page 14](#)
- ☐ Removing and installing
⇒ [page 47](#)

3 - Fuel pressure regulating valve -N276-

- ☐ Fitting location
⇒ [page 12](#)

4 - High-pressure fuel pump

- ☐ Removing and installing
⇒ [page 12](#)

5 - Vacuum unit for intake manifold flaps (air flow control flaps)

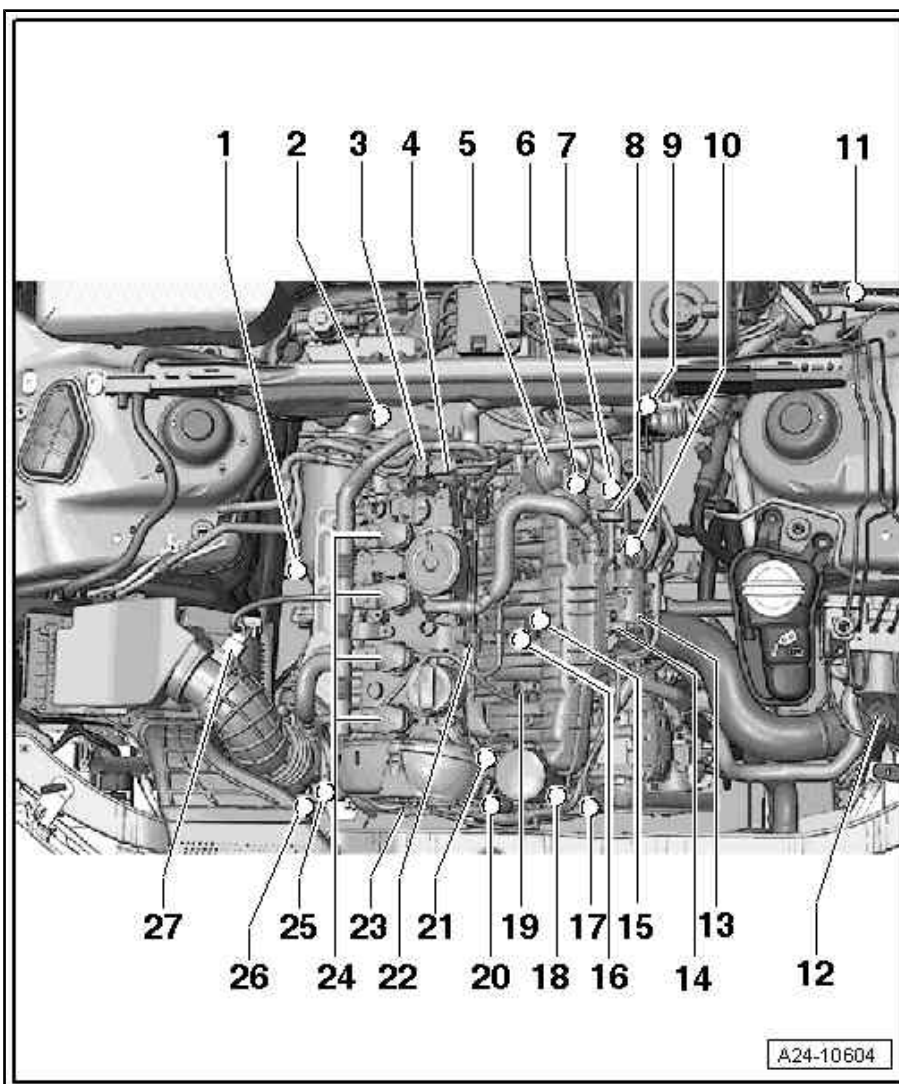
- ☐ Fitting location
⇒ [page 11](#)

6 - Intake manifold flap valve - N316-

- ☐ Fitting location
⇒ [page 11](#)

7 - Engine speed sender -G28-

- ☐ Fitting location



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⇒ [page 12](#)

- ☐ 4.5 Nm

8 - Activated charcoal filter solenoid valve 1 -N80-

9 - 6-pin connectors

- ☐ For Lambda probe -G39- and Lambda probe heater -Z19- (black)
- ☐ Lambda probe after catalytic converter -G130- and Lambda probe 1 heater, after catalytic converter -Z29- (brown connector)
- ☐ Fitting location ⇒ [page 14](#)

10 - Electrical connectors

- ☐ For knock sensor 1 -G61- , intake manifold flap valve -N316- , fuel pressure sender -G247- , intake manifold flap potentiometer -G336- , coolant temperature sender -G62- , Hall sender -G40- and injectors N30...N33
- ☐ Fitting location ⇒ [page 12](#)

11 - Engine control unit -J623-

- ☐ Fitting location ⇒ [page 9](#)
- ☐ Removing and installing ⇒ [page 51](#)

12 - Charge pressure sender -G31-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing ⇒ Rep. Gr. 21

13 - Throttle valve module -J338- , throttle valve drive (electric throttle operation) -G186-

- ☐ Throttle valve drive angle sender 1 -G187- and throttle valve drive angle sender 2 -G188-
- ☐ Throttle valve module -J338- must always be re-adapted to engine control unit -J623- after removal and installation or if it has been renewed
- ☐ Fitting location ⇒ [page 13](#)

14 - Intake air temperature sender -G42-

- ☐ Fitting location ⇒ [page 13](#)

15 - Knock sensor 1 -G61-

- ☐ To remove, first remove coolant pump with thermostat
- ☐ Tightening torque: 20 Nm
- ☐ Removing and installing ⇒ [page 58](#)

16 - Coolant temperature sender -G62-

- ☐ Fitting location ⇒ [page 13](#)

17 - Valve for oil pressure control -N428-

- ☐ Fitting location ⇒ [page 10](#)
- ☐ Checking: see Guided Fault Finding
- ☐ Removing and installing ⇒ Rep. Gr. 17

18 - Oil pressure switch for reduced oil pressure -F378-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Removing, installing and testing ⇒ Rep. Gr. 17

19 - Fuel pressure sender -G247-

- ☐ 27 Nm
- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ [page 32](#)

20 - Oil pressure switch -F22-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Removing, installing and testing ⇒ Rep. Gr. 17

21 - Intake manifold flap potentiometer -G336-

- ☐ Fitting location ⇒ [page 11](#)



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

- ☐ Fitting location ⇒ [page 12](#)

23 - Inlet camshaft control valve 1 -N205-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing ⇒ Rep. Gr. 15

24 - Ignition coils with output stages

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Puller -T40039- is required for removing ignition coils from cylinder head.
- ☐ Removing and installing ⇒ [page 57](#)

25 - Turbocharger air recirculation valve -N249-

- ☐ Located directly on turbocharger ⇒ [page 14](#)
- ☐ Removing and installing ⇒ Rep. Gr. 21

26 - Solenoid valve for charge pressure control -N75-

- ☐ Located directly on turbocharger ⇒ [page 14](#)
- ☐ Removing and installing ⇒ Rep. Gr. 21

27 - Air mass meter -G70-

- ☐ Removing and installing ⇒ [page 20](#)

A - Diagnostic connector

- ☐ In driver's knee restraint

B - Fuel pump control unit -J538-

- ☐ Fitting location ⇒ [page 9](#)
- ☐ Adaption must be performed after renewing the fuel pump or fuel pump control unit -J538- "Start basic setting" (display group 103).
- ☐ Checking fuel pump control unit -J538- ⇒ Rep. Gr. 20

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

- ☐ Fitting location ⇒ [page 10](#)
- ☐ In footwell on brake pedal
- ☐ Removing and installing ⇒ Rep. Gr. 45

D - Clutch position sender -G476-

- ☐ Only fitted on vehicles with manual gearbox
- ☐ Fitting location ⇒ [page 10](#)

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

- ☐ Fitting location ⇒ [page 10](#)
- ☐ On accelerator pedal (both senders are accommodated in one housing)
- ☐ Removing and installing ⇒ Rep. Gr. 20

F - Radiator fan control unit -J293-

- ☐ Incorporated in radiator fan

G - Injectors

- ☐ In fuel rail
- ☐ Injector, cylinder 1 -N30-
- ☐ Injector, cylinder 2 -N31-
- ☐ Injector, cylinder 3 -N32-
- ☐ Injector, cylinder 4 -N33-
- ☐ Removing and installing ⇒ [page 40](#)

The fuel injectors are high-pressure injectors. They inject fuel at high pressure (maximum approx. 120 bar) directly into the cylinder.

H - Continued coolant circulation pump -V51-

- ☐ For hot countries only
- ☐ Fitting location ⇒ [page 10](#)
- ☐ Removing and installing ⇒ Rep. Gr. 19

I - Electrohydraulic engine mounting solenoid valve (left-side) -N144-

- ☐ Not installed in all vehicles (depends on gearbox type)

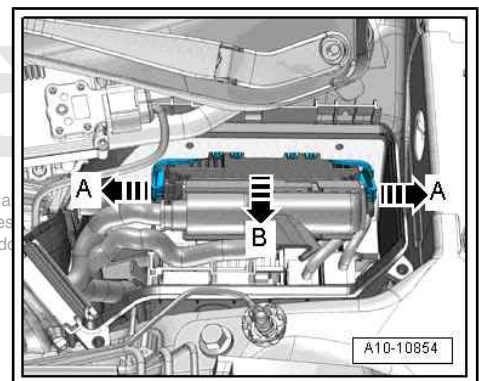
J - Fuel pump control unit -J538-

- ☐ Fitting location ⇒ [page 9](#)
- ☐ Removing and installing ⇒ Rep. Gr. 20

Engine control unit -J623-

- ◆ In left-side electronics box in engine compartment.

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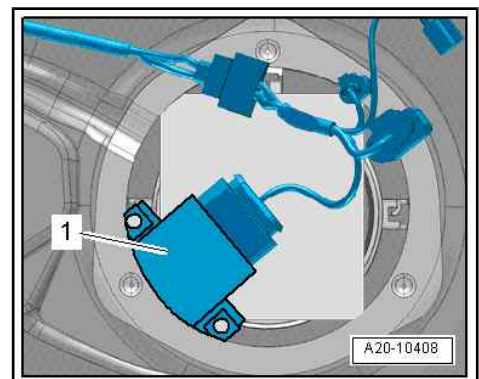


Fuel pump control unit -J538- -1-

Adaption must be performed after renewing the fuel pump or fuel pump control unit -J538- , see vehicle diagnostic and service information system -VAS 5052- .

Checking fuel pump control unit -J538- ⇒ Rep. Gr. 20

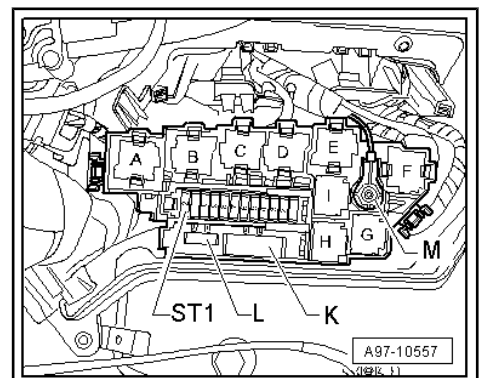
Removing and installing ⇒ Rep. Gr. 20



Relay and fuse holder in electronics box in plenum chamber (left-side)

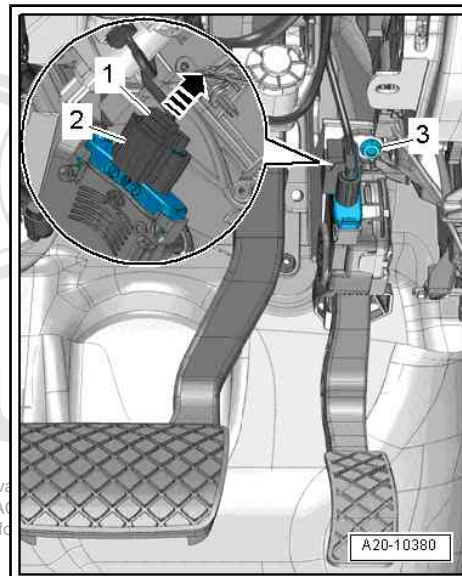
- A - Current supply relay for engine components -J757-
- B - Starter motor relay -J53- (black/purple socket)
- B - Starter motor relay 2 -J695- (black/blue socket)
- C - Secondary air pump relay -J299-
- D - Motronic current supply relay -J271-
- E - Continued coolant circulation relay -J151- (brown/blue socket)
- E - Brake servo relay -J569- (brown/purple socket)

Refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



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

2 - Electrical connector

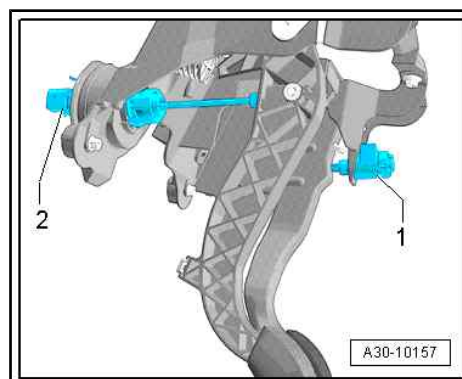


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Clutch position sender -G476- -2-

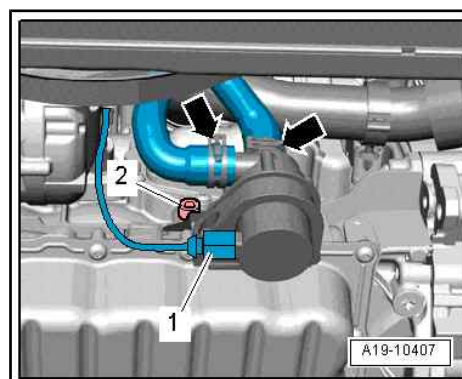
Integrated functions: clutch pedal switch for engine start -F194- and clutch pedal switch -F36- (manual gearbox only)

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

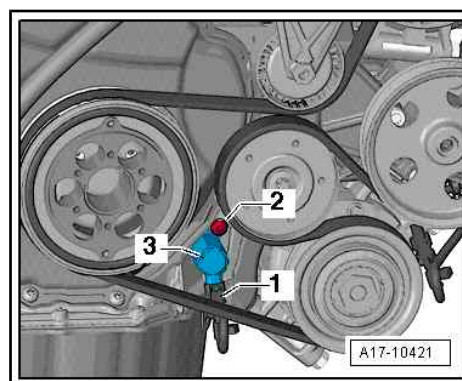


Continued coolant circulation pump -V51-

1 - Electrical connector for continued coolant circulation pump - V51-

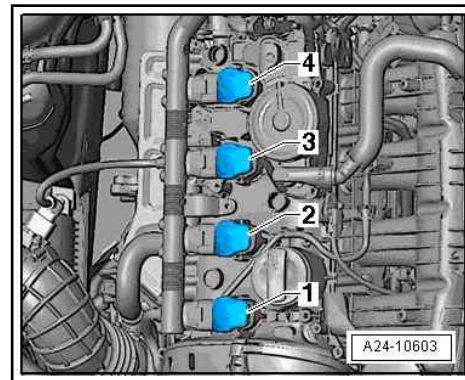


Valve for oil pressure control -N428- -3-



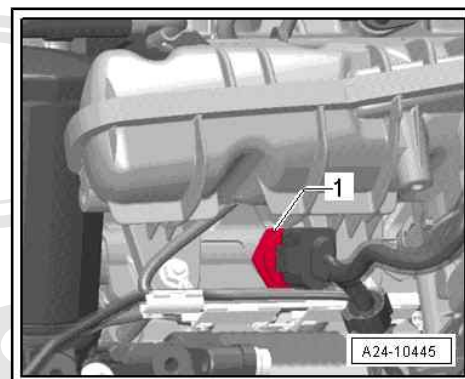
Ignition coils

- 1 - Ignition coil 1 with output stage -N70-
- 2 - Ignition coil 2 with output stage -N127-
- 3 - Ignition coil 3 with output stage -N291-
- 4 - Ignition coil 4 with output stage -N292-



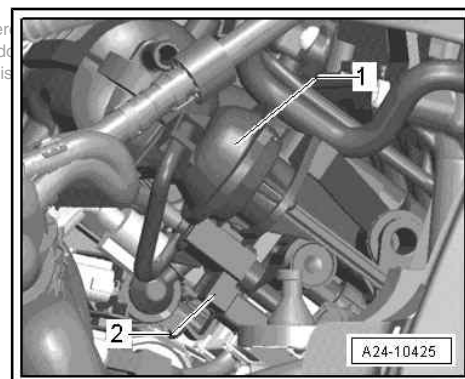
Fuel pressure sender -G247- -1-

- Make sure that connecting piece is tightened to specified torque "22 Nm" before installing fuel pressure sender -G247-

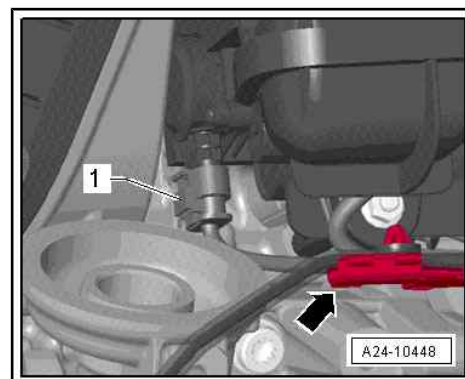


Intake manifold flap valve -N316- -2-

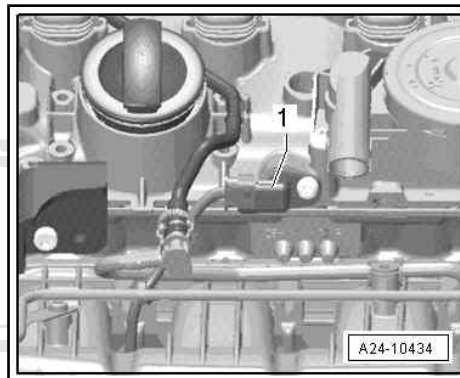
- 1 - Vacuum unit for intake manifold flaps



Intake manifold flap potentiometer -G336- -1-

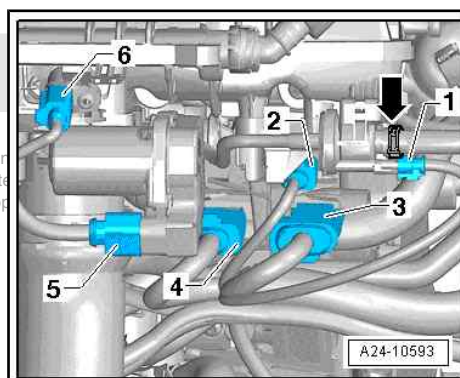


Hall sender -G40- -1-



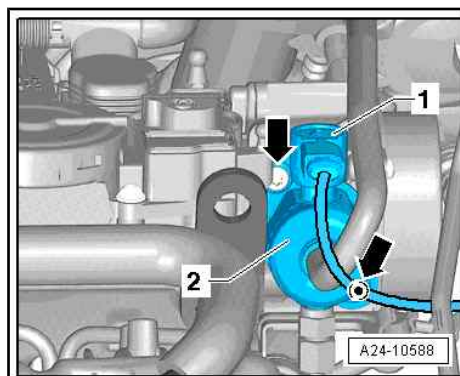
Electrical connectors

- 1 - From activated charcoal filter solenoid valve 1 -N80-
- 2 - From knock sensor 1 -G61-
- 3 - (14-pin) from intake manifold flap valve -N316- fuel pressure sender -G247- , intake manifold flap potentiometer -G336- , coolant temperature sender -G62- and Hall sender -G40-
- 4 - (8-pin) from injectors -N30-....-N33-
- 5 - From throttle valve module -J338-
- 6 - From intake air temperature sender -G42-

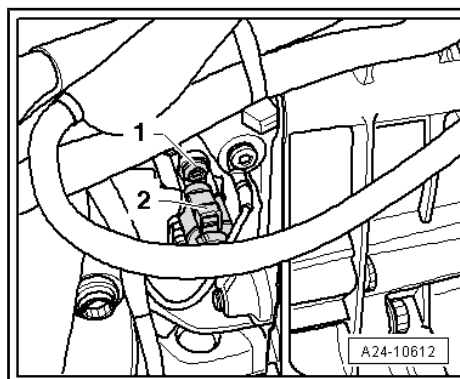


High-pressure fuel pump

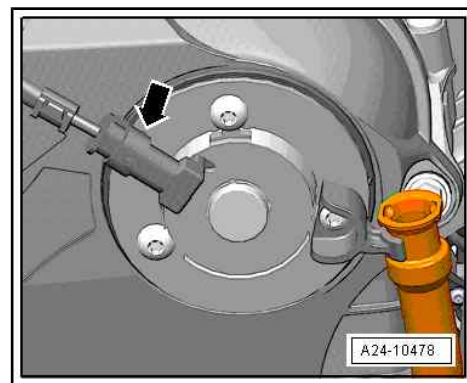
- 1 - Fuel pressure regulating valve -N276-
- 2 - High-pressure fuel pump
- -Arrows- denote securing bolts



Engine speed sender -G28- -2-

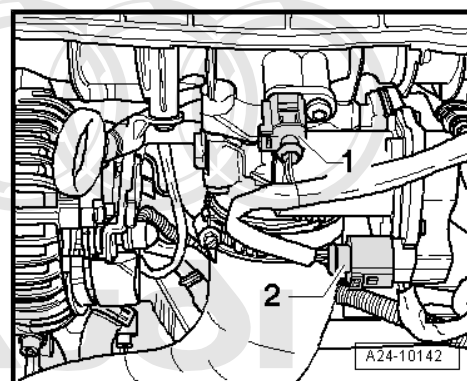


Inlet camshaft control valve 1 -N205- -arrow-



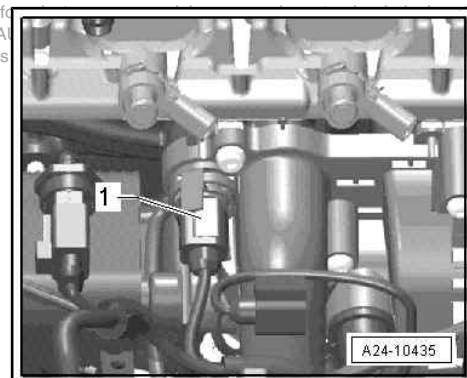
Components

- 1 - Intake air temperature sender -G42-
- 2 - Throttle valve module -J338-



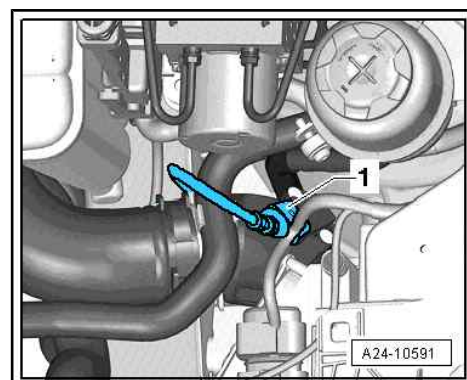
Coolant temperature sender -G62- -1-

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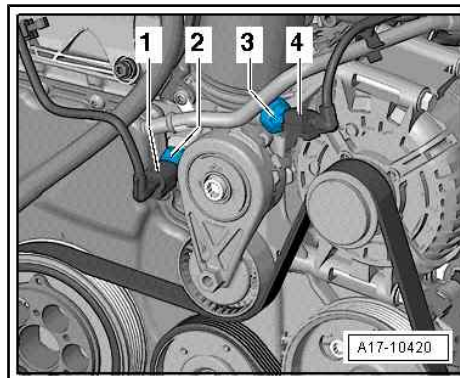
Charge air pressure sender -G31- -1-

- Removing and installing ⇒ Rep. Gr. 21



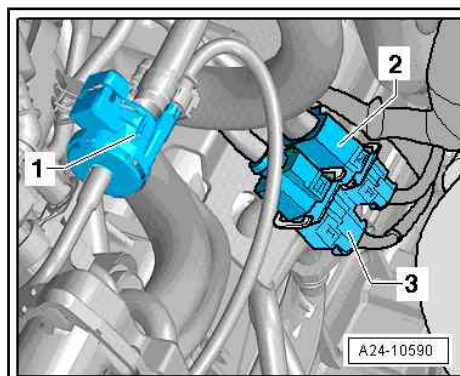
Oil pressure switch

- 2 - Oil pressure switch -F22-
- 3 - Oil pressure switch for reduced oil pressure -F378-



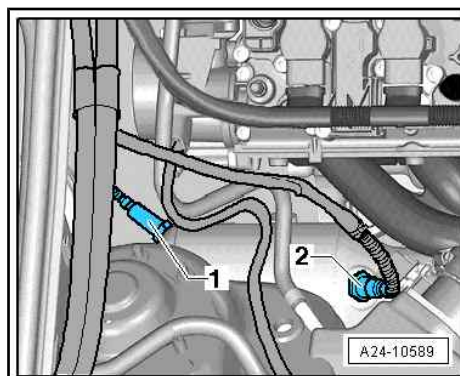
Component and electrical connectors

- 1 - Activated charcoal filter solenoid valve 1 -N80-
- 2 - Lambda probe, after catalytic converter -G130- and Lambda probe heater 1, after catalytic converter -Z29-
- 3 - Lambda probe -G39- and Lambda probe heater -Z19-



Lambda probes

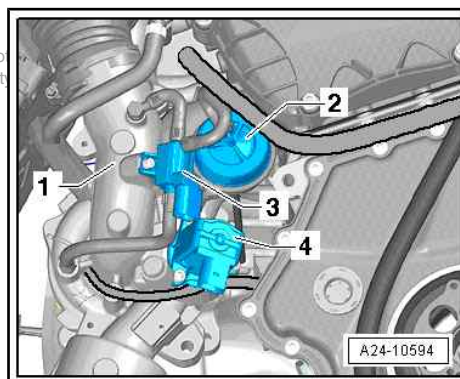
- 1 - Lambda probe, after catalytic converter -G130- and Lambda probe heater 1, after catalytic converter -Z29-
- 2 - Lambda probe -G39- and Lambda probe heater -Z19-



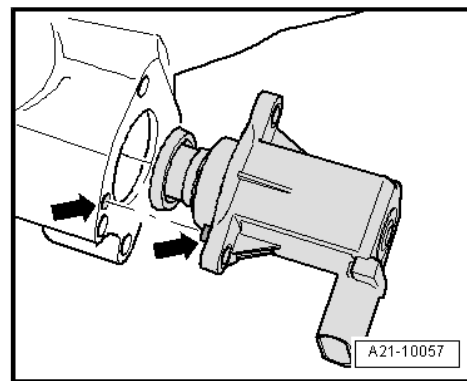
Components on turbocharger

- 1 - Turbocharger
- 2 - Vacuum unit for turbocharger; checking, adjusting, removing and installing ⇒ Rep. Gr. 21
- 3 - Solenoid valve for charge pressure control -N75-
- 4 - Turbocharger air recirculation valve -N249- (note installation position, refer to next illustration)

For removing and installing components on turbocharger, refer to ⇒ Rep. Gr. 21 .

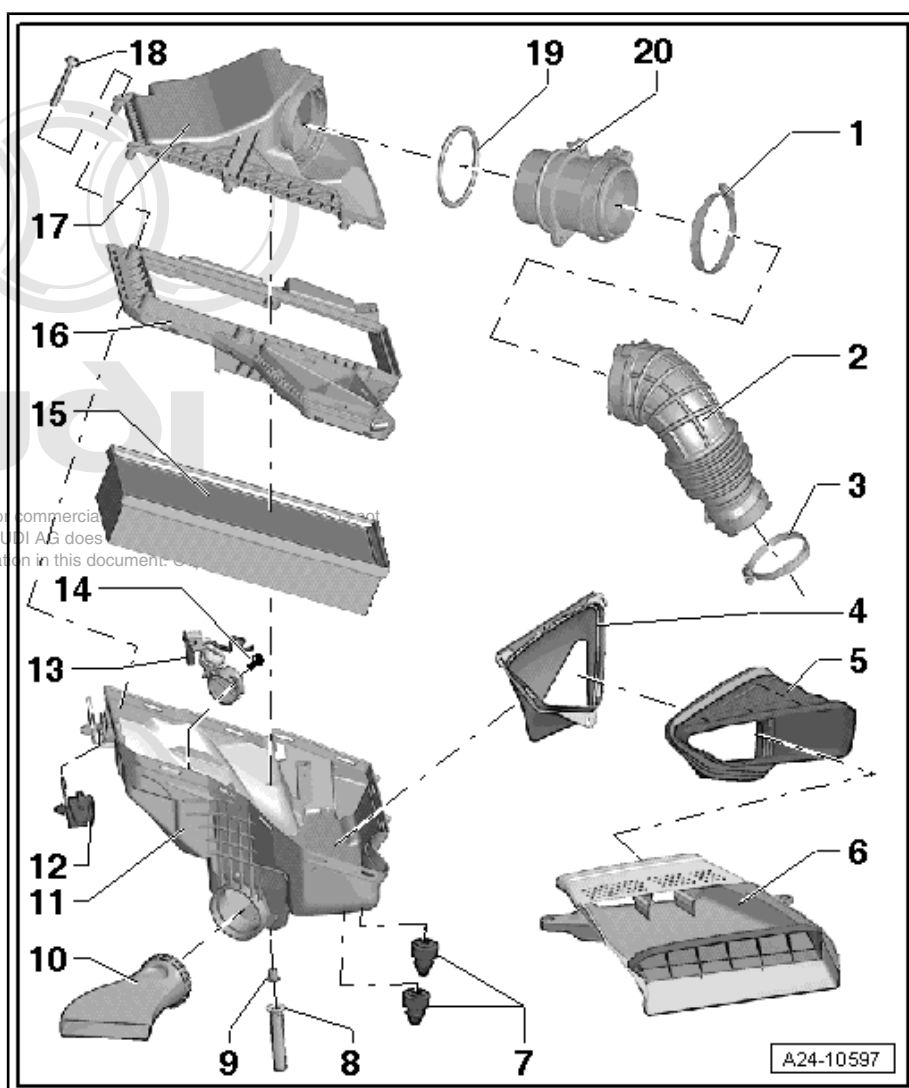


Pay attention to installation position of turbocharger air recirculation valve -N249-



2.3 Air cleaner - exploded view

- 1 - Hose clip
- 2 - Air hose
- 3 - Hose clip
- 4 - Air duct
 - ☐ Clipped into air cleaner housing
 - ☐ Clean dirt and leaves out of air duct
- 5 - Air duct
 - ☐ Clean dirt and leaves out of air duct
- 6 - Air duct
 - ☐ Secure to lock carrier (2 Nm)
 - ☐ Clean dirt and leaves out of air duct
- 7 - Rubber grommet
- 8 - Water drain hose
 - ☐ Clean any leaves and dirt out of water drain hose (important)
- 9 - Guide for water drain hose
- 10 - Hot air intake (countries with cold climates only)
 - ☐ Slide hot air intake into air cleaner as far as stop; then turn clockwise until it engages no-



ticeably

11 - Air cleaner housing (bottom section)

- ☐ Clean any salt deposits or leaves and dirt out of air cleaner housing (bottom section)
- ☐ Check for dirt in water drain and clean as required (this is important)

12 - Retainer for securing air cleaner housing (bottom section)

- ☐ Must engage positively
- ☐ Do not use any lubricants

13 - Variable intake manifold change-over valve -N335-

- ☐ These components (bypass flap with variable intake manifold change-over valve -N335-) are not installed on certain equipment versions or on vehicles for certain export markets

14 - Bolt

- ☐ Only if variable intake manifold change-over valve -N335- is fitted

15 - Air filter element

- ☐ Always use genuine part for air filter element
- ☐ Maintenance intervals ⇒ Maintenance ; Booklet 811
- ☐ Removing and installing ⇒ [page 17](#)
- ☐ Also clean snow screen (if fitted)

16 - Frame insert for air cleaner (bottom section)

17 - Air cleaner housing (top section)

- ☐ Clean any salt deposits or leaves and dirt out of air cleaner housing (top section)

18 - Bolt

19 - O-ring

- ☐ Renew if damaged

20 - Air mass meter

- ☐ Removing and installing air mass meter -G70- with intake air temperature sender -G42- ⇒ [page 20](#)

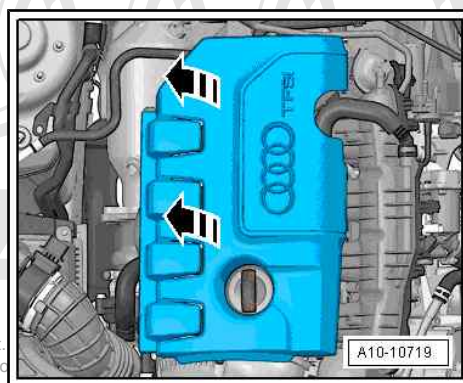
2.4 Removing and installing engine cover panel

Removing

- Pull engine cover panel carefully off retaining pins. Do not jerk the cover panel away, and do not try to pull on one side only.

Installing

- To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.
- Position engine cover panel on engine (note locations of oil filler neck and oil dipstick).
- Press engine cover panel with both hands into the rubber grommets.



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2.5 Removing and installing air filter element

Removing air filter element

- Unplug electrical connector -1- at air mass meter -G70- .
- Release hose clip -2- securing air hose (going to turbocharger) and disconnect hose from air mass meter -G70- .
- Remove all bolts -arrows- from air cleaner (top section) and lift out air cleaner (top section).
- Take out old filter element.

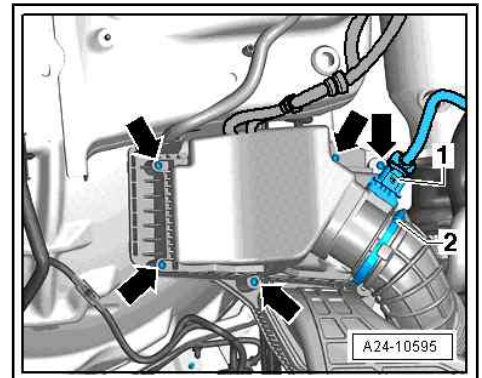
Installing air filter element

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



Note

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter -G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly. Do not use any lubricants containing silicone when assembling.*
- ◆ *Both sections of the air cleaner housing MUST be clean.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment): ➔ Parts catalogue*
- ◆ *To prevent malfunctions, cover all critical parts of the engine air intake tract (air mass meter, intake pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*



◆ **Please observe requirements for disposal.**
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- Blow out water drain -arrow- in bottom section of air cleaner housing with compressed air.

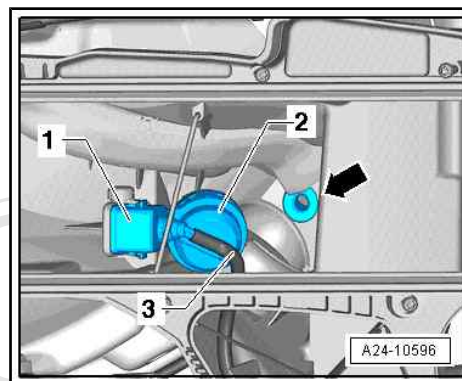


Note

Disregard items 1, 2 and 3.

- Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
- If fitted, re-connect vacuum hose at variable intake manifold change-over valve -N335- .
- When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).
- Fit the top section of the air cleaner carefully on the bottom section, without using force. Make sure the top section of the air cleaner is fitted straight on the air filter element (note position of sealing lip on air filter element).
- Ensure secure fit of intake hose at air mass meter -G70- .

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

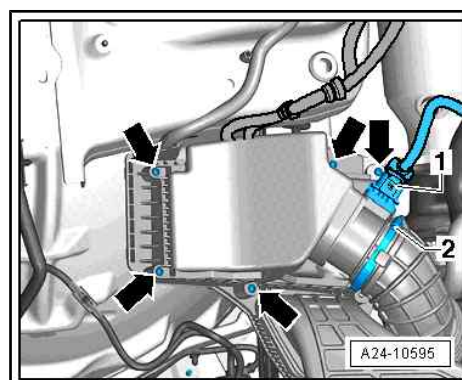


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2.6 Removing air cleaner housing (bottom section)

Removing

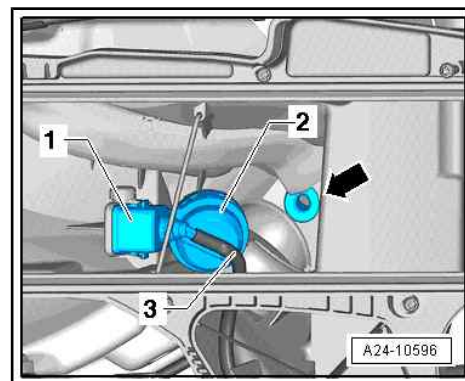
- Unplug electrical connector -1- at air mass meter -G70- .
- Release hose clip -2- securing air hose (going to turbocharger) and disconnect hose from air mass meter -G70- .
- Remove all bolts -arrows- from air cleaner (top section) and lift out air cleaner (top section).
- Take out old filter element.



- Disconnect vacuum hose -3- (if fitted) at variable intake manifold change-over valve -N335- -1-.
- Release retainer for bottom section of air cleaner housing (press in rubber on left and right side and pull upwards).

**Note**

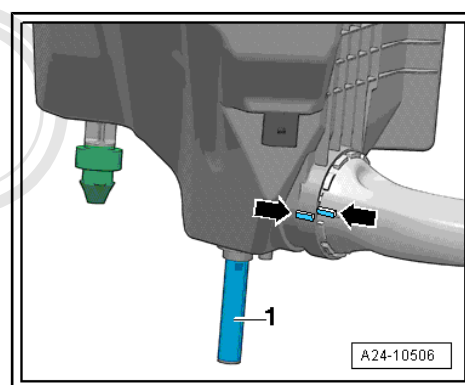
- ◆ *The variable intake manifold change-over valve -N335- is not installed on certain equipment versions or on vehicles for certain export markets.*
- ◆ *Do not use lubricant when installing retainer.*
- ◆ *The bypass flap with variable intake manifold change-over valve -N335- are not installed on certain equipment versions or on vehicles for certain export markets*
- Disconnect electrical connector at variable intake manifold change-over valve -N335- (if fitted).
- Carefully take out bottom section of air cleaner housing.

**Installing**

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

**Note**

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter -G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element.*
- ◆ *Use a silicone-free lubricant when installing the intake hose.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment): ➔ Parts catalogue*
- If warm air intake hose is fitted (for countries with cold climates only), make sure that air intake connection has engaged properly -arrows- (pay attention to markings).
- Check water drain hose -1- in air cleaner housing (bottom section) for dirt and other obstructions (clean if necessary).
- 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.
- Re-attach electrical connector at variable intake manifold change-over valve -N335- (if fitted).
- Re-install bottom section of air cleaner housing.

**Note**

The water drain hose must be routed straight downwards and must not be kinked.

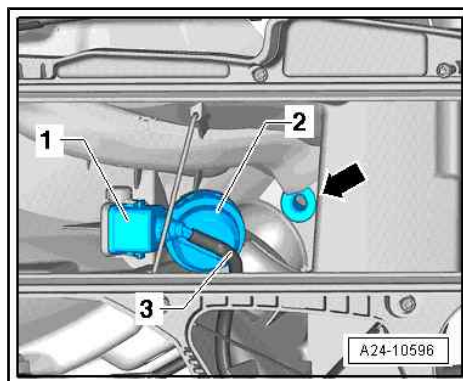
- Slide vacuum hose -3- (if fitted) back onto connection of variable intake manifold change-over valve -N335- -1-.
- Fit the top section of the air cleaner housing carefully on the bottom section, without using force.



Note

Before tightening bolts, make sure that the top section of the air cleaner housing is inserted into the groove on the bottom section (to prevent air leaks).

- Then secure top section of air cleaner housing to bottom section.
- Ensure secure fit of air hose at air mass meter -G70- .
- Re-connect electrical connector at air mass meter -G70- .
- The remaining installation steps are carried out in the reverse sequence.



2.7 Removing and installing air mass meter -G70-

Removing

- Unplug electrical connector -1- at air mass meter -G70- .
- Release hose clip securing air hose (coming from turbocharger) and disconnect hose from air mass meter -G70- .
- Unscrew both bolts from air mass meter -G70- .
- Then carefully pull air mass meter -G70- out of guide on air cleaner housing.

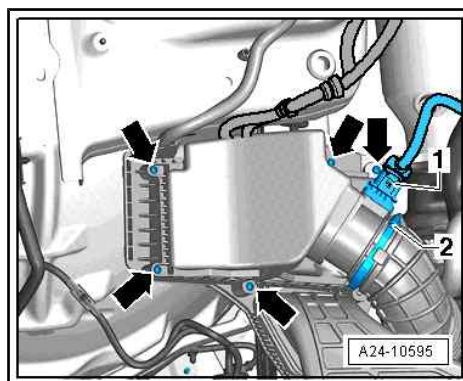
Installing

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



Note

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter -G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element.*
- ◆ *Use a silicone-free lubricant when installing the intake hose.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment): ⇒ Parts catalogue*
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Check for dirt in air duct leading to air filter element. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing air cleaner ⇒ [page 17](#) .



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

2.8 Intake manifold - exploded view

1 - Screw for intake air temperature sender -G42-

☐ 9 Nm

2 - Intake air temperature sender -G42-

- Activated charcoal filter solenoid valve 1 -N80-

☐ With dual non-return valve

4 - Intake manifold

☐ Removing and installing
 ➔ [page 24](#)

5 - Vacuum unit for air flow control flaps (intake manifold flaps)

6 - Bolts for high-pressure pump

☐ 10 Nm

7 - Connecting piece for fuel supply line

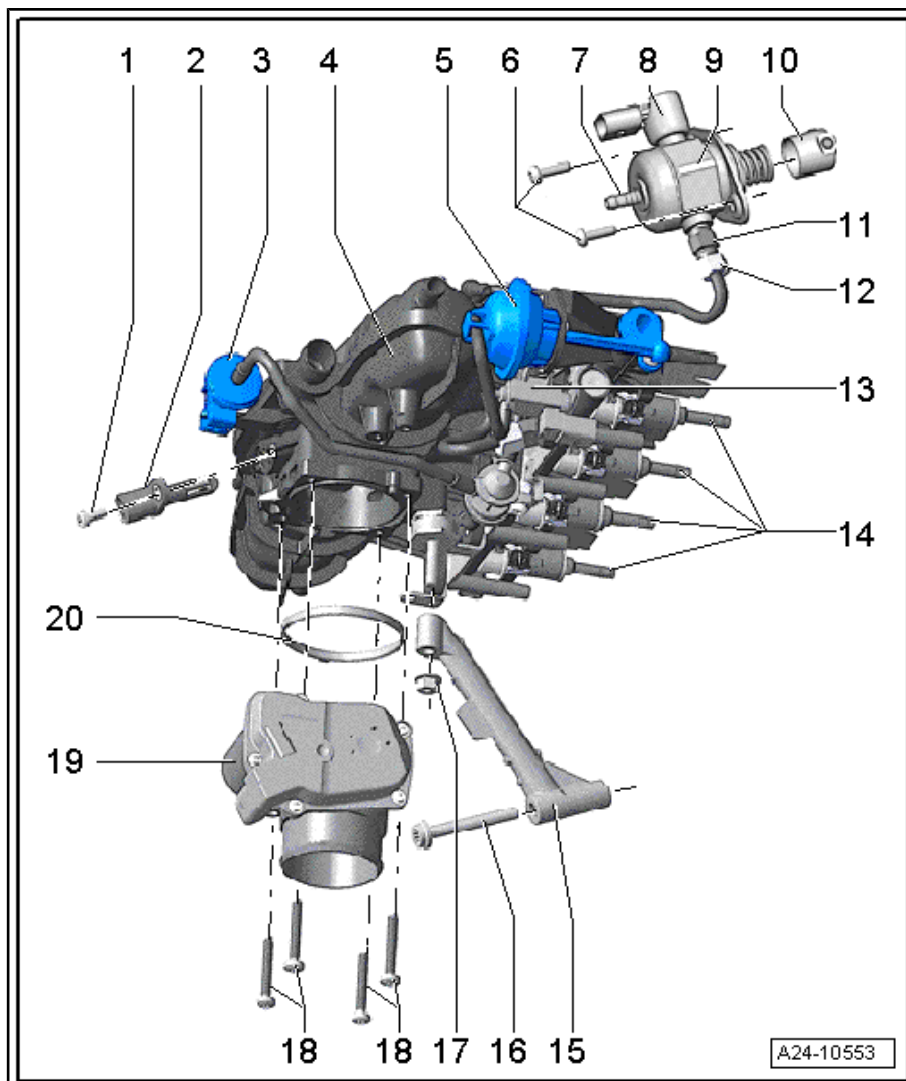
☐ From fuel tank

8 - Fuel pressure regulating valve -N276-

9 - Mechanical single-plunger high-pressure pump

☐ With fuel pressure regulating valve -N276-

☐ An electric fuel pump (fitted in fuel tank) supplies fuel to the mechan-



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ical high-pressure pump

- ☐ When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.
- ☐ The fuel system must not be under pressure when installing the high-pressure pump; procedure for reducing fuel pressure ⇒ [page 3](#)
- ☐ Fuel pipes must be free of tension when installed.
- ☐ Removing and installing ⇒ [page 39](#)

10 - Roller tappet

- ☐ May remain lodged in exhaust pump when high-pressure pump is removed; it can be taken out

11 - Connecting piece for fuel supply pipe to fuel rail

- ☐ Renew
- ☐ 22 Nm

12 - High-pressure fuel pipe

- ☐ Fuel pipes must be free of tension when installed.
- ☐ 18 Nm

13 - Intake manifold flap valve -N316-

14 - Injectors

- ☐ Renew O-ring and teflon ring
- ☐ Ensure correct installation position.
- ☐ Removing and installing ⇒ [page 40](#)

15 - Intake manifold support

16 - Bolt for intake manifold support

- ☐ 23 Nm

17 - Securing nut for intake manifold support

- ☐ 10 Nm

18 - Bolts for throttle valve module -J338-

- ☐ 4 x
- ☐ 5 Nm

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19 - Throttle valve module -J338- , throttle valve drive for electric throttle -G186-

- ☐ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ☐ Throttle valve module -J338- must be re-adapted to engine control unit -J623- after removal and installation or if it has been renewed, see vehicle diagnostic, testing and information system -VAS 5051B- "Guided Functions"

20 - Seal

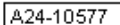
- ☐ Renew

1 - Injector

- ## 2 - Support ring

- ❑ Removing and installing
⇒ [page 28](#)

- ❑ Fuel pipes must be free of tension when instal-





led.

- ☐ Removing and installing ⇒ [page 39](#)

5 - Roller tappet

6 - Fuel pressure regulating valve -N276-

7 - Bolts for high-pressure pump

- ☐ 10 Nm

8 - Connecting piece for fuel supply line

- ☐ Renew
- ☐ 25 Nm

9 - Union nut for fuel supply line

- ☐ 18 Nm

10 - Air flow control flaps (port separator plates)

11 - Gasket

- ☐ Renew

12 - Intake manifold

- ☐ Removing and installing ⇒ [page 24](#)

13 - Vacuum unit for air flow control flaps (port separator plates)

14 - Throttle valve module -J338- , throttle valve drive for electric throttle -G186-

- ☐ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ☐ Throttle valve module -J338- must always be re-adapted to engine control unit -J623- after removal and installation or if it has been renewed, see vehicle diagnostic, testing and information system -VAS 5051B- "Guided Functions"
- ☐ 7 Nm

15 - Bolts for intake manifold

- ☐ 9 Nm

16 - Intake manifold flap potentiometer -G336-

- ☐ Intake manifold flap potentiometer -G336- must be re-adapted to engine control unit -J623- if it has been renewed. For this purpose, use vehicle diagnosis and service information system -VAS 5052- , "Guided Functions".
- ☐ After intake manifold flap potentiometer -G336- or intake manifold has been removed or installed intake manifold flap potentiometer -G336- must always be adapted to engine control unit -J623- . For this purpose, use vehicle diagnosis and service information system -VAS 5052- , "Guided Functions".

17 - Fuel pressure sender -G247-

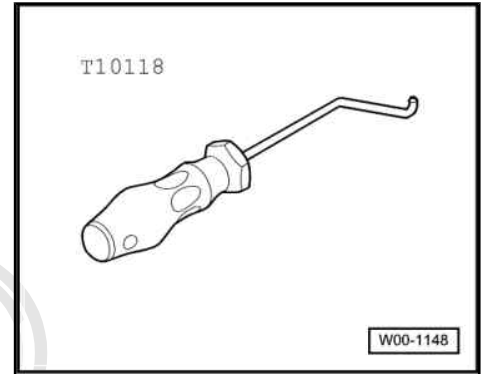
- ☐ 27 Nm
- ☐ Lubricate threads lightly with clean engine oil
- ☐ Always renew connecting piece and tighten to 22 Nm

2.10 Removing and installing intake manifold with fuel rail

After the fuel rail has been removed or renewed, intake manifold flap potentiometer -G336- must be adapted to engine control unit -J623- . For this purpose, use vehicle diagnosis and service information system -VAS 5052- , "Guided Functions".

Special tools and workshop equipment required

- ◆ Assembly tool -T10118-



- ◆ Hose clip pliers -V.A.G 1921-

Removing



Note

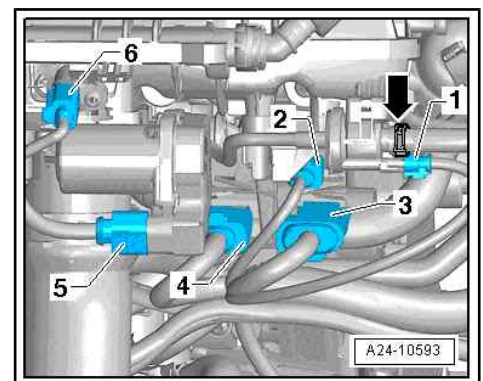
- ◆ *The injectors can only be accessed after removal of the intake manifold and fuel rail with air flow control flap.*
- ◆ *The combustion chamber (teflon) ring seal and the O-ring must always be renewed.*
- ◆ *Intake manifold - exploded view ➔ [page 21](#)*
- ◆ *Fuel rail - exploded view ➔ [page 23](#)*



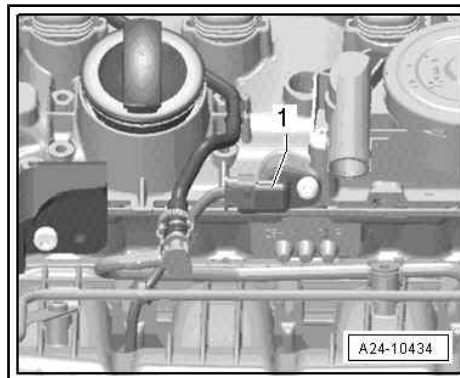
WARNING

The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ➔ [page 3](#).

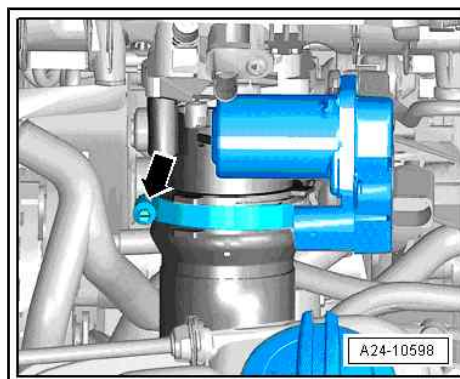
- Disconnect negative terminal from battery.
- Remove engine cover panel ➔ [page 16](#).
- Disconnect vacuum line -arrow- leading to activated charcoal filter.
- Unplug following electrical connectors:
 - 1 - Activated charcoal filter solenoid valve 1 -N80-
 - 2 - From knock sensor 1 -G61-
 - 3 - From intake manifold flap valve -N316-, fuel pressure sender -G247- and Hall sender -G40-
 - 4 - From injectors
 - 5 - Throttle valve module -J338-
 - 6 - Intake air temperature sender -G42-



Unplug electrical connector -1- at Hall sender -G40- .

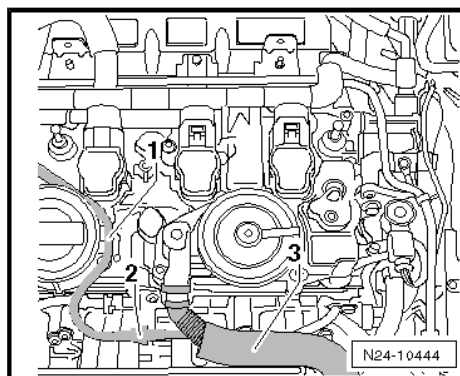


- Open hose clip -arrow- securing air intake hose and disconnect hose downwards from throttle valve module -J338- .



- Disconnect vacuum line -1- at connection -2-.
- Remove crankcase breather hose -3-.

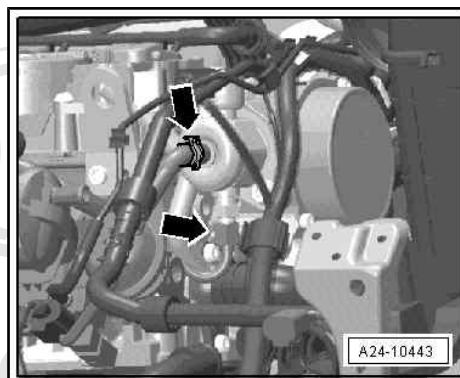
i Note



- Release spring-type clip -top arrow- and detach fuel supply hose from high-pressure pump.
- Unscrew union nut for high-pressure fuel pipe -bottom arrow- at high-pressure pump.

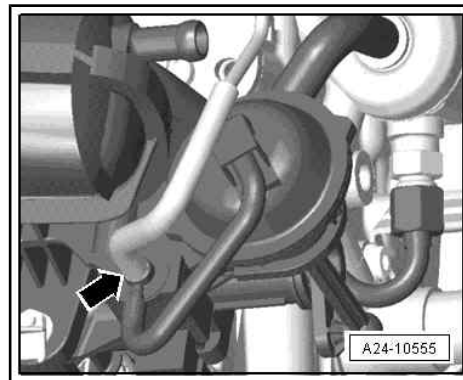
i Note

- ◆ *The fuel system must not be under pressure.*
- ◆ *Use a clean cloth to catch escaping fuel.*
- ◆ *Seal off open connections with clean caps. It is essential to ensure that no dirt enters the fuel system.*

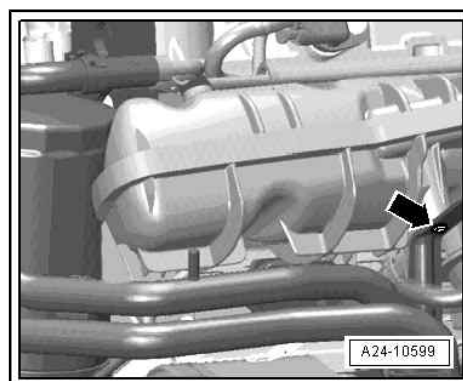


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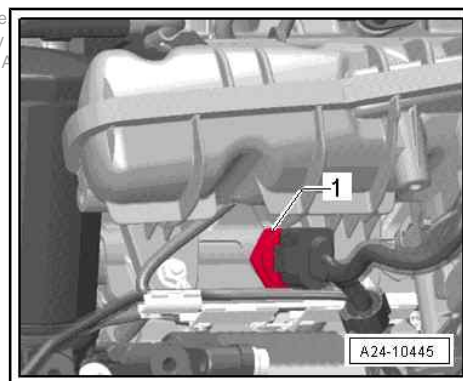
- Disconnect vacuum line -arrow- at intake manifold flap valve -N316- .



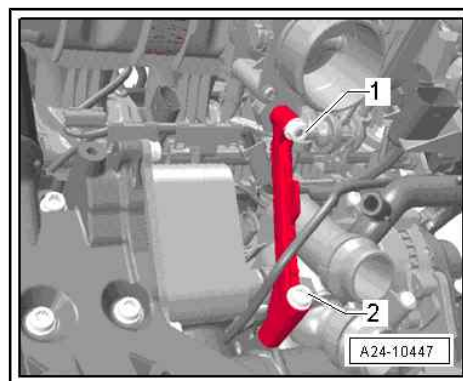
- Remove bolt -arrow- for coolant line from intake manifold.



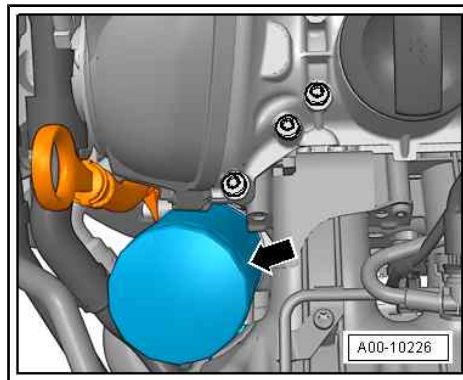
- Unplug electrical connector at fuel pressure sender -G247- or in whole -1-.



- Slightly loosen securing nut -1- and remove bolt -2-.



- Loosen oil filter with Hazet strap wrench -2171-1- or with oil filter tool -3417- and remove oil filter.
- Unscrew all bolts from intake manifold.
- Carefully pull intake manifold and fuel rail slightly away from cylinder head.



- Unplug electrical connector -1- from intake manifold flap potentiometer -G336- and then detach intake manifold.



Note

- ♦ The injectors can remain in the fuel rail.
- ♦ Block off intake ports with a clean cloth.
- Disconnect intake manifold from fuel rail ⇒ [page 28](#) .

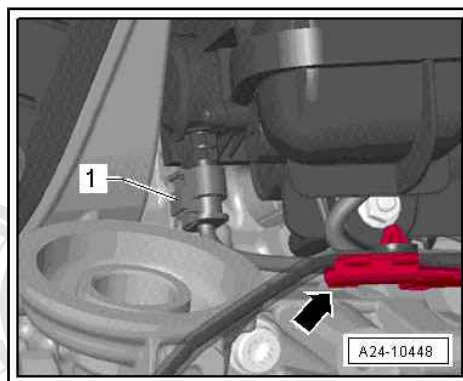
Installing



Note

Make sure that injectors are installed correctly.

- Fit intake manifold onto studs (left and right) on cylinder head.
- The remaining installation steps are carried out in the reverse sequence.
- ♦ Tightening torques: Intake manifold - exploded view ⇒ [page 21](#)
- ♦ Tightening torques: Fuel rail - exploded view ⇒ [page 23](#)



2.11 Removing and installing fuel rail

After the fuel rail has been removed or renewed, intake manifold flap potentiometer -G336- must be adapted to engine control unit -J623- .



Note

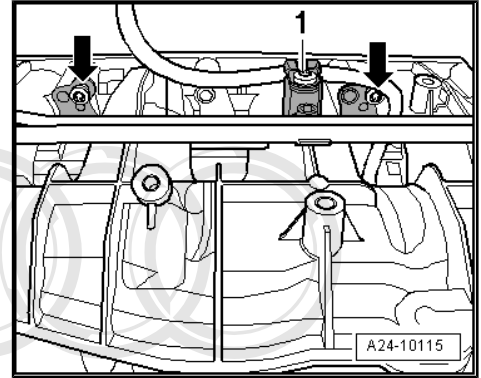
Intake manifold must be removed; refer to ⇒ [page 24](#) for removal procedure.

- Release hose clip -1-.
- Remove hoses from activated charcoal filter.
- Disconnect fuel pipe at fuel rail.

- Unscrew two bolts -arrows- on fuel rail.
- Pull fuel rail off intake manifold.

Installing

- Always renew both connecting pieces for fuel supply line.
- Connect fuel pipe.
- Re-connect electrical connectors.
- Install intake manifold ➔ [page 24](#) .
- ◆ Tightening torques: Intake manifold - exploded view
➔ [page 21](#)
- ◆ Tightening torques: Fuel rail - exploded view ➔ [page 23](#)
- Install in reverse order.



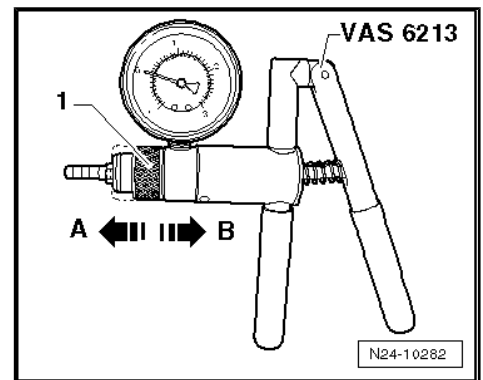
2.12 Checking intake manifold change-over function

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Only perform this test if there is a loss of engine torque (poor flexibility or lack of pulling power).

Special tools and workshop equipment required

- ◆ Hand-operated vacuum pump -VAS 6213-



Test condition:

- ◆ Intake manifold flap valve -N316- has been checked with vehicle diagnostic and service information system -VAS 5052- .

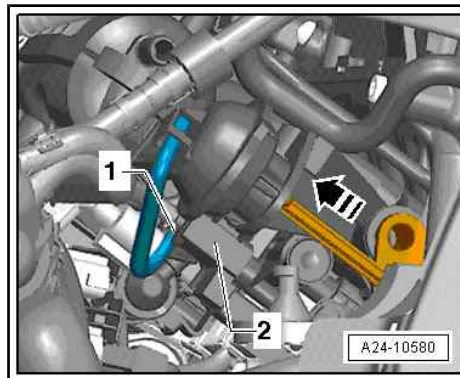
Perform the following steps if the intake manifold flap valve -N316- is OK.

- Carefully pull off engine cover panel.
- Start engine and run at idling speed.
- Have a second mechanic rev. up engine quickly (short burst of throttle) and observe vacuum unit for intake manifold change-over.

- The vacuum unit should pick up -arrow-.

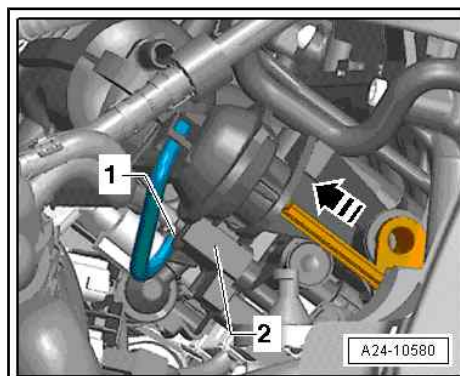
If the change-over does not operate as described:

- Check vacuum system for leaks.
- Check that change-over mechanism moves freely by operating linkage manually.
- Check proper connection of vacuum lines.
- Check vacuum hoses for porosity.

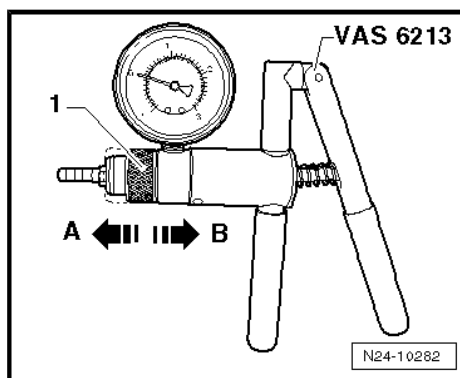


- Disconnect vacuum hose -1- leading to vacuum unit for intake manifold flap valve -N316- at intake manifold flap valve -N316-2-.

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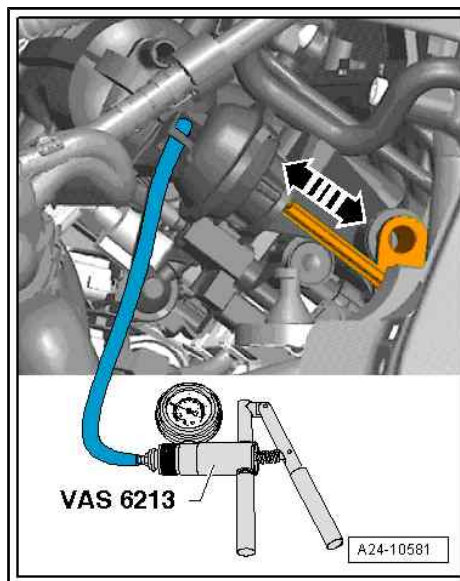
- Move adjuster ring -1- on hand-operated vacuum pump -VAS 6213- to position -A- to select "vacuum".



- Connect hand-operated vacuum pump -VAS 6213- to vacuum unit for intake manifold flap valve -N316- .
- Operate the hand-operated vacuum pump -VAS 6213- several times.

The vacuum unit should move -arrows-.

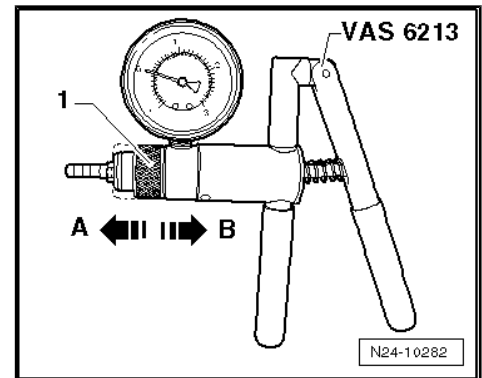
- If vacuum unit does not move, renew vacuum unit.



2.13 Checking dual non-return valve

Special tools and workshop equipment required

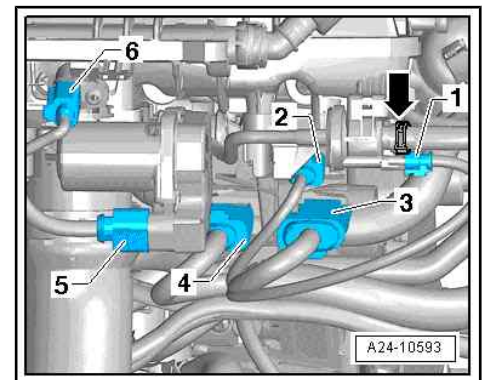
- ◆ Hand-operated vacuum pump -VAS 6213-



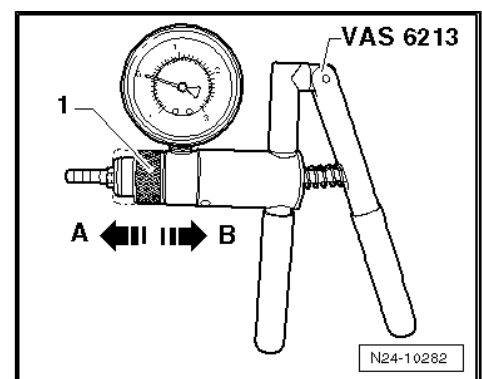
- ◆ Auxiliary measuring set -V.A.G 1594C-

Test condition:

- Activated charcoal filter solenoid valve 1 -N80- has been checked with vehicle diagnostic and service information system -VAS 5052- and is OK.
- Carefully pull off engine cover panel.
- Unplug connector -1- and detach breather hose -arrow- from activated charcoal filter solenoid valve 1 -N80-.



- Move adjuster ring 1 on hand-operated vacuum pump -VAS 6213- to position -A- to select "vacuum".



- Connect hand-operated vacuum pump -VAS 6213- to activated charcoal filter solenoid valve 1 -N80- .
- Connect contacts of activated charcoal filter solenoid valve 1 -N80- -1- to battery using test leads. This will open activated charcoal filter solenoid valve 1 -N80- .

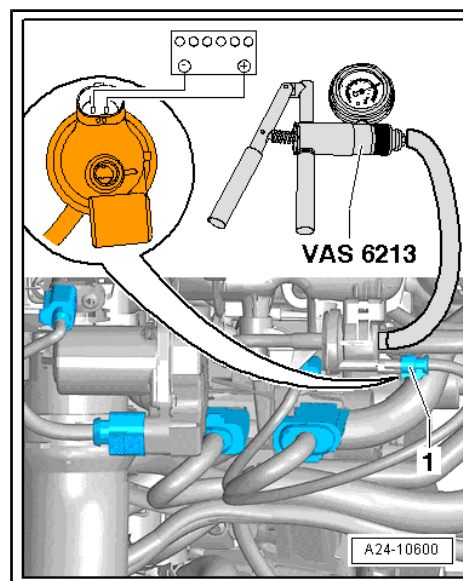
Then immediately operate hand-operated vacuum pump -VAS 6213- several times.

- Vacuum should build up.
- Again disconnect battery to cut off current supply.

If vacuum does not build up:

- Renew dual non-return valve -1-.

Dual non-return valve, activated charcoal filter solenoid valve 1 -N80- and plastic hoses are combined as one unit and can only be renewed together.

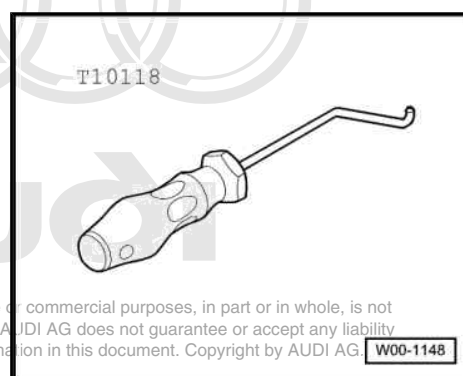


2.14 Removing and installing fuel pressure sender -G247-

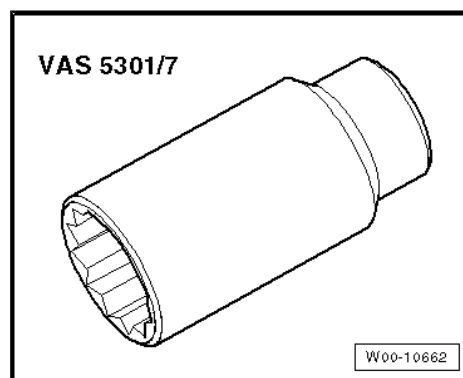
If the fuel pressure sender -G247- fails, the fuel pressure regulating valve -N276- is switched off, the electric fuel pump is fully activated and the engine is operated with the fuel pressure which remains. This will reduce engine torque considerably.

Special tools and workshop equipment required

- ◆ Assembly tool -T10118-



- ◆ Double hexagon socket, 27 mm -VAS 5301/7-



Removing:

- Carefully pull off engine cover panel.

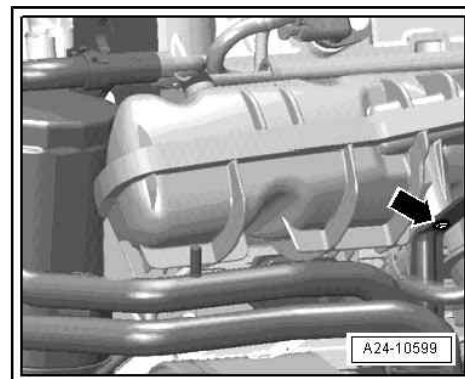


WARNING

The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ➔ [page 3](#).

- Remove bolt -arrow- for coolant line from intake manifold.

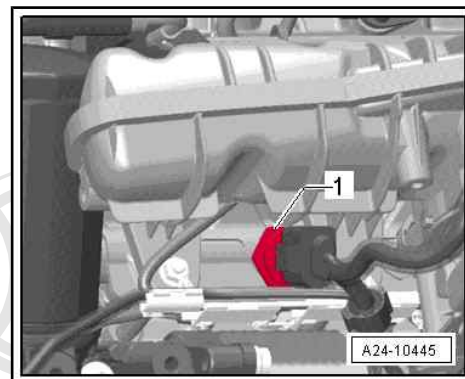
ß



- Release connector on fuel pressure sender -G247- -1- using assembly tool -T10118- .
- Unscrew fuel pressure sender -G247- -1- using double hexagon socket, 27 mm -VAS 5301/7- .

Installing:

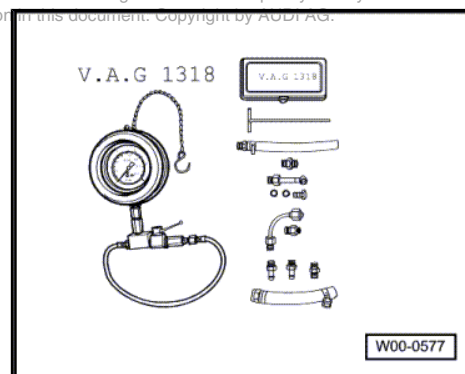
- Install in reverse order.
- Make sure that connecting piece is tightened to specified torque before installing fuel pressure sender -G247- .
- ◆ Tightening torque for connecting piece: Fuel rail - exploded view ➔ [page 23](#)
- ◆ Tightening torque for fuel pressure sender -G247- : Fuel rail - exploded view ➔ [page 23](#)



2.15 Checking residual pressure in fuel system (up to high-pressure pump)

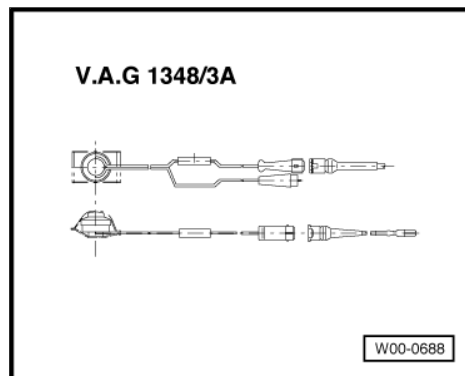
Special tools and workshop equipment required

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



- ◆ Adapter set -V.A.G 1318/10-12-
- ◆ Auxiliary measuring set -V.A.G 1594C-

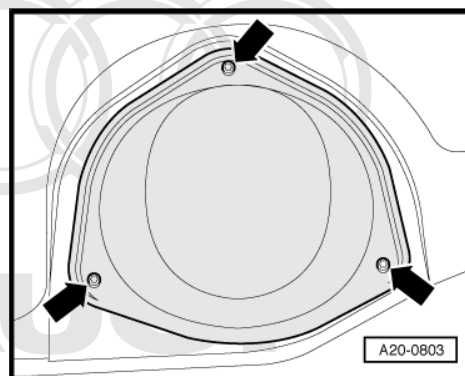
- ◆ Remote control -V.A.G 1348/3A- for V.A.G 1348 with adapter cable -V.A.G 1348/3-3-



- ◆ Fuel-resistant measuring container
- ◆ Protective gloves
- Battery voltage at least 12.5 V
- Fuel filter OK
- Fuel tank at least $\frac{1}{4}$ full.
- Fuel pump control unit -J538- OK.
- Ignition off.

Checking residual pressure

- Remove rear seat bench ⇒ Rep. Gr. 72 .
- Unscrew cover for flange -arrows-.



- Unplug electrical connector -1- at flange.

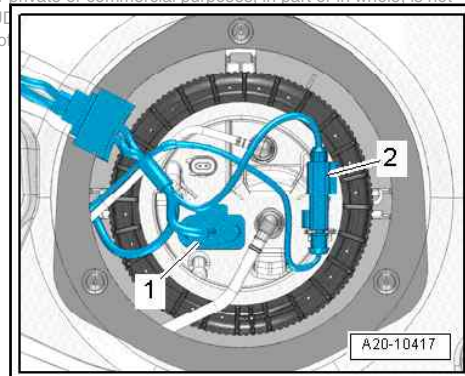
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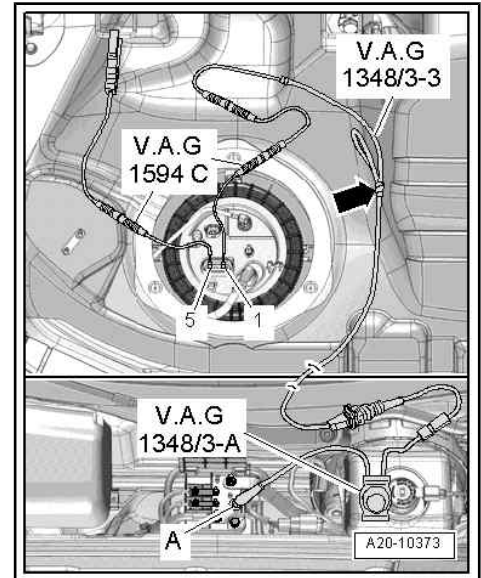
Note

Disregard -item 2-.

- Connect remote control -V.A.G 1348/3A- for V.A.G 1348 to contact -1- using adapter cable -V.A.G 1348/3-3- and test lead from auxiliary measuring set -V.A.G 1594C- .



- Tape off 2nd connector contact of adapter cable -V.A.G 1348/3-3- with insulating tape -arrow- to prevent short circuits.
- Connect contact -5- to the body (earth) using a test lead from auxiliary measuring set -V.A.G 1594C- .
- Move switch of remote control -V.A.G 1348/3A- for V.A.G 1348 to front of engine compartment.

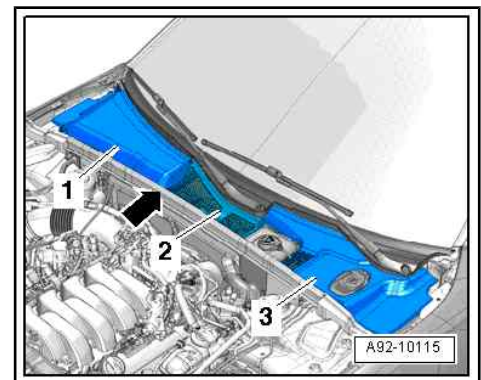


- Remove seal -arrow-.
- Unclip plenum chamber cover -2- and remove.

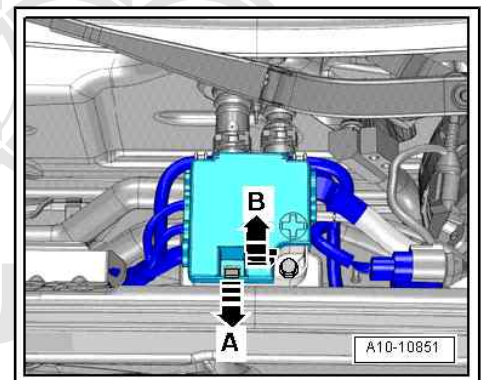


Note

Disregard -items 1 and 3-.



- Release retainer -arrow A- and open cover -arrow B-.



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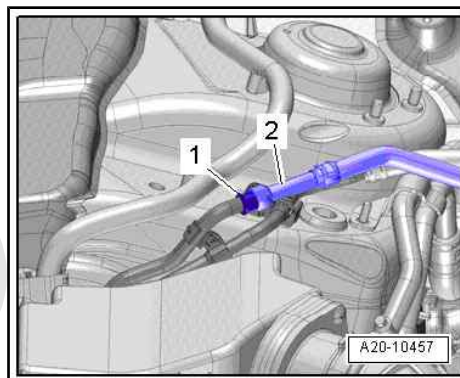
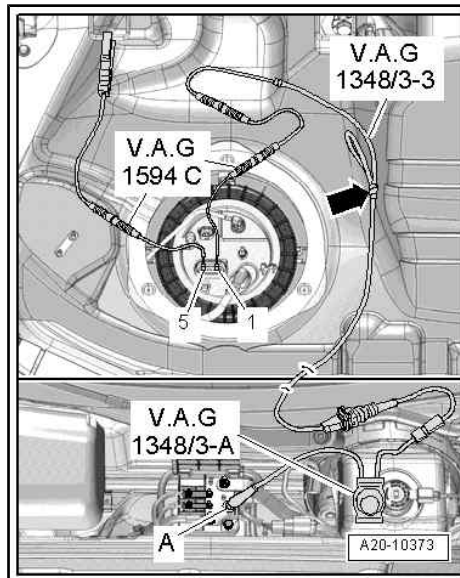
- Connect remote control -V.A.G 1348/3A- for V.A.G 1348 to item -A- of junction box in plenum chamber (battery positive). For safety reasons an in-line fuse (10 A) must be connected into the lead.



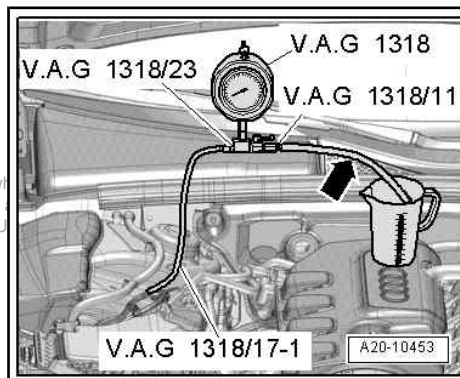
WARNING

- ◆ *The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ page 3 .*
- ◆ *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*

- Remove filler cap from fuel filler neck.
- Disconnect fuel pipe -2- by pulling release ring -1-.



- Screw connector -V.A.G 1318/23- and adapter -V.A.G 1318/17-1- onto K-Jetronic tester -V.A.G 1318- .
- Fit adapter -V.A.G 1318/17-1- onto the disconnected fuel supply pipe.
- Screw adapter -V.A.G 1318/11- onto K-Jetronic tester -V.A.G 1318- .
- Fit test hose -arrow- onto pressure tester and hold end of hose into a container to catch escaping fuel.
- Open cut-off valve on pressure tester.
 - Lever points in direction of flow.
- Bleed fuel system by pressing remote control switch briefly.



- Close cut-off tap on pressure gauge.
- Lever is at right angle to direction of flow -arrow-.
- Press switch on remote control until pressure gauge shows no further increase in pressure.
- Check for leaks and check residual pressure by watching drop in pressure on pressure tester.
- After 10 minutes pressure should still be at least 3 bar.

If the residual pressure drops below 3 bar:

- ◆ Check union between pressure gauge and fuel line for leaks.
- ◆ Check pressure tester for leaks.
- ◆ Check fuel lines and their connections for leaks.
- ◆ Check fuel pump delivery rate ⇒ Rep. Gr. 20 .
- ◆ Renew fuel filter with integral fuel pressure regulator ⇒ Rep. Gr. 20 .
- ◆ Non-return valve of fuel pump is defective ⇒ Rep. Gr. 20 .

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

- Switch off ignition.



Note

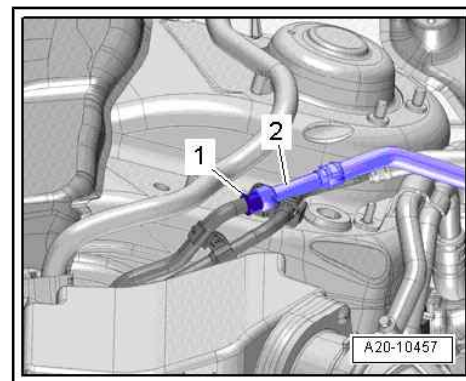
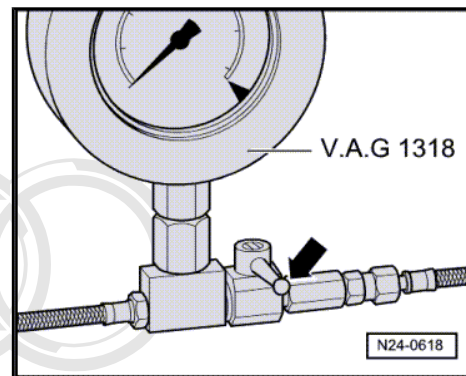
Before removing pressure gauge, release fuel pressure by opening cut-off valve. Hold a container under the connection.

- Reconnect fuel supply pipe -arrow- (make sure that all parts are clean).



Note

Check fuel system for leaks.



2.16 High-pressure pump - exploded view



WARNING

Fuel system operates under high pressure. Always dissipate fuel pressure prior to opening fuel system. For procedure, refer to ⇒ [page 3](#)

1 - Roller tappet

- ☐ May possibly remain lodged in exhauster pump when high-pressure pump is removed

2 - O-ring

- ☐ Renew

3 - Mechanical single-plunger high-pressure pump

- ☐ An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump
- ☐ When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.
- ☐ The fuel system must not be under pressure when installing the high-pressure pump; procedure for reducing fuel pressure ⇒ [page 3](#)
- ☐ Fuel pipes must be free of tension when installed.
- ☐ Removing and installing ⇒ [page 39](#)

4 - Fuel pressure regulating valve -N276-

5 - Aperture in exhauster pump for high-pressure pump

6 - Injectors

- ☐ Renew O-ring and teflon ring
- ☐ Ensure correct installation position.
- ☐ Removing and installing ⇒ [page 40](#)

7 - Hall sender -G40-

8 - Inlet camshaft control valve 1 -N205-

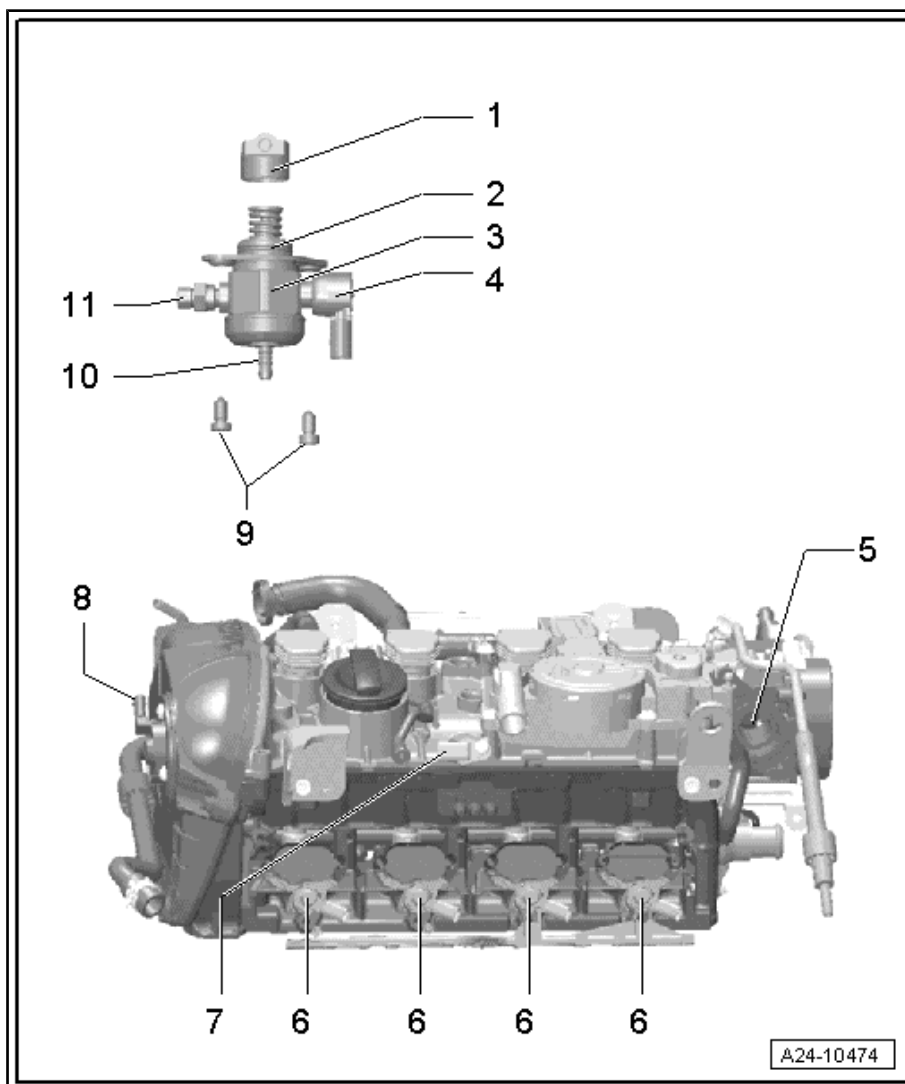
9 - Bolts for high-pressure pump

- ☐ 10 Nm

10 - Connecting piece for fuel supply pipe from fuel tank

11 - Connecting piece for fuel supply pipe to fuel rail

- ☐ Renew
- ☐ Connecting piece: 22 Nm
- ☐ Tightening torque for union nut for fuel supply pipe: 18 Nm
- ☐ Fuel supply pipe must be free of tension when installed (make sure all parts are clean)



2.17 Removing and installing high-pressure pump



WARNING

Fuel system operates under high pressure. Always dissipate fuel pressure prior to opening fuel system. For procedure, refer to ➔ [page 3](#)

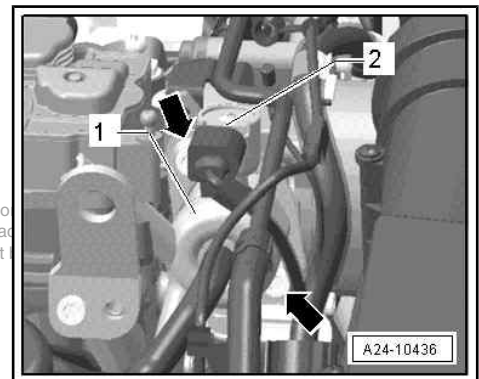


Note

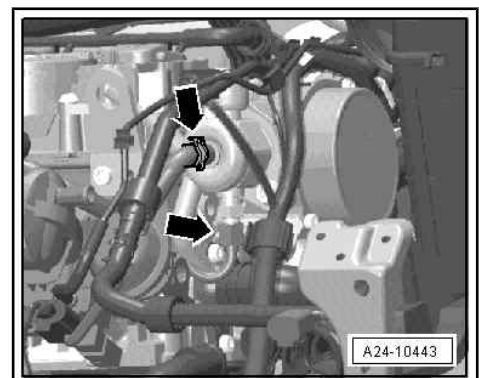
- ◆ *The high-pressure fuel pump should only be removed and installed when the engine is cold.*
- ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *Use a cloth to catch escaping fuel.*
- ◆ *The O-ring must always be renewed.*
- ◆ *Always ensure that the high-pressure fuel pipes are free of tension when tightening the connections.*

Removing

- Remove engine cover panel.
- Detach electrical connector -2- from fuel pressure regulating valve -N276- .



- Disconnect both fuel lines -arrows-.



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- Remove 2 bolts -arrows-.
- Carefully pull out high-pressure fuel pump. It is possible that the sleeve may remain lodged in the exhauster pump.

Installing

- Renew O-ring for high-pressure pump.
- Fit roller tappet in exhauster pump (check roller tappet for damage first).



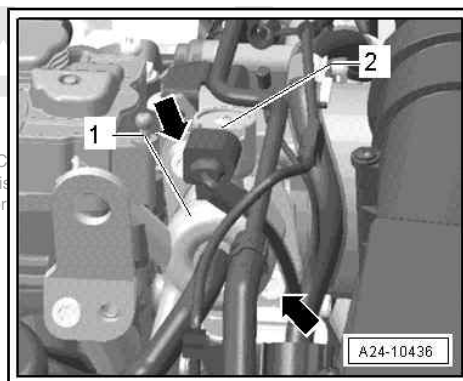
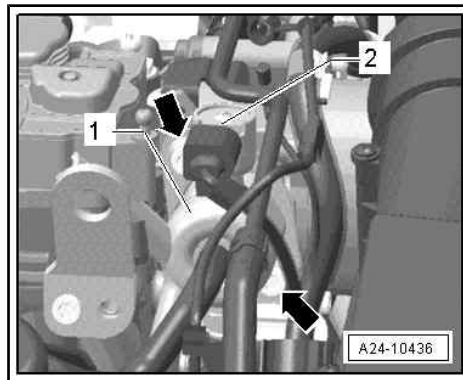
Note

- ◆ *The roller tappet must be positioned at the lowest point when installing the high-pressure pump.*
- ◆ *If the old high-pressure pump is re-installed, or if a used pump is installed, the connecting piece for the fuel supply pipe (high-pressure section of the system) must be renewed. Refer to high-pressure pump - exploded view (item 11) ➤ [page 37](#).*
- Turn crankshaft until roller tappet is positioned at lowest point.
- Fit high-pressure pump in exhauster pump.
- Tighten bolts hand-tight.
- Renew connecting piece at high-pressure pump.
- ◆ Tightening torque: refer to exploded view of high-pressure pump ➤ [page 37](#).
- Now tighten bolts alternately to specified torque, refer to high-pressure pump - exploded view ➤ [page 37](#).
- Tighten union nut on fuel supply line hand-tight. Align so that parts are free of tension.
- ◆ Tightening torque for fuel supply line (union nut): Intake manifold - exploded view ➤ [page 21](#).
- Re-attach electrical connector -2- for fuel pressure regulating valve -N276-.
- Put back fuse if it has been removed.



Note

Check fuel system for leaks.



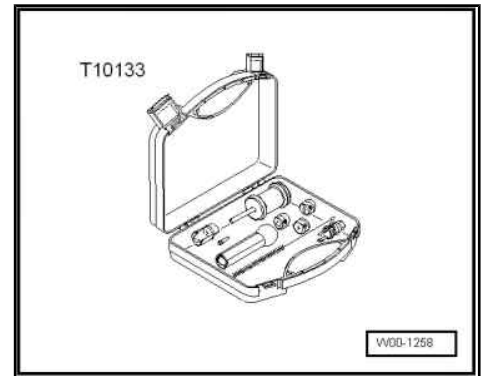
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2.18 Removing and installing injectors

Special tools and workshop equipment required

- ◆ Tool kit with puller -T10133-

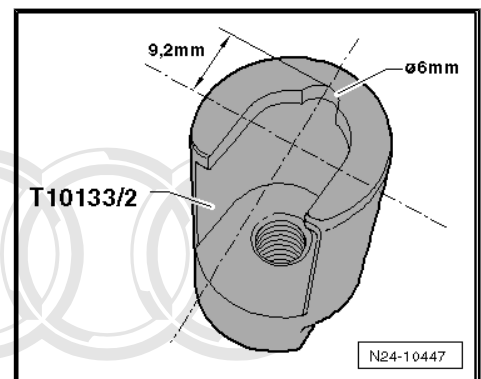


Note

Special tool T10133/2 (puller) has been modified and now has the designation puller T10133/2 A. If you have not yet received the new tool you can make the modification yourself.

Modifying special tool T10133/2 (puller) to make it equivalent to puller T10133/2 A

- File out a semi-circular recess as shown in the illustration. The recess allows the tool to be pushed further onto the injector so the contact surface is increased.
- For identification purposes, mark the modified tool with the letter “A” after the tool number.



Special tools and workshop equipment required

- ◆ Round file, approx. 6 mm

Removing

- Remove engine cover panel ➔ [page 16](#)
- Remove intake manifold and fuel rail ➔ [page 24](#)

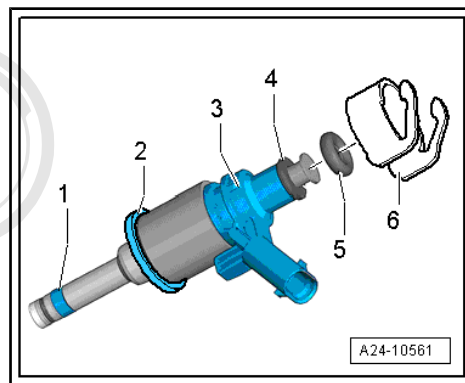
Removing injectors (from fuel rail)

Carefully pull injectors out of fuel rail.

Removing injectors (from cylinder head)

Illustration shows injector assembly:

- 1 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant
- 2 - Ring (renew)
- 3 - Injector
- 4 - Spacer ring (renew if damaged)
- 5 - O-ring (renew; apply thin coating of clean engine oil prior to installation)
- 6 - Support ring (via this support ring, fuel rail exerts force which secures injector in cylinder head)

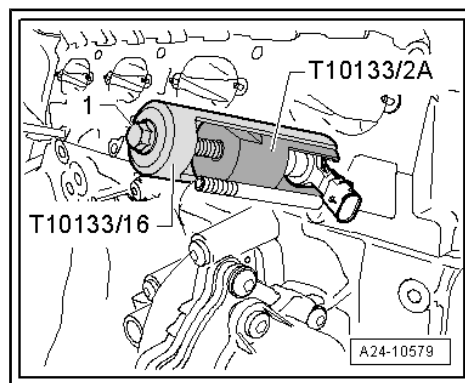


- Cover open inlet ports with a clean cloth.
- Unplug electrical connector at injector that is to be removed.
- Apply puller -T10133/2A- to groove on injector.
- Then attach removal tool -T10133/16- and pull out injector by turning bolt -1-.



Note

The combustion chamber ring seal must always be renewed prior to reinstalling the injector ➔ [page 43](#).



2.18.1 Renewing combustion chamber ring seal (teflon ring seal)

Note

The combustion chamber ring seal must always be renewed prior to reinstalling the injector.

Illustration shows injector assembly:

1 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant

2 - Ring (renew)

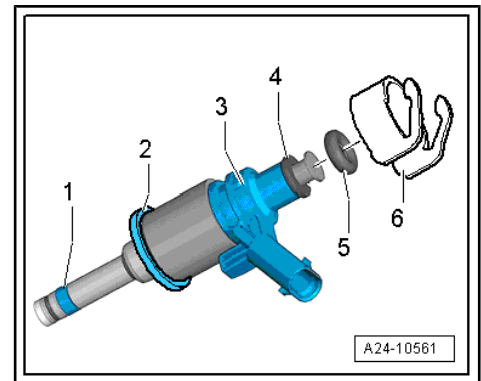
3 - Injector

4 - Spacer ring (renew if damaged)

5 - O-ring (renew; apply thin coating of clean engine oil prior to installation)

6 - Support ring (via this support ring, fuel rail exerts force which secures injector in cylinder head)

- Carefully remove old teflon ring using suitable tools (e.g. cut open ring using razor blade, or prise open ring with small screwdriver and then pull off forwards). It is important to ensure that the groove and the continuous ridge in the bottom of the groove are not damaged.



Note

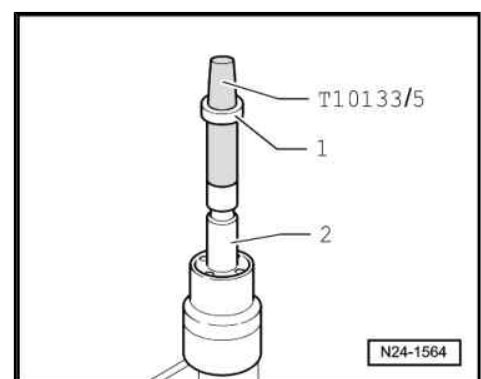
The injector must be renewed if the groove is damaged.

- Before new teflon ring is fitted, any combustion residue must be removed from ring groove and injector stem using a clean cloth.

Note

The illustration shows an injector with "offset connector". This can be ignored since it is not relevant when replacing the combustion chamber ring seal.

- Fit the assembly cone -T10133/5- with new teflon seal -1- onto the injector -2-.



- Use assembly sleeve -T10133/6- to press teflon ring seal further onto assembly cone -T10133/5- until it seats in groove. Do not use any lubricants during this procedure.



Note

The teflon ring is widened as it is pushed onto the injector. The teflon ring must therefore be compressed again after it has been fitted. This is done in two steps. The procedure is described below.

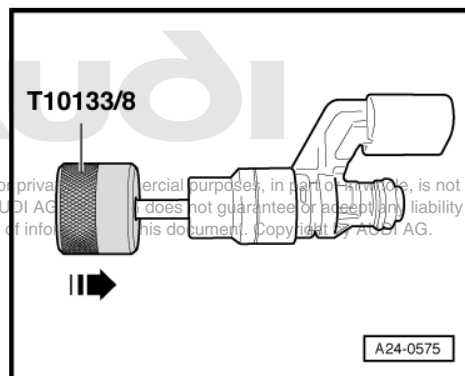
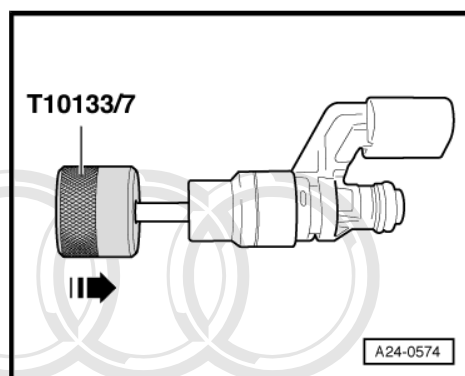
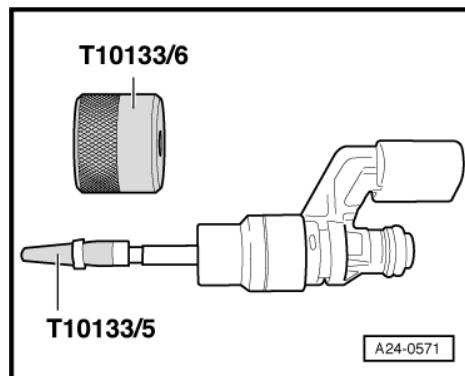
Step 1 of teflon ring seal calibration (adaption) is done with calibration sleeve -T10133/7- .

- Slide calibration sleeve -T10133/7- onto injector as far as the stop by pressing lightly and turning approx. 180°. Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.

Step 2 of teflon ring seal calibration (adaption) is done with calibration sleeve -T10133/8- .

- Slide calibration sleeve -T10133/8- onto injector as far as the stop by pressing lightly and turning approx. 180°. Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.
- Fit new O-ring on injector. Lubricate O-ring lightly with clean engine oil before installing.
- The teflon ring must not be lubricated.

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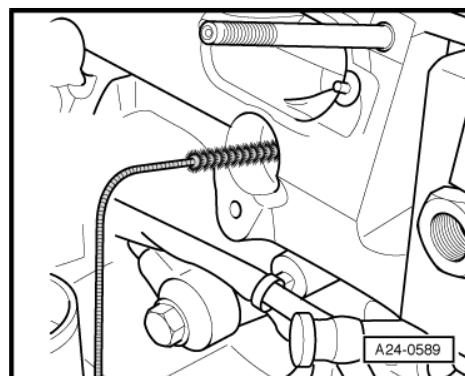


- Use supplied nylon brush -T10133/4- to thoroughly clean holes for injectors in cylinder head prior to installing injectors.



Note

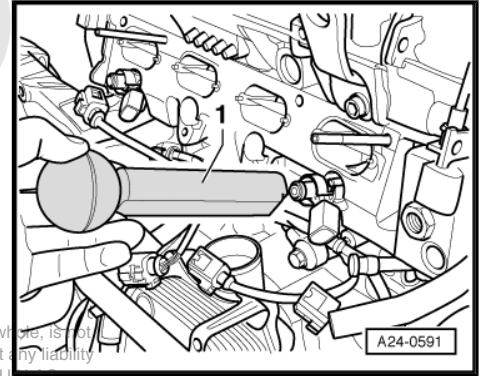
- ♦ *The teflon seal on the injector must not be oiled or greased.*
- ♦ *Make sure there is no cleaning fluid or oil in the cylinder head bores when installing the injectors.*



- Use assembly tool -T10133/9- to push injector as far as it will go into hole in cylinder head (free of oil and grease). Ensure that the injector is properly seated in the cylinder head.
- The remaining installation steps are carried out in the reverse sequence.

Important: the following points must always be observed:

- Coat O-rings of high-pressure injectors with clean engine oil to facilitate insertion into fuel rail.
- Renew all seals.
- Fuel rail must be positioned on injectors and pressed in evenly.
- Install intake manifold with fuel rail ➔ [page 24](#) .



2.19 Cleaning injectors

- Remove injectors ➔ [page 40](#) .



Note

Observe safety precautions and operating instructions for ultrasonic unit.

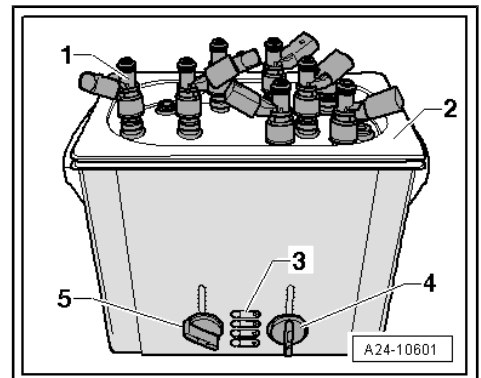
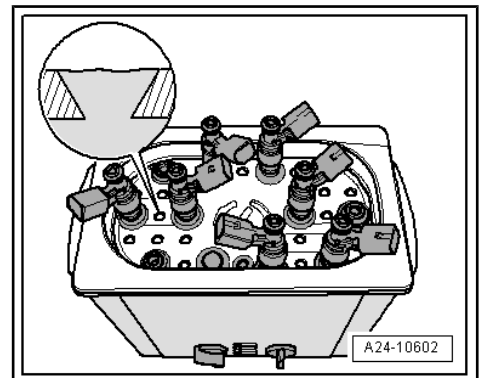
- Fill up ultrasonic unit with cleaning agent supplied.



Note

Ultrasonic unit must be filled with cleaning agent up to top edge of apertures (see detail in illustration).

- Insert injectors -1- in retainer provided -2- as far as stop.
- Immerse injectors together with retainer into cleaning agent.
- Set rotary knob -4- to a temperature of 50°C.
- Select a cleaning time of 30 minutes with rotary knob -5-.
- Switch on ultrasonic unit with button -3-.



Note

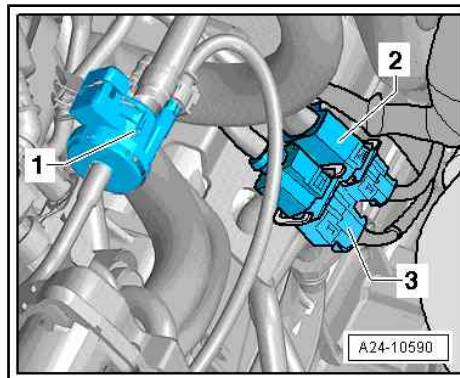
The time set starts to elapse as soon as a cleaning temperature of 50°C is reached.

- After cleaning, always renew combustion chamber ring seal (teflon ring seal) for each injector ➔ [page 43](#) .
- Then re-install injectors ➔ [page 40](#) .

2.20 Lambda probes - overview

Electrical connectors for Lambda probes

- 1 - Activated charcoal filter solenoid valve 1 -N80-
- 2 - Lambda probe, after catalytic converter -G130- and Lambda probe heater 1, after catalytic converter -Z29-
- 3 - Lambda probe -G39- and Lambda probe heater -Z19-



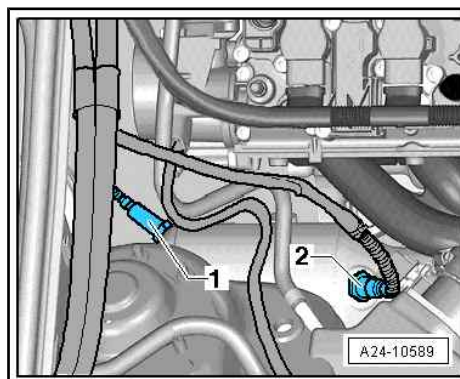
Lambda probes

- 1 - Lambda probe, after catalytic converter -G130- and Lambda probe heater 1, after catalytic converter -Z29-
- 2 - Lambda probe -G39- and Lambda probe heater -Z19-



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Tightening torque: 55 Nm.*



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

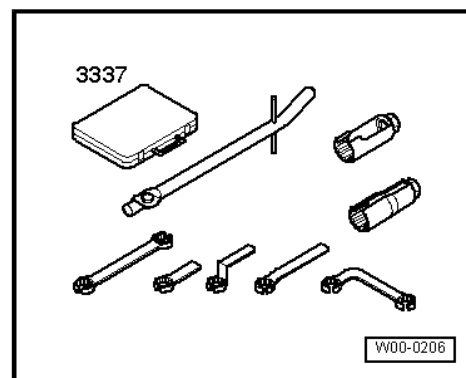
⇒ ["2.21 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter", page 46](#) .

Removing and installing Lambda probe after catalytic converter - G130- and Lambda probe 1 heater, after catalytic converter -Z29- ⇒ ["2.22 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater, after catalytic converter Z29", page 47](#)

2.21 Removing and installing Lambda probe -G39- and Lambda probe heater -Z19- before catalytic converter

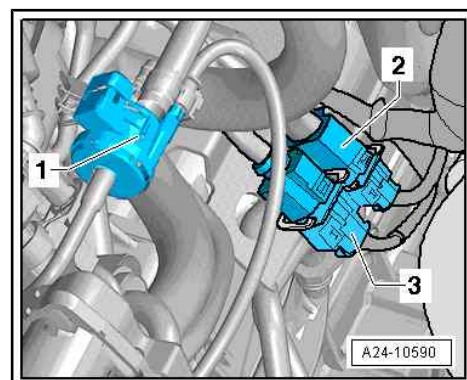
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing

- Unplug electrical connector -3- for Lambda probe -G39- and Lambda probe heater -Z19- .



- Unscrew Lambda probe -G39- -2- using tool from Lambda probe open ring spanner set -3337- .

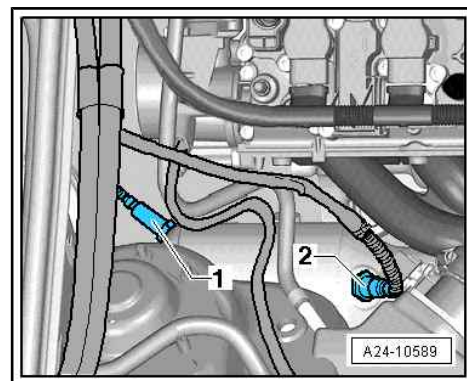
Installing

When installing, note the following:



Note

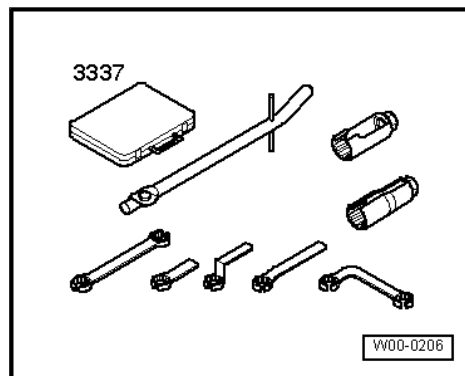
- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Tightening torques: refer to exploded view of Lambda probes ⇒ [page 46](#) .*



2.22 Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe 1 heater, after catalytic converter -Z29-

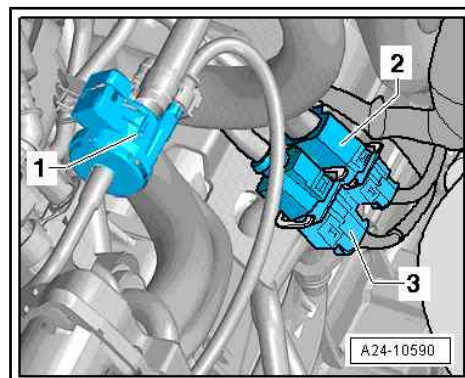
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing

- Unplug electrical connector -2- for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater, after catalytic converter -Z29- .



- Unscrew Lambda probe after catalytic converter -G130- -1- using tool from Lambda probe open ring spanner set -3337- .

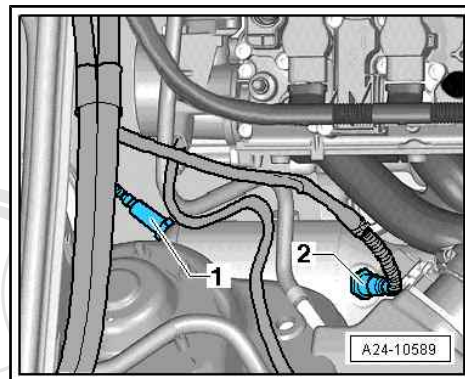
Installing

When installing, note the following:



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Tightening torques: refer to exploded view of Lambda probes ⇒ [page 46](#) .*



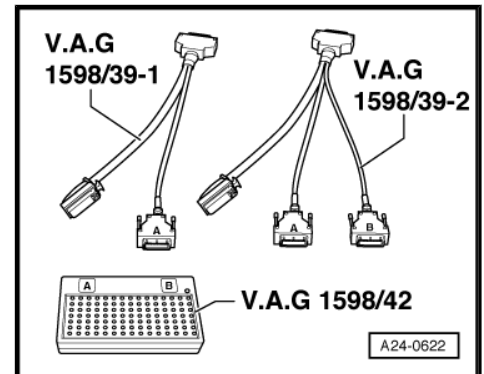
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3 Engine control unit

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

Special tools and workshop equipment required

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

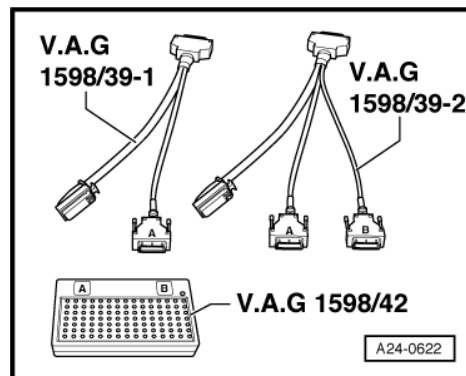


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Note

- ◆ 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.
- ◆ If you want to check a wiring connection to the engine control unit, first refer to the current flow diagram to find out which connector on the engine control unit the wiring connection leads to. If this is a wire which leads to the 60-pin connector (e.g. the activation wire for the intake manifold change-over valve, T60/27), then attach the smaller of the two connectors to connection "A" of the test box -V.A.G 1598/42- (using adapter cable -V.A.G 1598/39-1-) and measure to pin 27.
- ◆ If a wiring connection leads to the 94-pin connector (according to current flow diagram), then connect the larger of the two connectors using adapter cable -V.A.G 1598/39-2- as follows: The connector marked "A" must be attached to connection "A" on the test box -V.A.G 1598/42- and the connector marked "B" must be attached to connection "B" on the test box -V.A.G 1598/42- .
- ◆ The test box -V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time.
- ◆ The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).
- ◆ The relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.



WARNING

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

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- The engine control unit has to be removed before multi-pin connectors can be unplugged from engine control unit
⇒ [page 51](#) .
- 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 locking plate must be re-fitted on the control unit.
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.

- Interrogate fault memory and erase if necessary. If you have erased fault memory, you must then generate readiness code in engine control unit in “Guided Functions” mode (refer to vehicle diagnosis and service information system -VAS 5052-).

 Note

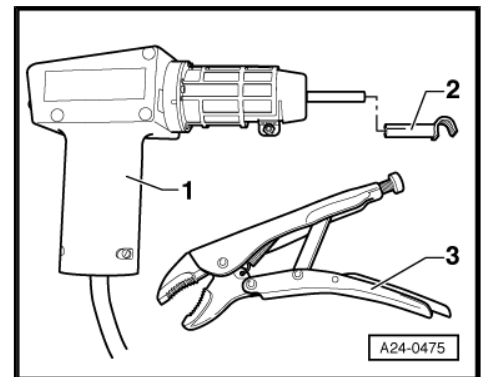
After completion of the Guided Fault Finding routine, the tester will attempt to erase the fault memories of all control units. If this is not successful, the remaining faults registered in the memories must be rectified until all faults can be erased.

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3.2 Renewing engine control unit -J623-

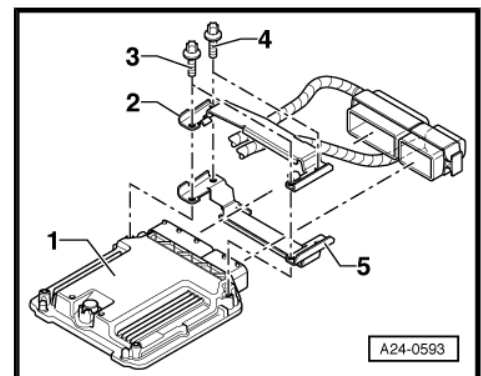
Special tools and workshop equipment required

- ◆ Hot air blower (220 V/ 50 Hz) -VAS 1978/14- -item 1- with nozzle attachment -2- from wiring harness repair set -VAS 1978-
- ◆ Small, commercially available vice grip pliers -3- (mole grip)



 Note

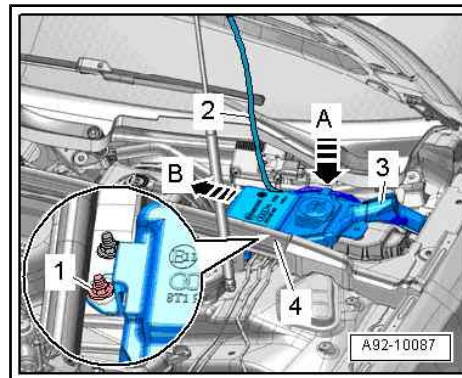
- ◆ The engine control unit -1- is bolted to the protective housing -5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.
- ◆ The metal casing has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).



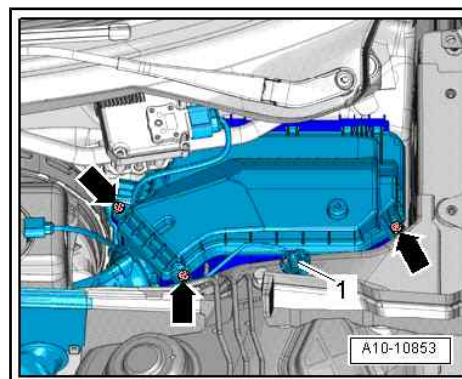
Removing

- When renewing engine control unit, select diagnosis object “Renew engine control unit” in “Guided Functions” ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- Switch off ignition and remove ignition key.

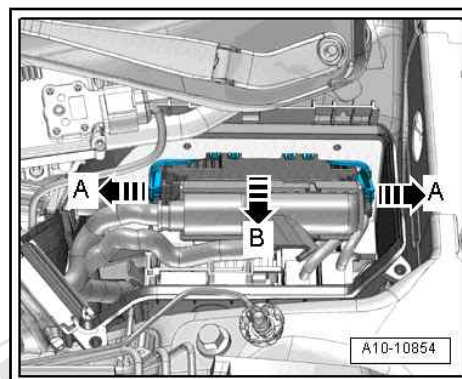
- Slightly pull off rubber seal in front of nut -1- on plenum chamber cover.
- Unhook wiring harness -2- from retainers -A-.
- Remove nut -1-.
- Pull filler neck -3- with filler pipe out of washer fluid reservoir and through opening in body.



- Unscrew bolts -arrows- and take off cover for electronics box.

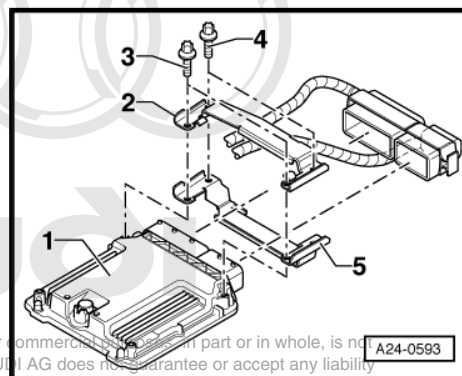


- Release retainers -arrows A- and pull out engine control unit -J623- -arrow B-.



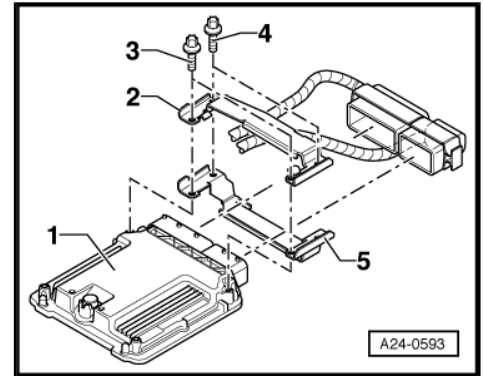
To help prevent unauthorised access to the connectors on the engine control unit, the engine control unit -1- is bolted to a metal casing -5- by means of shear bolts -3 and 4- and a locking plate -2-.

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 bolts, the threads must therefore be heated with the hot-air blower.



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

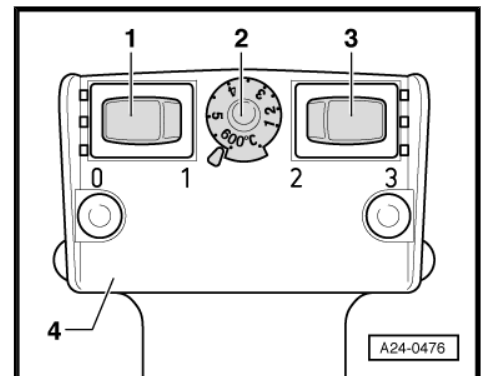


- Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.

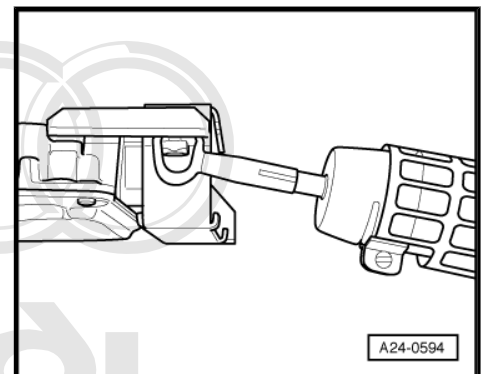


WARNING

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



- Apply heat to the threads of the shear bolts on the connector side for approx. 25 to 30 seconds.
- Unscrew shear bolts using vice-grip pliers (see arrow in illustration).



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- The two shear bolts screwed into the engine control unit do not need to be heated. They can be removed without heating.
- Detach metal locking plate from control unit connectors.
- Release connectors on engine control unit and unplug connectors.
- Take out old engine control unit -J623- and install new engine control unit -J623- .

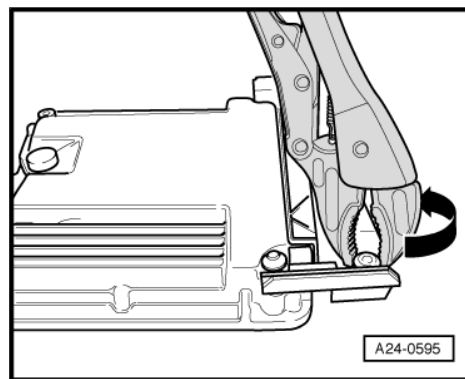
Installing

Installation is performed in the reverse sequence.

- After installation, the locking plate must be re-fitted on the engine control unit -J623- .
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.
- ◆ Tightening torque for bolts securing cover of electronics box: 3.5 Nm.

After installing a new engine control unit, the following operation must be performed:

- Activate engine control unit on vehicle diagnosis and service information system -VAS 5052- in "Guided Functions" mode, "Renew engine control unit".



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28 – Ignition system

1 General notes and safety precautions

1.1 General notes on ignition system

- ◆ The engine control unit has a self-diagnosis capability.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ 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.
- ◆ If the engine starts, runs for a short period and then cuts out after completing fault finding, repairs or component tests, this may be due to the immobiliser disabling the engine control unit. The fault memory must then be interrogated and, if necessary, the control unit must be adapted.

1.2 Safety precautions



WARNING

- ◆ *Test equipment must always be secured on the rear seat and operated from that position by a second person.*
- ◆ *If test and measuring instruments are operated from front passenger's seat and the vehicle is involved in an accident, the person sitting in this seat could be seriously injured when the airbag is triggered.*

To avoid any risk of injuries to persons and/or damage to the fuel injection and ignition system, always observe the following safety precautions.

- ◆ Do not touch or disconnect ignition wiring when the engine is running or being turned at starter speed.
- ◆ The ignition must be switched off before disconnecting or connecting ignition system wiring, high-voltage wires and test leads.
- ◆ If you want to crank the engine at starting speed without actually starting it (e.g. compression test), first unplug the connectors from the ignition coils and the injectors. After completing the work, interrogate and erase the fault memory.
- ◆ Always switch off the ignition before cleaning the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

2 Servicing ignition system

2.1 Test data

Engine data	1.8 ltr. turbo FSI engine
Idling speed is not adjustable; controlled by the idling speed stabilisation	640...800 rpm
Engine speed limiter (deactivates injectors/closes throttle valve)	approx. 6,500 rpm
Ignition timing is determined by the control unit. Ignition timing cannot be adjusted.	
Ignition system	Multi-coil ignition system with 4 ignition coils (integrated output stages) connected directly to spark plugs via spark plug connectors; ignition coils can be pulled out of cylinder head using puller - T40039 -
Firing order	1-3-4-2

2.2 Ignition system - exploded view

1 - Knock sensor 1 -G61-

- ☐ Contacts gold-plated
- ☐ Removing and installing
⇒ [page 58](#)

2 - Ignition coil with output stage

- ☐ Ignition coil 1 with output stage -N70-
- ☐ Ignition coil 2 with output stage -N127-
- ☐ Ignition coil 3 with output stage -N291-
- ☐ Ignition coil 4 with output stage -N292-
- ☐ Removing and installing
⇒ [page 57](#)
- ☐ Use puller -T40039- for removal

3 - Spark plug

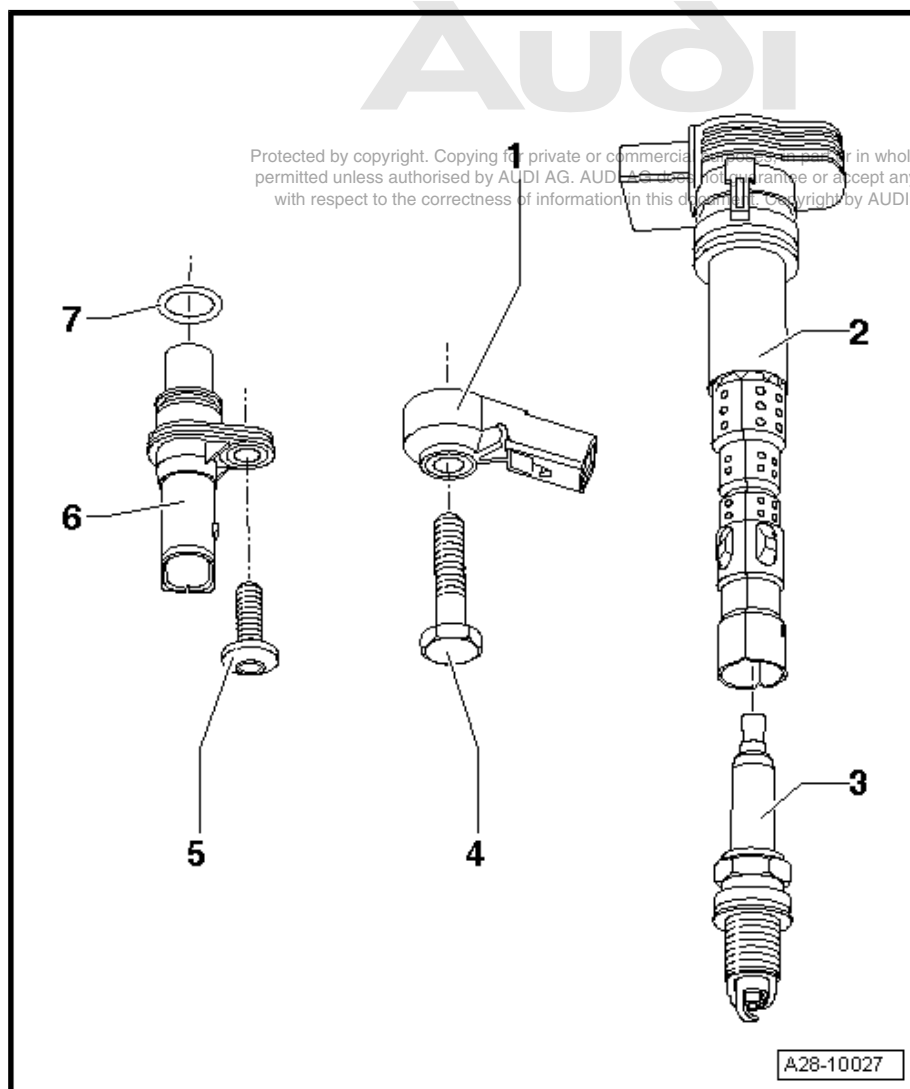
- ☐ 30 Nm
- ☐ Removing and installing
⇒ Maintenance ; Book-let 811

4 - Bolt

- ☐ 20 Nm
- ☐ Tightening torque influences functions of knock sensor

5 - Bolt

- ☐ 10 Nm



6 - Hall sender -G40-

- ☐ Contacts gold-plated

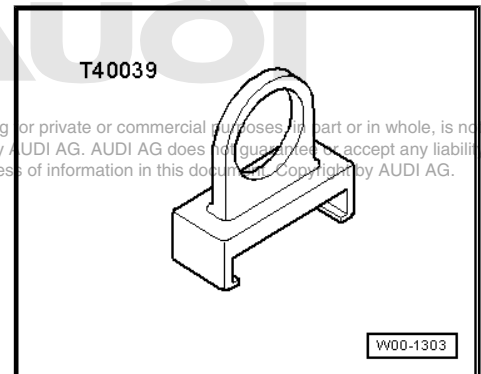
7 - O-ring

- ☐ Renew O-Ring if damaged

2.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

- ◆ Puller -T40039-



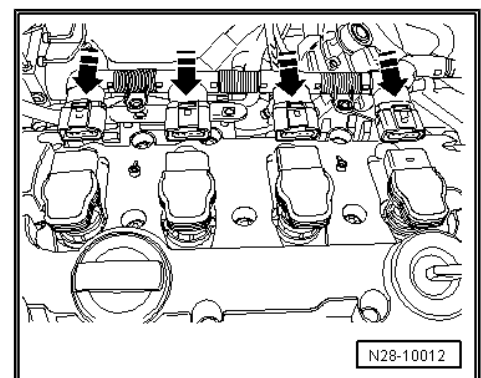
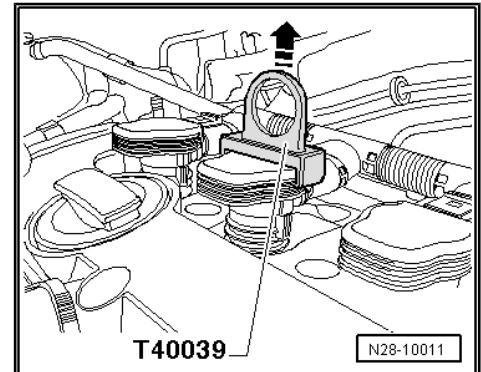
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Removing:

- Remove engine cover.
- Unscrew two bolts on connector rail.
- Pull all ignition coils approx. 30 mm out of spark plug holes using puller -T40039-.
- Release connectors and unplug all connectors from the ignition coils at the same time.

Installing:

- Fit all ignition coils loosely into spark plug holes.
- Align the ignition coils with the connectors and attach all connectors onto ignition coils simultaneously.
- Press ignition coils onto spark plugs by hand with uniform pressure (do not use tool).



2.4 Removing knock sensor 1 -G61-

Removing

- Unplug electrical connector -2- at knock sensor 1 -G61- .
- Remove coolant pump with thermostat ➔ Engine, mechanics; Rep. Gr. 19 .



Note

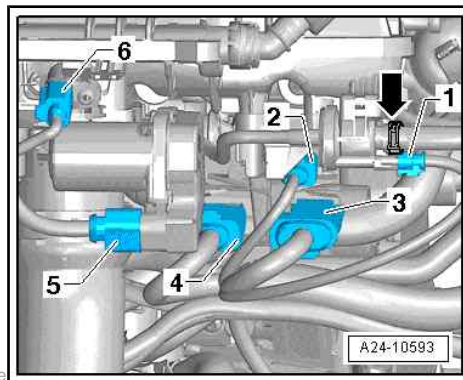
Knock sensor 1 -G61- is located below the intake manifold and behind the coolant pump.

- Unscrew knock sensor 1 -G61- .

Installing

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- Install in **reverse order** .
- ♦ Tightening torque: refer to exploded view of ignition system ➔ [page 56](#) .



2.5 Removing and installing engine speed sender -G28-

Removing

- Unplug electrical connector at engine speed sender -G28- -2- using assembly tool -T10118- .



Note

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

- Unscrew securing bolt -1- for engine speed sender -G28- .

Installing

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

- ♦ Tightening torques: refer to overview of fitting locations ➔ [page 5](#) .

