

Workshop Manual Audi A1 2011 ➤

**Direct petrol injection and ignition system (4-cyl. 2.0 ltr.
4-valve turbo)**

Engine ID	CDL H							
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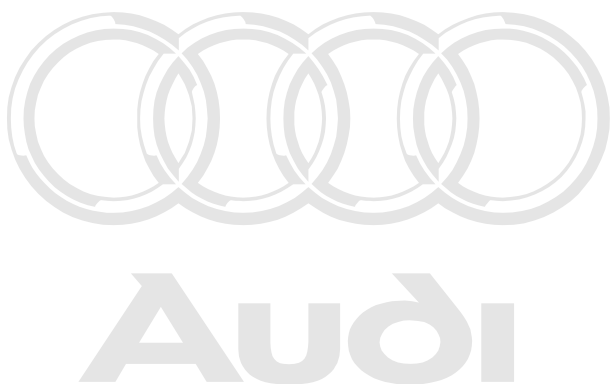
List of Workshop Manual Repair Groups

Repair Group

00 - Technical data

24 - Mixture preparation - injection

28 - Ignition 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.

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00 – Technical data

1 Safety precautions

⇒ „1.1 Safety precautions when working on the fuel supply system“, page 1

⇒ „1.2 Reducing pressure in high-pressure section of injection system“, page 2

⇒ „1.3 Safety precautions when working on vehicles with start/stop system“, page 3

⇒ „1.4 Safety precautions when using testers and measuring instruments during a road test“, page 4

⇒ „1.5 Safety precautions when working on the ignition system“, page 4

1.1 Safety precautions when working on the fuel supply system

Please note the following warnings when working on the fuel supply system:



WARNING

The fuel system operates at extremely high pressure. This can cause injury.

- ◆ *The fuel system is pressurised. The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system; for the correct procedure see ⇒ „1.2 Reducing pressure in high-pressure section of injection system“, page 2.*

- ◆ *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.*

- ◆ *Wear protective gloves.*

- ◆ *Wear safety goggles.*

Escaping fuel can cause a fire risk.

- ◆ *As the fuel pump is activated by the door contact switch when the driver's door is opened, disconnect the voltage supply for the fuel pump if the battery has NOT been disconnected.*

- ◆ *Remove fuse for fuel pump control unit -J538- → Current flow diagrams, Electrical fault finding and Fitting locations.*



Caution

To prevent irreparable damage to the electronic components when disconnecting the battery:

- ◆ *Observe notes on procedure for disconnecting the battery.*

Always switch off the ignition before disconnecting the battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

Even small amounts of dirt can cause malfunctions. For this reason, please observe the following rules when working on the fuel supply system and injection system:

- ◆ 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. Do not use fluffy 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.
- ◆ Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

1.2 Reducing pressure in high-pressure section of injection system



WARNING

The fuel system operates at extremely high pressure. This can cause injury.

- ◆ *The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 7 bar).*
- ◆ *Prior to opening the high-pressure section (e.g. when removing the high-pressure pump, fuel rail, injectors, fuel pipes or fuel pressure sender -G247-), the fuel pressure in the high-pressure section must be reduced to a residual pressure of approx. 7 bar. The procedure is described below.*

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester

Reducing fuel pressure in high-pressure section:

- Connect vehicle diagnostic tester and perform function „Reduce fuel pressure“ in „Guided Functions“.
- **Fuel pressure will drop to a specified value.**
- **Switch off ignition.**

The fuel rail is still filled with fuel, however it is no longer under high pressure.

**WARNING**

There is a risk of injury: avoid skin contact with fuel.

- ◆ *Wear safety goggles and protective clothing when opening the fuel system.*
- ◆ *Before opening the high-pressure section of the fuel system, place a clean cloth around the connection to catch escaping fuel.*

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

**Note**

- ◆ *The pressure will increase again due to the effect of residual heat if the high-pressure system is not opened immediately.*
- ◆ *The ignition must not be switched on again from this point on as this would increase the pressure again.*

Additional steps required

- Erase event memory and generate readiness code in engine control unit in „Guided Functions“ mode.

1.3 Safety precautions when working on vehicles with start/stop system

When performing repairs on vehicles with start/stop system, note the following:

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**WARNING**

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

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

1.4 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.*

1.5 Safety precautions when working on the ignition system

Observe the following to prevent injuries to persons and damage to the injection and ignition system:

- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and xenon headlights.
- ◆ Do not open any fuel line connections while the engine is running.
- ◆ Always switch off the ignition before connecting or disconnecting electrical wiring for the injection or ignition system or tester cables.
- ◆ If the event 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 starting speed without actually starting (e.g. to test compression pressure), detach the four connectors from the ignition coils using the puller - T40039-. Also remove fuse for fuel pump control unit -J538-.



Caution

To prevent irreparable damage to the electronic components when disconnecting the battery:

- ◆ *Observe notes on procedure for disconnecting the battery.*
- ◆ *Always switch off the ignition before disconnecting the battery ⇒ Electrical system; Rep. gr. 27; Battery; Disconnecting and connecting battery.*

2 Repair instructions

⇒ „2.1 Rules for cleanliness“, page 5

⇒ „2.2 General notes“, page 5

⇒ „2.3 General repair instructions“, page 6

⇒ „2.4 Checking vacuum system“, page 6

2.1 Rules for cleanliness

Even small amounts of dirt can cause malfunctions. For this reason, please observe the following rules when working on the fuel supply system, injection system and turbocharger:

- ◆ 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.
- ◆ Place parts that have been removed on a clean surface and cover them over. Use only lint-free cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ 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 and do not move the vehicle.
- ◆ Make sure that no fuel runs onto the fuel hoses. Should this occur, the fuel hoses must be cleaned again immediately.
- ◆ Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

2.2 General notes

- ◆ The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding, the event memory must be interrogated. The vacuum hoses and connections must also be checked (unmetered air).
- ◆ 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](#).

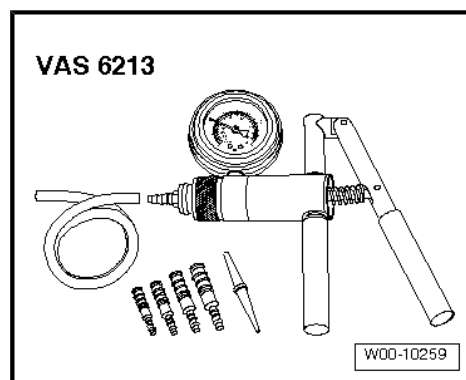
2.3 General repair instructions

- ◆ Clean tools and workbench etc. before working on the injection system.
- ◆ 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.
- ◆ 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.
- ◆ All cable ties which are released or cut open when removing must be refitted in the same position when installing.
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.

2.4 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 all vacuum lines leading to the corresponding component and also check the remaining vacuum lines leading to other components.
- If it is not possible to build up 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.

24 – Mixture preparation - injection

1 Injection system

⇒ „1.1 Overview of fitting locations - injection system“,
page 7

Technical data

Engine data		2.0 ltr. 184 kW turbo FSI engine
Idling speed (cannot be adjusted; is regulated by idling speed stabilisation)		760 ±100 rpm
Maximum rpm governed by deactivation of fuel injectors		6800 ±100 rpm
Fuel pressure	Initial fuel pressure up to high-pressure pump (generated by electric fuel pump in fuel tank)	approx. 6.0 bar (identical for all operating conditions)
	Pressure in high-pressure fuel circuit (generated by a mechanical single-plunger high-pressure pump) at a coolant temperature of approx. 85°C	approx. 35 bar at idling speed approx. 150 bar in certain parts of operating range

1.1 Overview of fitting locations - injection system

Components A to L are not shown in the overview.

1 - Hall sender -G40- (cam-shaft position sensor)

- ❑ Fitting location
⇒ [page 12](#)
- ❑ Electrical connectors for Hall sender -G40-
⇒ [page 13](#)

2 - Connector

- ❑ For Lambda probe - G39- and Lambda probe heater -Z19- (black) ⇒ [page 14](#)

3 - Charge pressure control solenoid valve -N75-

- ❑ Located directly on turbocharger ⇒ [page 15](#)

4 - Turbocharger

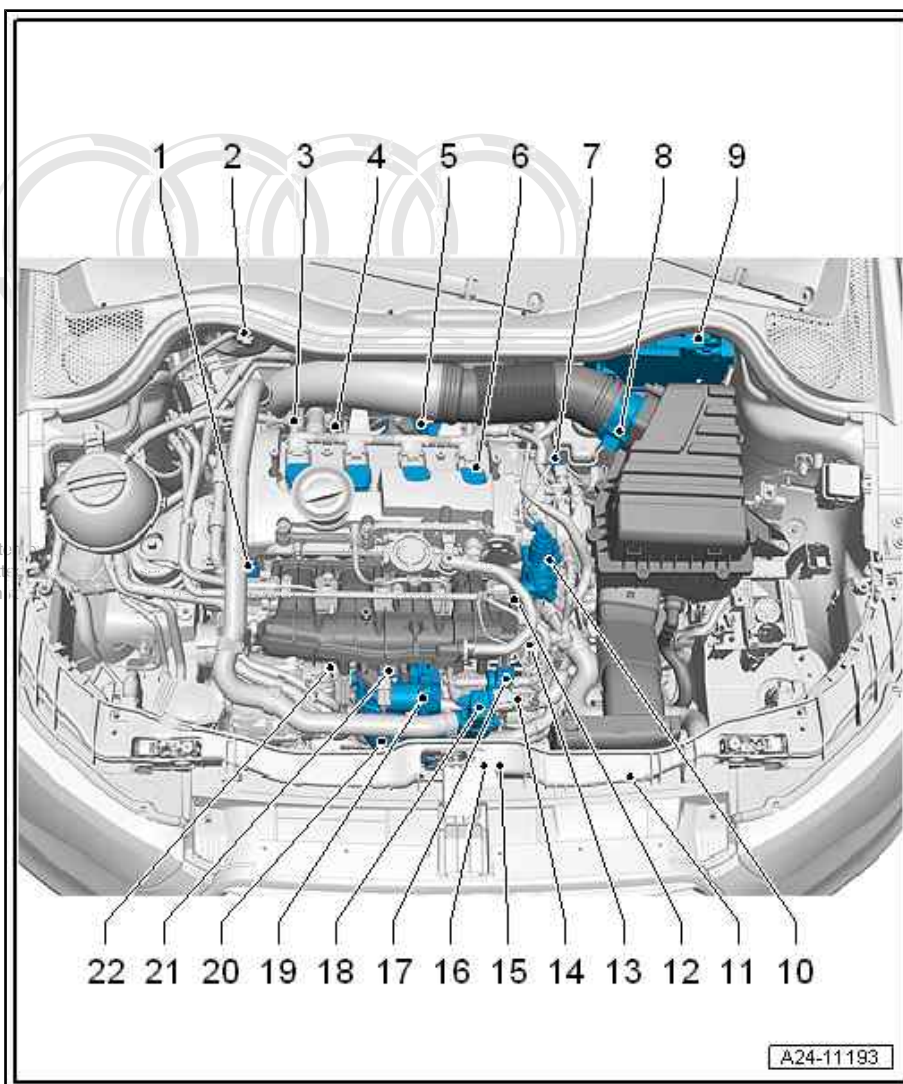
- ❑ Removing and installing
⇒ Engine, mechanics;
Rep. gr. 21 ; Removing and installing turbocharger

5 - Lambda probe -G39- and Lambda probe heater -Z19-

- ❑ Fitting location
⇒ [page 14](#)
- ❑ Removing and installing
⇒ [page 54](#)

6 - Ignition coils with output stages

- ❑ Removing and installing
⇒ [page 65](#)
- ❑ 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-
- ☐ Puller -T40039- is required for removing ignition coils from cylinder head.

7 - Camshaft control valve 1 -N205-

- ☐ Removing and installing ⇒ Rep. gr. 15

8 - Air mass meter -G70-

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

9 - Engine control unit -J623-

- ☐ Removing and installing ⇒ [page 60](#)

10 - High-pressure pump

- ☐ With fuel pressure regulating valve -N276-
- ☐ Removing and installing ⇒ [page 37](#)

11 - Radiator outlet coolant temperature sender -G83-

- ☐ Fitting location ⇒ [page 11](#)

12 - Fuel pressure sender for low pressure -G410-

- ☐ 15 Nm

13 - Coolant temperature sender -G62-

- ☐ Fitting location ⇒ [page 11](#)

14 - Intake manifold flap motor -V157- with intake manifold flap potentiometer -G336-

- ☐ After fuel rail has been removed or renewed, intake manifold flap potentiometer -G336- must be re-adapted to engine control unit -J623-; see „Guided Functions“ using vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 31](#)

15 - Engine speed sender -G28-

- ☐ Electrical connectors for knock sensor 1 -G61- and for knock sensor 2 -G66-
- ☐ Fitting location ⇒ [page 13](#)

16 - Charge pressure sender -G31-

- ☐ Fitting location ⇒ [page 13](#)

17 - Activated charcoal filter solenoid valve 1 -N80-

- ☐ Fitting location ⇒ [page 15](#)

18 - Turbocharger air recirculation valve -N249-

- ☐ Fitting location ⇒ [page 15](#)
- ☐ Removing and installing ⇒ Rep. gr. 21

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

- ☐ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ☐ After throttle valve module -J338- has been renewed, it must be re-adapted to engine control unit -J623- ; see „Guided Functions“ using a vehicle diagnostic tester

20 - Continued coolant circulation pump -V51-

- ☐ Fitting location ⇒ [page 14](#)

21 - Intake air temperature sender -G42-

22 - Fuel pressure sender -G247-

- ☐ 22 Nm
- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ [page 46](#)
- ☐ Electrical connectors for fuel pressure sender -G247- ⇒ [page 13](#)

A - Fuel pump control unit -J538-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Adaption of fuel pump must be performed after renewing fuel pump control unit -J538- ; see „Guided Functions“ using a vehicle diagnostic tester

B - Brake light switch -F- and brake pedal switch -F63-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing ⇒ Rep. gr. 45

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

- ☐ Fitting location ⇒ [page 11](#)
 - ☐ On accelerator pedal (both senders are accommodated in one housing)
 - ☐ If accelerator pedal module or engine control unit is renewed, kick-down function must be adapted on vehicles with automatic gearbox
 - ☐ Removing and installing ⇒ Rep. gr. 20
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D - Clutch position sender -G476-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing, see Power transmission, clutch ⇒ Rep. gr. 30

E - Relay and fuse holder in electronics box

- ☐ Removing relay and fuses ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

F - Radiator fan control unit -J293-

- ☐ Fitting location ⇒ [page 14](#)

G - Injectors

- ☐ In fuel rail
- ☐ Removing and installing ⇒ [page 39](#)
- ☐ Injector, cylinder 1 -N30-
- ☐ Injector, cylinder 2 -N31-
- ☐ Injector, cylinder 3 -N32-
- ☐ Injector, cylinder 4 -N33-

The fuel injectors are high-pressure injectors. They inject fuel at high pressure (maximum approx. 110 bar) directly into the cylinder.

H - Lambda probe after catalytic converter -G130- and Lambda probe heater 1 after catalytic converter -Z29-

- ☐ Fitting location ⇒ [page 15](#)
- ☐ Removing and installing ⇒ [page 55](#)

I - Knock sensor 1 -G61-

- ☐ For cylinders 1 and 2
- ☐ 20 Nm
- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing ⇒ [page 65](#)

J - Knock sensor 2 -G66-

- ☐ For cylinders 3 and 4
- ☐ 20 Nm
- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing ⇒ [page 66](#)

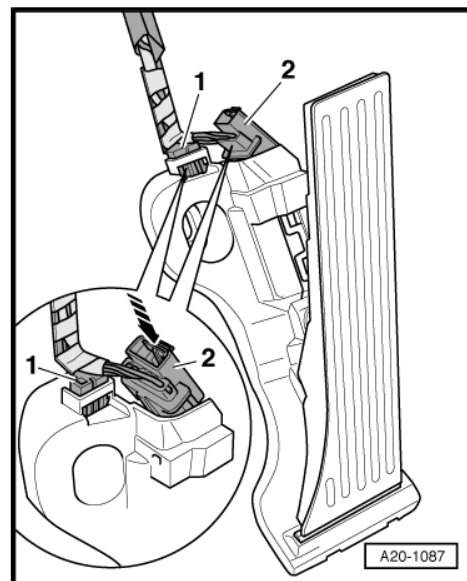
K - Oil pressure switch -F1-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing, installing and testing ⇒ Rep. gr. 17

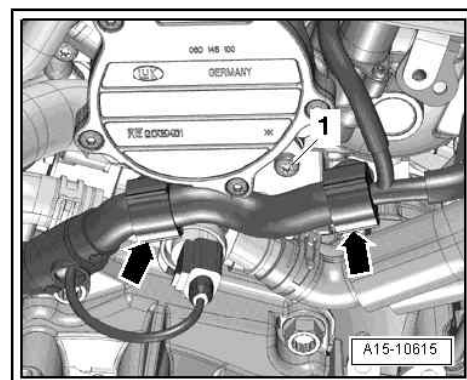
Accelerator position sender -G79- and accelerator position sender 2 -G185-

2 - Electrical connector for accelerator pedal module

Removing and installing ⇒ Rep. gr. 20

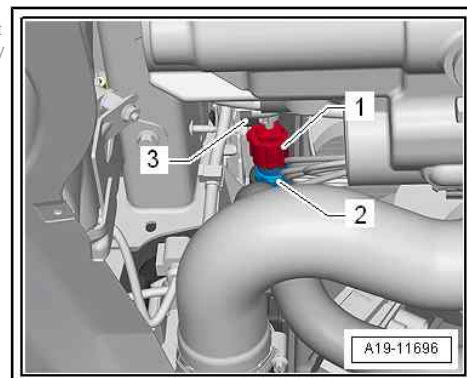


Coolant temperature sender -G62- -1-



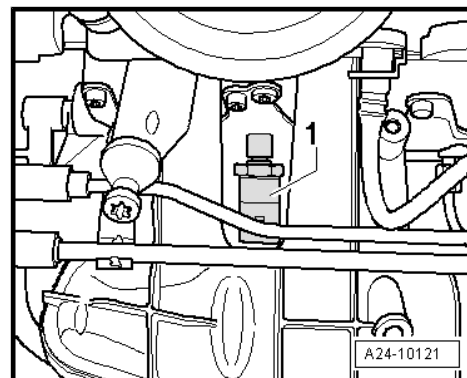
Radiator outlet coolant temperature sender -G83- -2-

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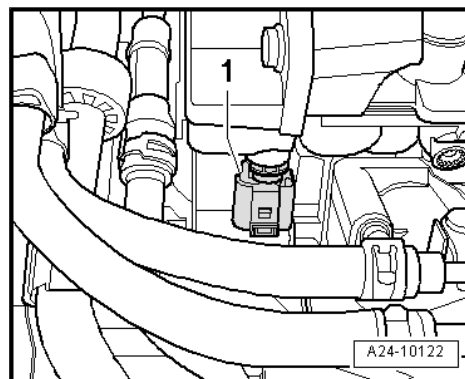


Fuel pressure sender -G247- -1-

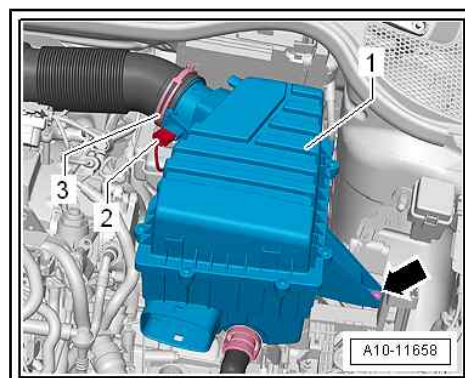
Removing and installing ⇒ [page 46](#)



Hall sender -G40- -1-

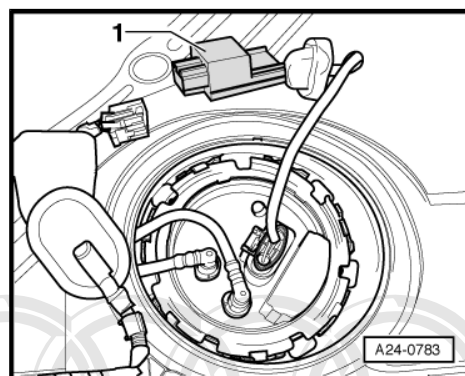


Air mass meter -G70- -2-



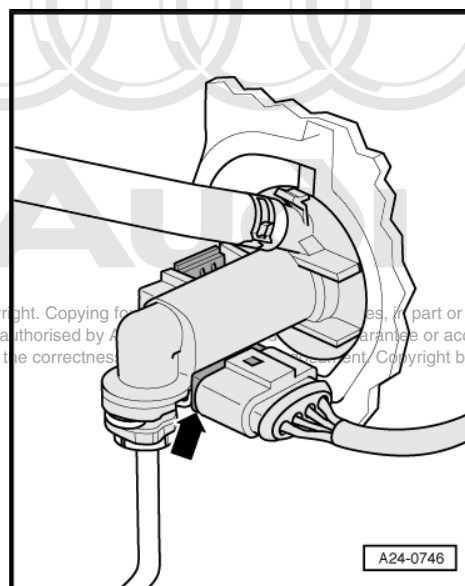
Fuel pump control unit -J538- -1-

Adaption of fuel pump must be performed after renewing fuel pump control unit -J538-. For basic setting, measured value block 103, refer to ⇒ Rep. gr. 20 .



Clutch position sender -G476-

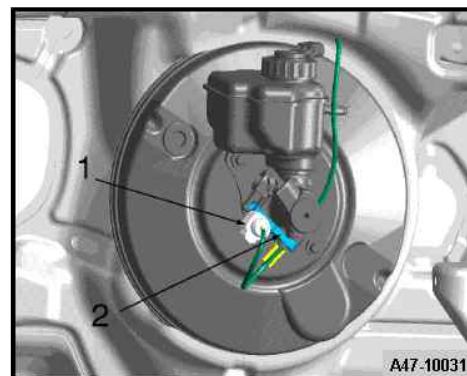
Removing and installing, see Power transmission, clutch ⇒ Rep. gr. 30



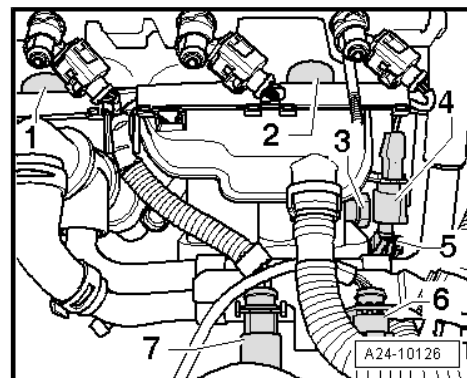
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Brake light switch -F- and brake pedal switch -F63-

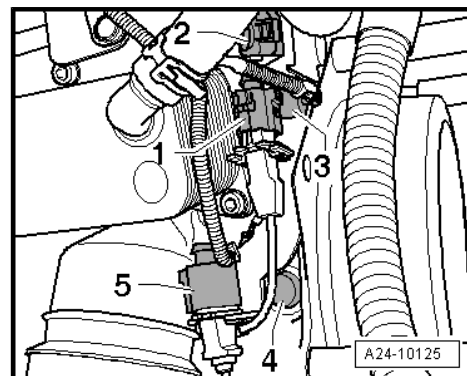
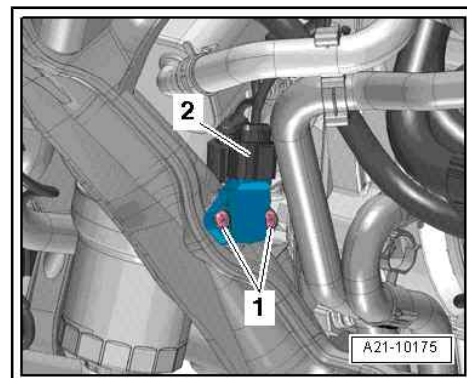
Removing and installing ⇒ Rep. gr. 45

**Fitting locations of components below intake manifold**

- 1 - Knock sensor 1 -G61-
- 2 - Knock sensor 2 -G66-
- 3 - Oil pressure switch -F1-
- 4 - 3-pin connector (brown) for knock sensor 2 -G66-
- 5 - 3-pin electrical connector (grey) for engine speed sender - G28-
- 6 - Electrical connector for Hall sender -G40- and fuel pressure sender -G247-
- 7 - 8-pin connector for injectors

**Electrical connectors**

- 1 - 3-pin connector (green) for knock sensor 1 -G61-
- 2 - 3-pin connector (brown) for knock sensor 2 -G66-
- 3 - Oil pressure switch -F1-
- 4 - Engine speed sender -G28-
- 5 - 3-pin electrical connector (grey) for engine speed sender - G28-

**Charge pressure sender -G31- -2-**

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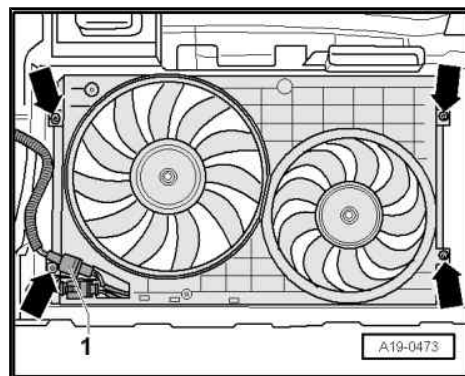
Radiator fan control unit -J293-

1 - Connector for radiator fan control unit -J293-

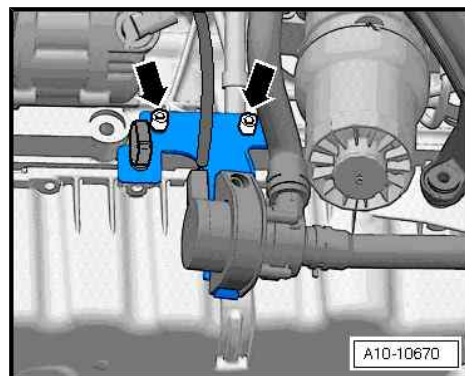


Note

The radiator fan control unit -J293- is integrated into the radiator fan -V7- .

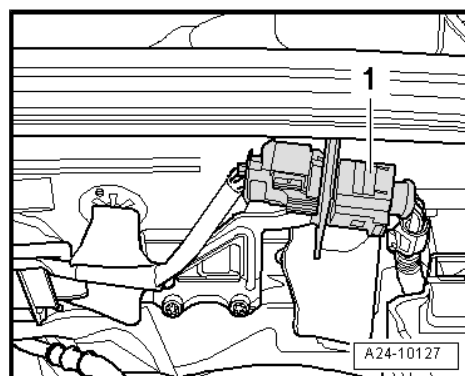


Continued coolant circulation pump -V51-

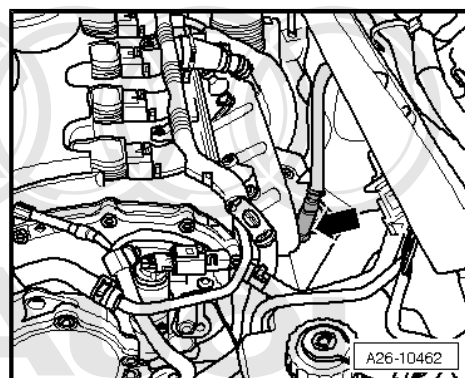


Electrical connector -arrow-

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



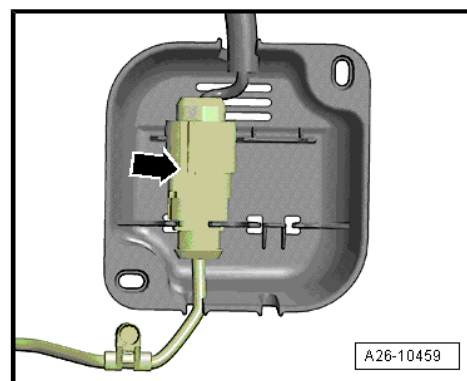
Lambda probe -G39- -arrow-



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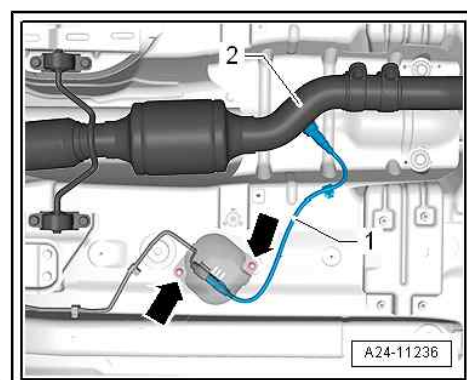
Electrical connector -arrow-

- Lambda probe, after catalytic converter -G130- and Lambda probe heater 1, after catalytic converter -Z29- on underbody (right-side)



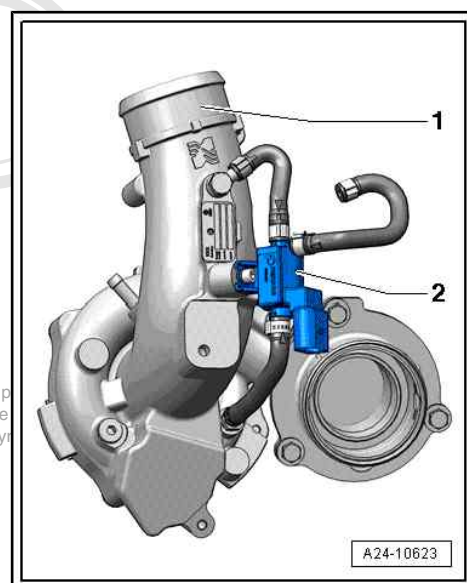
Lambda probe after catalytic converter -arrow-

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



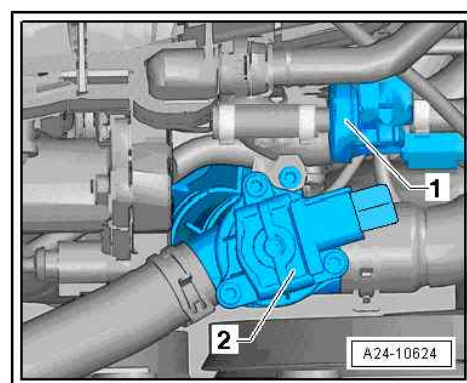
Components on turbocharger:

- 1 - Removing and installing turbocharger → Rep. gr. 21
- 2 - Tighten charge pressure control solenoid valve -N75- to 3 Nm



Turbocharger air recirculation valve -N249- -2-

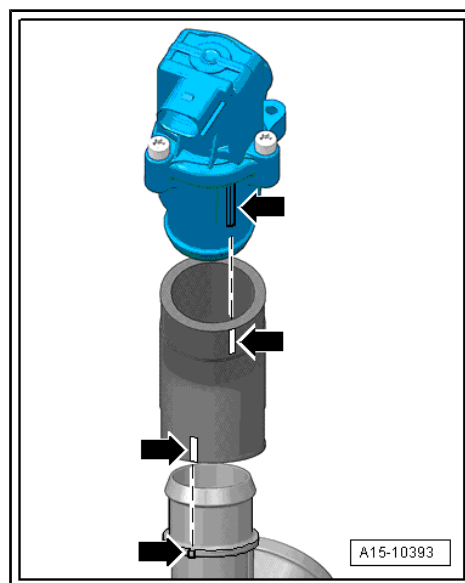
- 1 - Activated charcoal filter solenoid valve 1 -N80-
- 2 - Turbocharger air recirculation valve -N249-





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

The marks -arrows- must align.



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2 Air cleaner

⇒ „2.1 Exploded view - air cleaner“, page 17

⇒ „2.2 Removing and installing air filter element“, page 19

⇒ „2.3 Removing and installing air cleaner housing“, page 20

2.1 Exploded view - air cleaner

1 - Air cleaner (top section)

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

2 - Bolt

- ☐ 5 Nm

3 - Plug

4 - Air hose

- ☐ Connection of air mass meter -G70- to engine

5 - Bolt

- ☐ 3 Nm

6 - Spring-type clip

7 - Connecting pipe with mounting for air mass meter - G70-

8 - Air mass meter -G70-

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

9 - Bolt

- ☐ 3 Nm

10 - Nut

- ☐ Secures bracket to body
- ☐ 10 Nm

11 - Bracket

- ☐ Air cleaner housing (rear)

12 - Rubber mounting

- ☐ Mounting for bracket (rear)

13 - Rubber bush

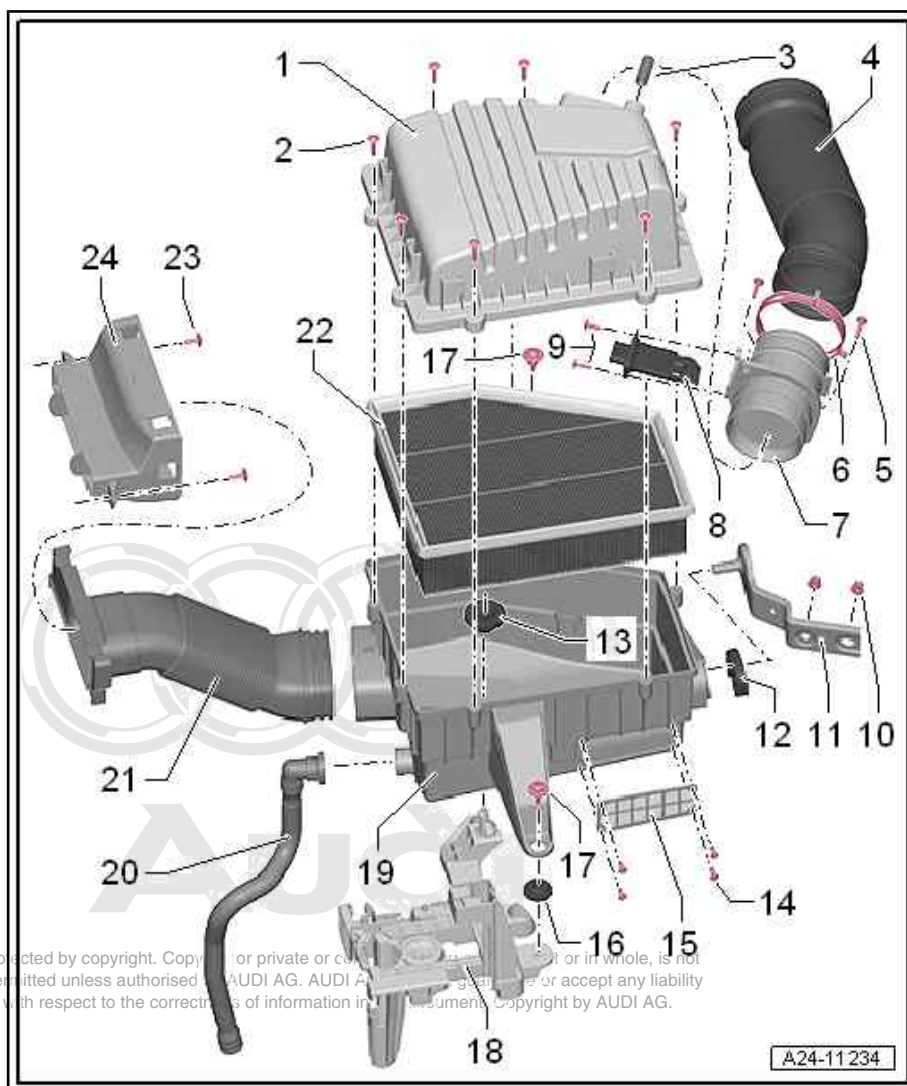
- ☐ Mounting for bracket (centre)

14 - Pins

- ☐ Secure snow screen (additional opening for increased performance)
- ☐ Pins are removed from inside to outside

15 - Snow screen

- ☐ Secure snow screen (additional opening for increased performance)
- ☐ Check for dirt and damage every time maintenance is performed
- ☐ Renew if damaged
- ☐ Clean if dirty





16 - Rubber bush

- ☐ Mounting for bracket (left-side)

17 - Bolt

- ☐ 10 Nm

18 - Bracket with mountings for air cleaner housing

19 - Air cleaner (bottom section)

- ☐ Clean any salt residue, leaves and dirt out of air cleaner (bottom section)
- ☐ Removing and installing ⇒ [page 20](#)
- ☐ Clean out dirt, leaves and salt deposits

20 - Water drain hose

- ☐ Clean out dirt and leaves etc. from opening
- ☐ Check operation

21 - Front air duct

- ☐ Clean out dirt, leaves and salt deposits

22 - Air filter element

- ☐ Removing and installing ⇒ [page 19](#)
- ☐ Always use genuine part for air filter element
- ☐ Observe change intervals ⇒ Maintenance ; Booklet 810

23 - Bolt

- ☐ 5 Nm

24 - Mounting for air duct

- ☐ Bolted to lock carrier
- ☐ Clean out dirt, leaves and salt deposits



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2.2 Removing and installing air filter element

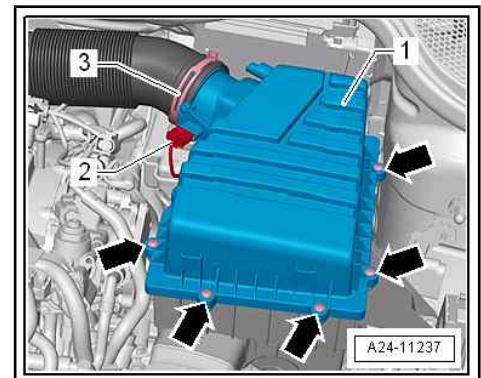
Removing

- Release spring-type clip -3- and detach air hose from air mass meter -G70- .
- Unplug electrical connector -2- from air mass meter -G70- .
- Remove bolts -arrows- and lift off air cleaner (top section).
- Take out air filter element -1-.

Installing

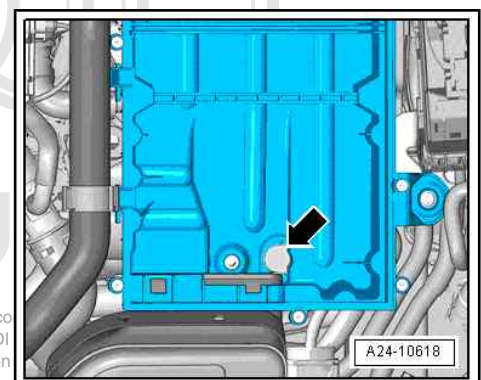
Installation is carried out in the reverse order; note the following:

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



Note

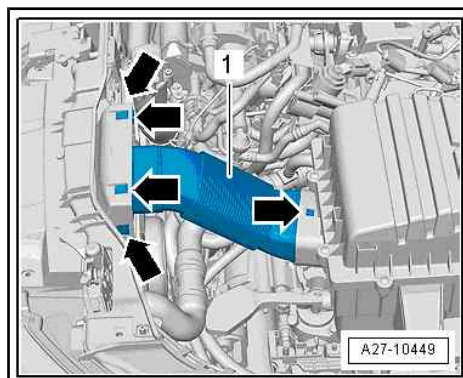
- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element.*
- ◆ *The air cleaner housing MUST be clean.*
- ◆ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To prevent malfunctions, cover all critical parts of the engine air intake tract (air mass meter, snow screen covering opening for increased performance ⇒ [Item 15 \(page 17\)](#) , intake pipes etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ *Please observe requirements for disposal.*
- Blow out water drain (in bottom section of air cleaner housing) with compressed air and check function.
- Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections), using a vacuum cleaner if necessary.
- Check for salt residue, dirt and leaves in air mass meter and air hose (engine intake side).
- Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
- Carefully fit top section of air cleaner onto bottom section, without using any 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).
- ◆ Tightening torque
⇒ [„2.1 Exploded view - air cleaner“, page 17](#)



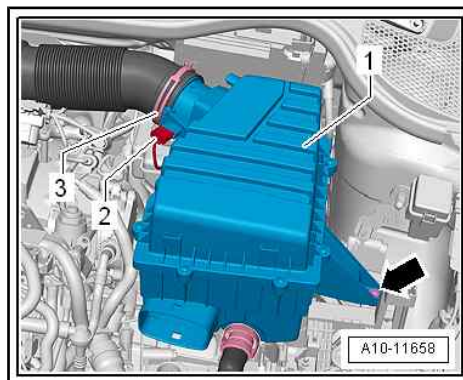
2.3 Removing and installing air cleaner housing

Removing

- Release fasteners -arrows- and detach air duct -1-.



- Unplug electrical connector -2- for air mass meter -G70- .
- Release hose clip -3- and detach air hose from intake connecting pipe.
- Disconnect water drain hose from air cleaner housing.
- Unscrew bolt -arrow- for air cleaner housing and lift air cleaner housing out of both rubber mountings.



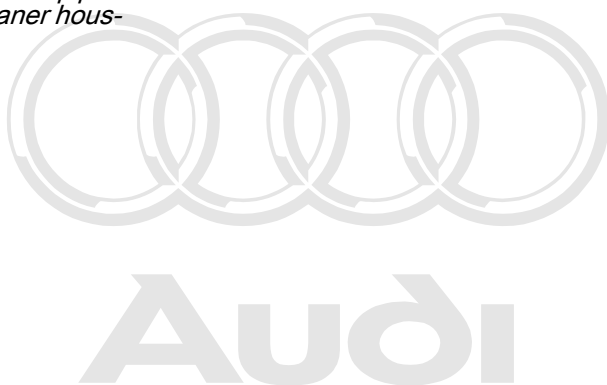
Installing

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



Note

- ◆ *The air cleaner housing MUST be clean.*
- ◆ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To prevent malfunctions, cover all critical parts of the engine air intake tract (air mass meter, snow screen covering opening for increased performance ⇒ [Item 15 \(page 17\)](#) , intake pipes etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ Tightening torque
⇒ [„2.1 Exploded view - air cleaner“, page 17](#)



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3 Engine cover panel

⇒ „3.1 Removing and installing engine cover panel“, page 21

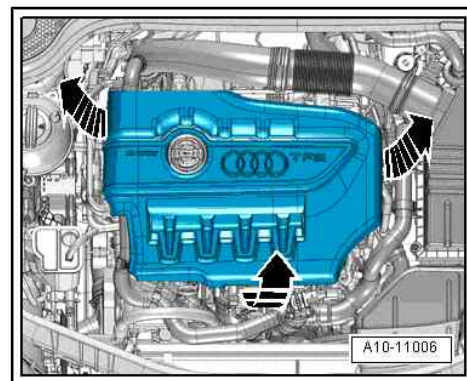
3.1 Removing and installing engine cover panel

Removing

- Carefully lift engine cover panel off mountings -arrows-.

Installing

- Press engine cover panel carefully back into its mountings.
- To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.



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4 Intake manifold

⇒ „4.1 Exploded view - intake manifold“, page 22

⇒ „4.2 Exploded view - fuel rail“, page 24

⇒ „4.3 Removing and installing intake manifold with fuel rail“, page 25

⇒ „4.4 Removing and installing throttle valve module J338“, page 29

⇒ „4.5 Cleaning throttle valve module J338“, page 30

⇒ „4.6 Removing and installing intake manifold flap motor V157“, page 31

⇒ „4.7 Checking intake manifold change-over function“, page 32

⇒ „4.8 Checking dual non-return valve“, page 34

4.1 Exploded view - intake manifold

1 - Screw for intake air temperature sender -G42-

□ 5 Nm

2 - Intake air temperature sender -G42-

3 - Intake manifold

□ Removing and installing
⇒ page 25

4 - Activated charcoal filter solenoid valve 1 -N80-

5 - Bolt for single-plunger high-pressure pump

□ 3x

□ 10 Nm

6 - Fuel pressure regulating valve -N276-

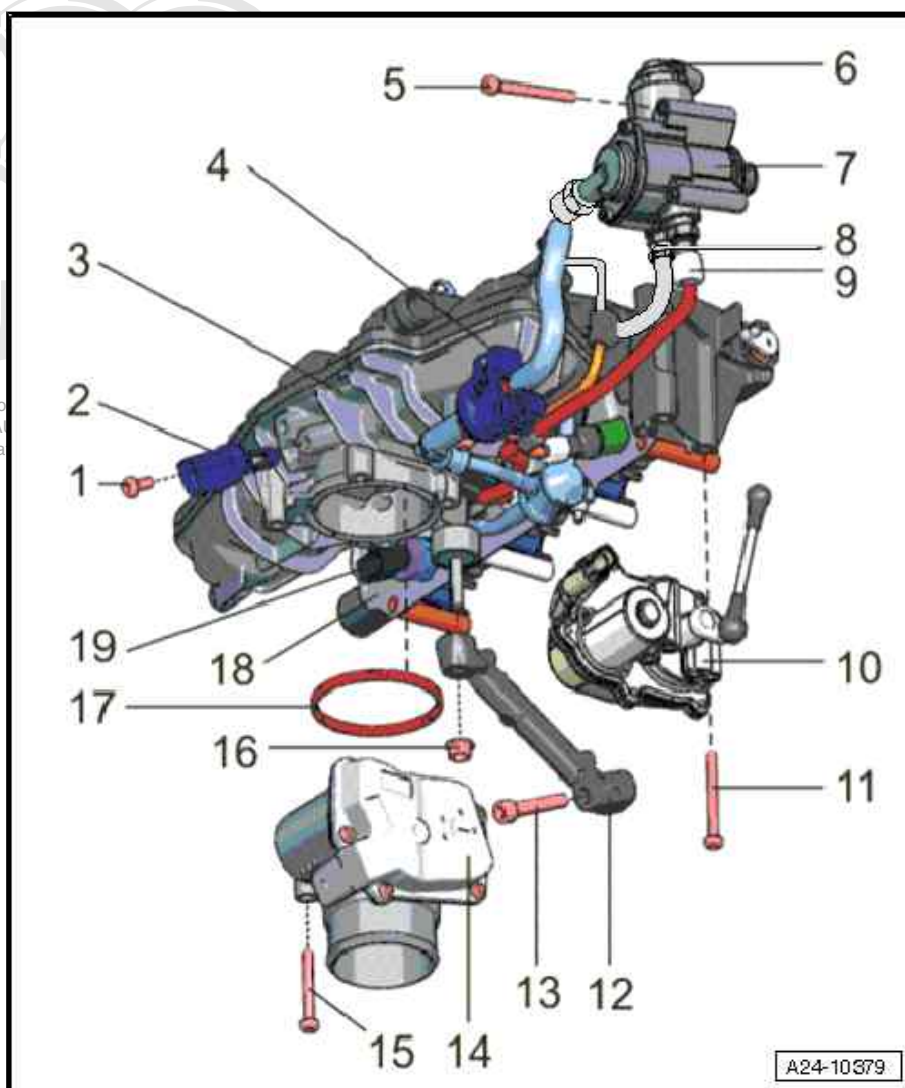
7 - High-pressure pump

□ With fuel pressure regulating valve -N276- and fuel pressure sender, low pressure -G410-

□ An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump at a pressure of approx. 6 bar

□ 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;
procedure for reducing fuel pressure ⇒ [page 2](#)

- ☐ Fuel lines must be free of tension when installed.
- ☐ Removing and installing ⇒ [page 37](#)

8 - Connection for fuel return line to fuel tank

- ☐ Fuel pipe must be free of tension when installed (make sure all parts are clean)

9 - Fuel supply line to fuel rail

- ☐ Renew connecting piece
- ☐ Tighten connecting piece to 30 Nm
- ☐ Fuel line must be free of tension when installed (make sure all parts are clean); tightening torque: 27 Nm

10 - Intake manifold flap motor -V157- with intake manifold flap potentiometer -G336-

- ☐ After fuel rail has been renewed, intake manifold flap potentiometer -G336- must be re-adapted to engine control unit; see „Guided Functions“ using vehicle diagnostic tester .
- ☐ Removing and installing ⇒ [page 31](#)

11 - Bolt for intake manifold flap motor -V157- with intake manifold flap potentiometer -G336-

- ☐ 7 Nm

12 - Intake manifold support

13 - Bolt for intake manifold support

- ☐ 23 Nm

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-
- ☐ After throttle valve module -J338- has been renewed, it must be re-adapted to engine control unit -J623- ; see „Guided Functions“ using a vehicle diagnostic tester

15 - Bolt for throttle valve module -J338-

- ☐ 4x
- ☐ 7 Nm

16 - Securing nut for intake manifold support

- ☐ 10 Nm

17 - Seal

- ☐ Renew

18 - Fuel rail

- ☐ Removing and installing ⇒ [page 25](#)

19 - Fuel pressure sender -G247-

- ☐ 20 Nm

4.2 Exploded view - fuel rail

1 - Radial compensation element

- ☐ Renew if damaged

2 - Injector

- ☐ With combustion chamber ring seal (teflon ring seal): always renew
- ☐ Renew O-rings
- ☐ Ensure correct installation position.
- ☐ Removing and installing
⇒ [page 39](#)

3 - Support ring

4 - Fuel rail

- ☐ Removing and installing
⇒ [page 25](#)

5 - Fuel pressure sender - G247-

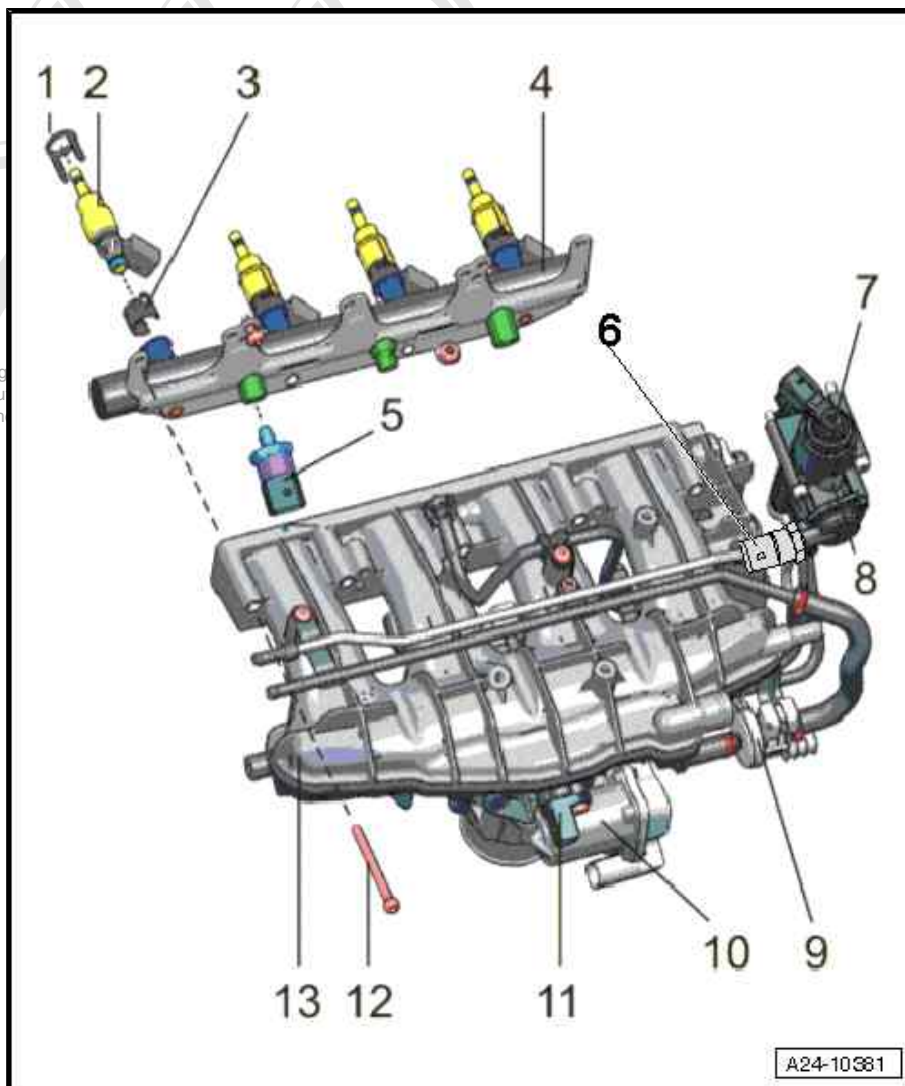
- ☐ 22 Nm
- ☐ Tighten connecting piece to 30 Nm

6 - Fuel pressure sender for low pressure -G410-

7 - Fuel pressure regulating valve -N276-

8 - High-pressure pump

- ☐ With fuel pressure regulating valve -N276- and fuel pressure sender, low pressure -G410-
- ☐ An electric fuel pump (fitted in fuel tank) sup-



plies fuel to the mechanical high-pressure pump at a pressure of approx. 6 bar

- ☐ 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 2](#)
- ☐ Fuel lines must be free of tension when installed.
- ☐ Removing and installing ⇒ [page 37](#)

9 - Activated charcoal filter solenoid valve 1 -N80-

10 - 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-
- ☐ After throttle valve module -J338- has been renewed, it must be re-adapted to engine control unit -J623- ; see „Guided Functions“ using a vehicle diagnostic tester

11 - Intake air temperature sender 2 -G299-

- ☐ 5 Nm

12 - Bolts for intake manifold

- ☐ 9 Nm

13 - Intake manifold

- ☐ Removing and installing ⇒ [page 25](#)

4.3 Removing and installing intake manifold with fuel rail

After fuel rail has been renewed, intake manifold flap potentiometer -G336- must be re-adapted to engine control unit -J623- ; see „Guided Functions“ using vehicle diagnostic tester



Note

- ◆ *The injectors can only be accessed after the intake manifold and the fuel rail with the air flow control flaps have been removed. (Additional or fewer steps may be required depending on the model.)*
- ◆ *The combustion chamber ring seal (teflon) and the O-ring must always be renewed.*
- ◆ *Exploded view - intake manifold ⇒ [page 22](#) .*
- ◆ *Exploded view - fuel rail ⇒ [page 24](#)*

Removing

- Remove radiator cowl ⇒ Rep. gr. 19 ; Removing and installing radiator cowl .



WARNING

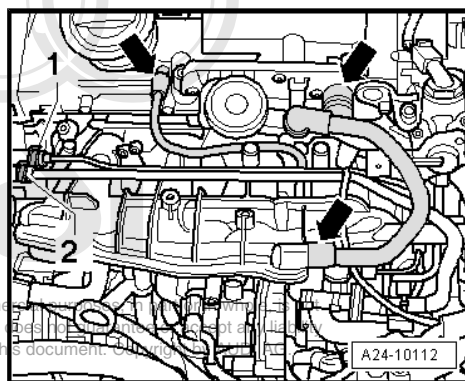
The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ⇒ [page 2](#) .

- Unplug all electrical connectors required.
- Disconnect vacuum hose between intake manifold and vacuum pump from intake manifold.



Note

- ◆ *This vacuum hose and the vacuum pump (located at rear of cylinder head) are only fitted on vehicles with automatic gear-box.*
- ◆ *Ignore items marked 1 and 2 in illustration.*
- Disconnect hose connections -arrows- at cylinder head cover.
- Disconnect vacuum line -2- leading to activated charcoal filter.

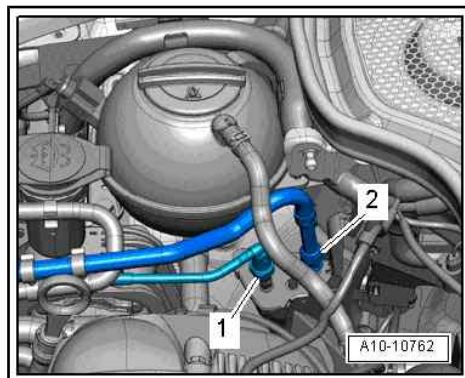


- Disconnect fuel supply hose -2- by pressing release ring.

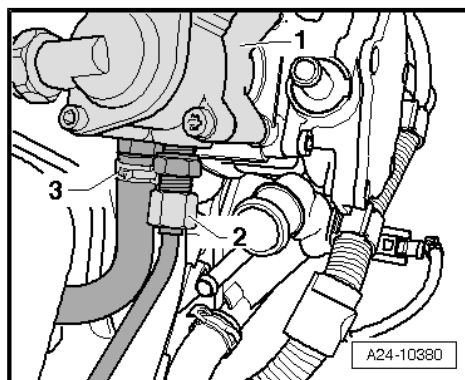


Note

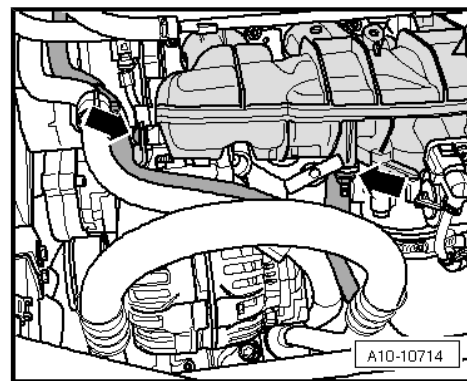
- ◆ *The fuel system must not be under pressure.*
- ◆ *Use a clean cloth to catch escaping fuel.*



- Open both fuel pipe connections -2 and 3- at high-pressure pump.

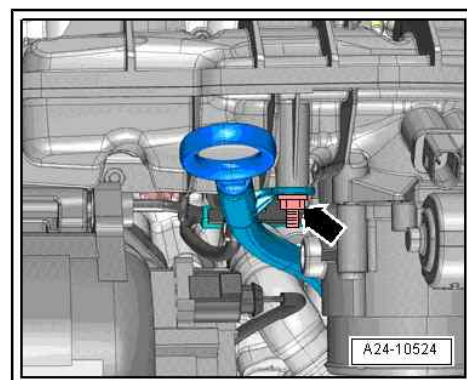


- Unscrew bolt and nut -arrows- and press coolant pipe (front right) to one side (coolant hoses remain attached).

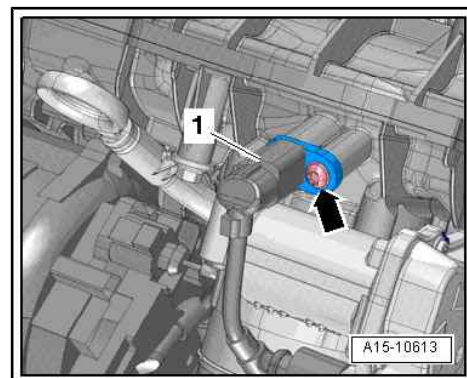


Remove bolt -arrow- for dipstick guide tube.

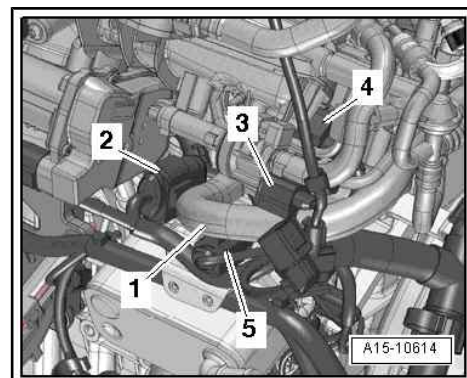
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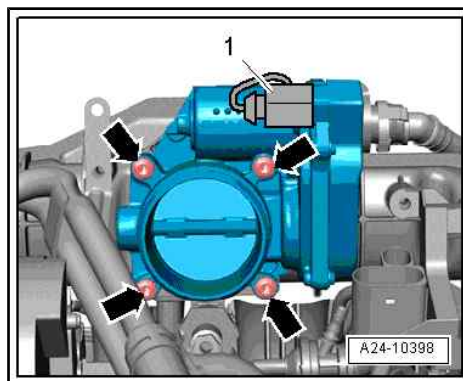
- Unplug electrical connector -1- at intake air temperature sender -G42- .



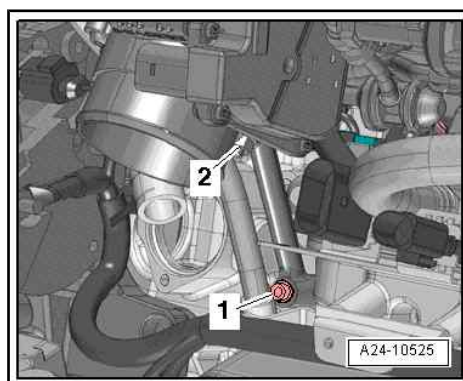
- Unplug electrical connectors:
 - 2 - For injectors (remove electrical connectors from bracket)
 - 3 - For activated charcoal filter solenoid valve 1 -N80-
 - 4 - Intake manifold flap motor -V157-
 - 5 - For fuel pressure sender -G247- and Hall sender -G40- (remove electrical connectors from bracket)



- Unplug electrical connector -1-.
- Remove bolts -arrows- and detach throttle valve module - J338- .



- Unscrew nut -2- and bolt -1- and remove support for intake manifold.



- Unplug electrical connector -1- at fuel pressure sender - G247- .
- Unscrew all bolts from intake manifold.
- Carefully pull intake manifold and fuel rail off cylinder head.



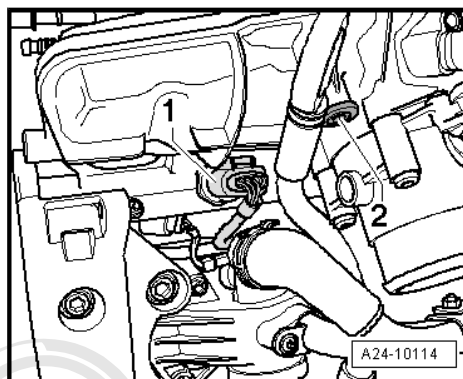
Note

The injectors can remain in the fuel rail.

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

Installing

- Install in reverse order.
- ♦ Tightening torque ⇒ „4.1 Exploded view - intake manifold“, [page 22](#)
- ♦ Tightening torque ⇒ „4.2 Exploded view - fuel rail“, [page 24](#)
- Install radiator cowl ⇒ Rep. gr. 19 ; Removing and installing radiator cowl .



4.3.1 Removing and installing fuel rail

If fuel rail is renewed, intake manifold flap potentiometer G336 must be adapted to engine control unit J623; see „Guided Functions“ using vehicle diagnostic tester

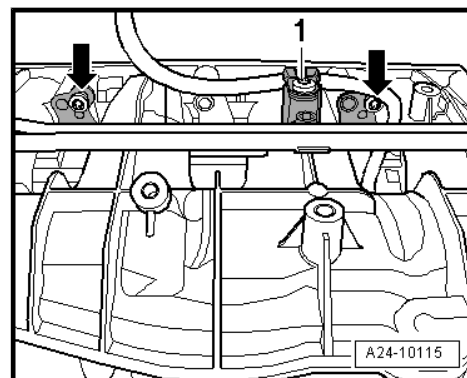


Note

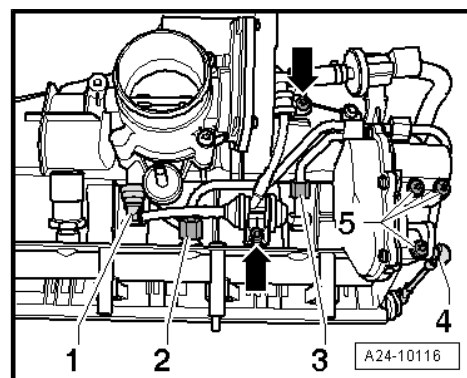
Intake manifold must be removed; removing intake manifold ⇒ [page 25](#) .

- Remove hoses from activated charcoal filter.

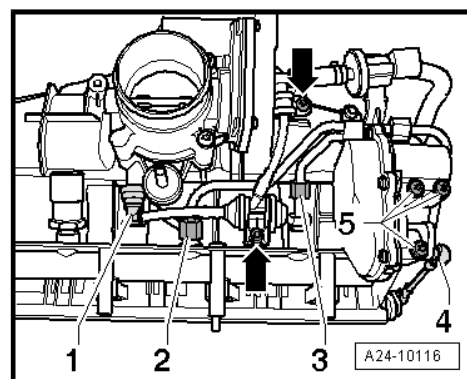
- To do so, release hose clip -1-.
- Loosen both bolts -arrows- on fuel rail.
- Detach hose connection -1- from intake manifold and unscrew two bolts -arrows-.



- Disconnect both fuel lines -2- and -3-.
- Carefully press linkage off intake manifold flap motor -V157- -4-.



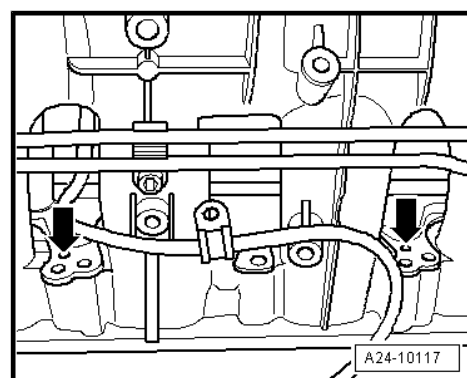
- Unbolt intake manifold flap motor -V157- -5-.



- Press fuel rail over retaining lugs -arrows- on intake manifold.
- Detach fuel rail from intake manifold.

Installing

- Install in reverse order.
- Install intake manifold ⇒ [page 25](#).



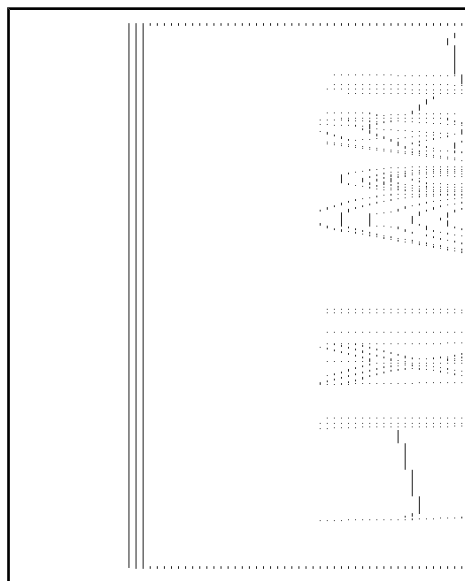
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4.4 Removing and installing throttle valve module -J338-

Removing

- Remove engine cover panel.
- Remove noise insulation.

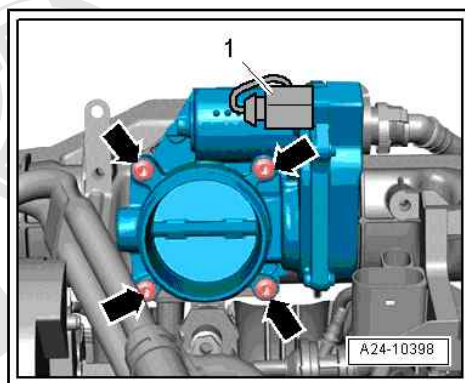
- Release screw-type clips -top arrows-, unscrew bolts -bottom arrows- and remove charge air pipe and hose from below.
- Unplug electrical connector -1- from throttle valve module - J338- .



- Remove the four bolts -arrows- from throttle valve module - J338- and detach throttle valve module -J338- .

Installing

- Install in reverse order.
- Clean sealing surface for seal.
- Renew seal.
- Tightening torques
⇒ „4.1 Exploded view - intake manifold“, page 22
- After throttle valve module -J338- has been renewed, it must be re-adapted to engine control unit -J623- ; see „Guided Functions“ using a vehicle diagnostic tester.



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4.5 Cleaning throttle valve module -J338-



Note

- ◆ *The throttle valve module must be adapted if a new engine control unit -J623- is installed.*
- ◆ *Take care not to scratch the throttle valve housing when cleaning it.*

Special tools and workshop equipment required

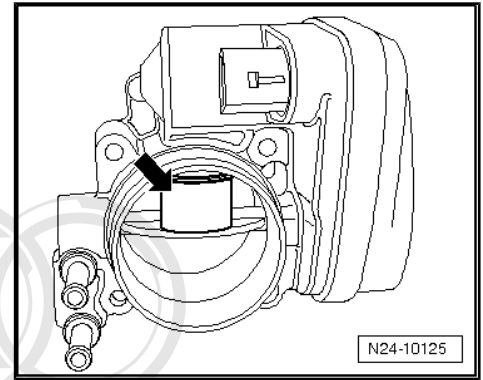
- ◆ Acetone (commercially available)
- ◆ Brush
- Remove throttle valve module -J338- ⇒ [page 29](#) .

- Open throttle valve by hand and lock it in open position with a wedge (plastic or wood) -arrow-.

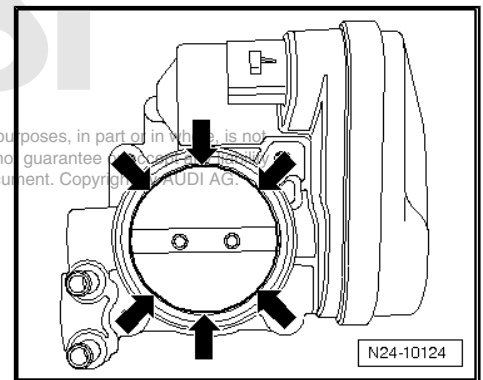
**WARNING**

Acetone is highly flammable.

- ◆ *Observe all accident prevention regulations and safety precautions when handling flammable liquids.*
- ◆ *Do not use compressed air when cleaning the throttle valve.*
- ◆ *Wear safety goggles and protective clothing to avoid any contact with skin and risk of injury.*



- Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.
- Wipe out throttle valve housing with a lint-free cloth.
- Allow acetone to flash off completely.
- Install throttle valve module -J338- ⇒ [page 29](#) .
- Erase learnt values and adapt engine control unit -J623- to throttle valve module -J338- . Use vehicle diagnostic tester .



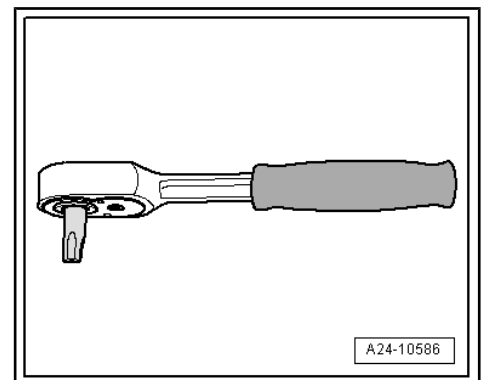
4.6 Removing and installing intake manifold flap motor -V157-

Removing and installing intake manifold flap motor -V157- with intake manifold flap potentiometer -G336-

For fitting location of intake manifold flap motor -V157- , refer to ⇒ [„4.1 Exploded view - intake manifold“, page 22](#) .

Special tools and workshop equipment required

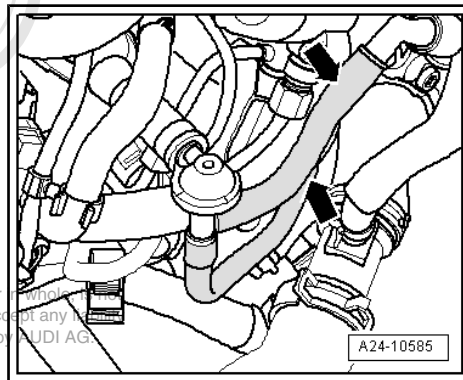
- ◆ Standard 1/4 inch ratchet
- ◆ Torx insert 30



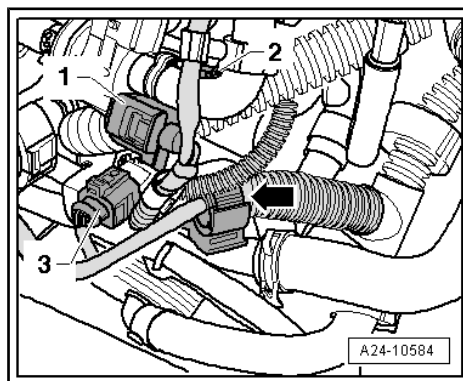
Removing

- Remove radiator cowl ⇒ Rep. gr. 19 ; Removing and installing radiator cowl .

- Detach vacuum lines -arrows-.



- Remove bracket -arrow- for electrical wiring harness.
- Unplug electrical connectors connected to electrical wiring harness and move wiring harness as far as necessary to one side.
- Pull bracket for connectors off coolant pipe.
- Carefully pry off linkage from intake manifold flap motor -V157- -4-.



- Unbolt intake manifold flap motor -V157- -5-.

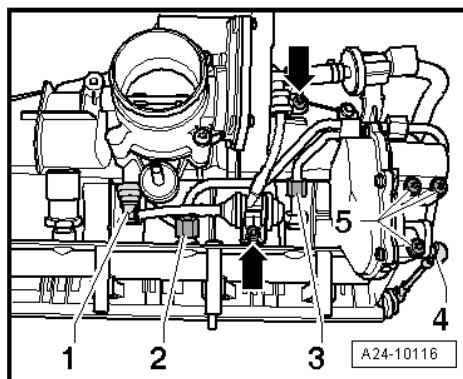


Note

The illustration shows the intake manifold flap motor -V157- with the intake manifold removed.

Installing

- Install in reverse order.
- ♦ Tightening torque: refer to intake manifold - exploded view
⇒ [page 22](#)
- Install radiator cowl ⇒ Rep. gr. 19 ; Removing and installing radiator cowl .

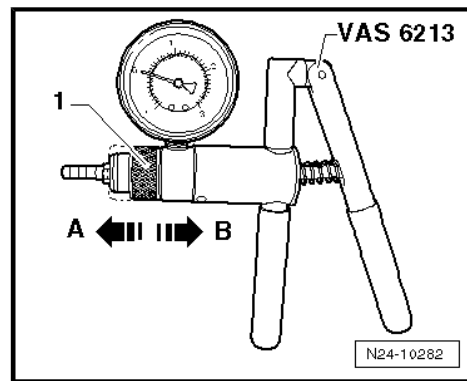


4.7 Checking intake manifold change-over function

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 vacuum pump -VAS 6213-



Test condition

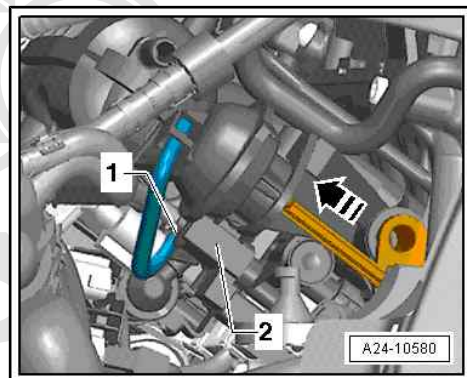
- ◆ Intake manifold flap valve -N316- has been checked with vehicle diagnostic tester.

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

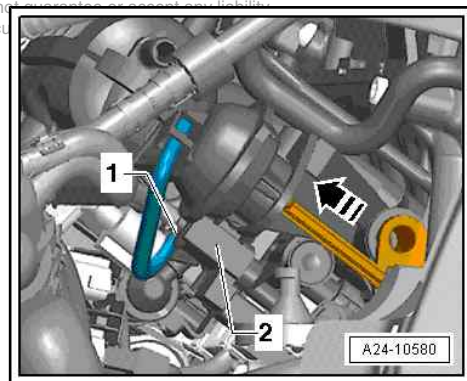
- Carefully pull off engine cover panel.
- Start engine and run at idling speed.
- Have a second mechanic rev up engine quickly (short burst of throttle) and observe vacuum unit for intake manifold change-over.
- The vacuum unit should pick up -arrow-.

If the change-over does not operate as described:

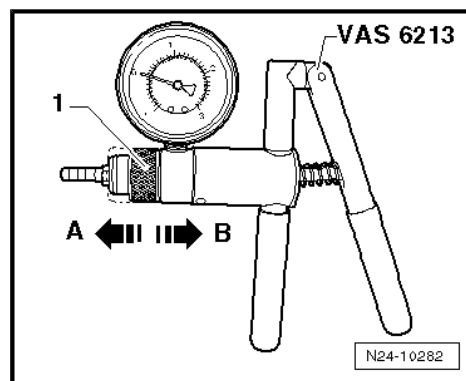
- Check vacuum system for leaks.
- Check that change-over mechanism moves freely by operating linkage manually.
- Check proper connection of vacuum lines.
- Check vacuum hoses for porosity.



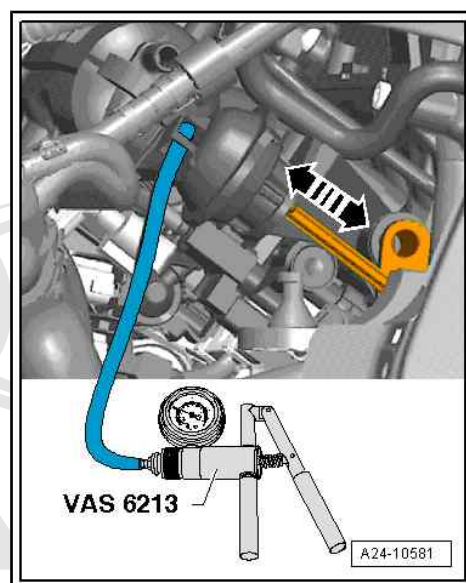
- Disconnect vacuum hose -1- leading to vacuum unit for intake manifold flap valve -N316- at intake manifold flap valve -N316-2-.



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



- Connect hand vacuum pump -VAS 6213- to vacuum unit for intake manifold flap valve -N316- .
 - Operate the hand vacuum pump -VAS 6213- several times.
- The vacuum unit should move -arrows-.
- If vacuum unit does not move, it must be renewed.

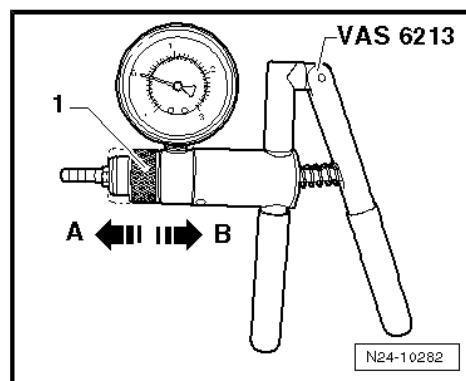


4.8 Checking dual non-return valve

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Special tools and workshop equipment required

- ◆ Hand vacuum pump -VAS 6213-

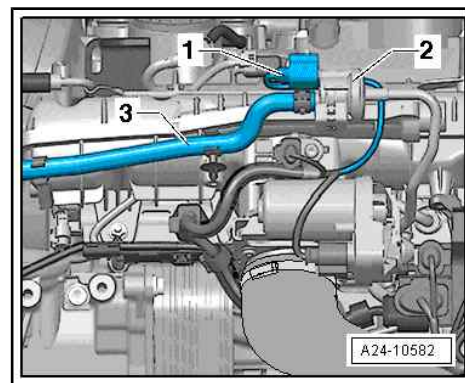


- ◆ Auxiliary measuring set -V.A.G 1594C-

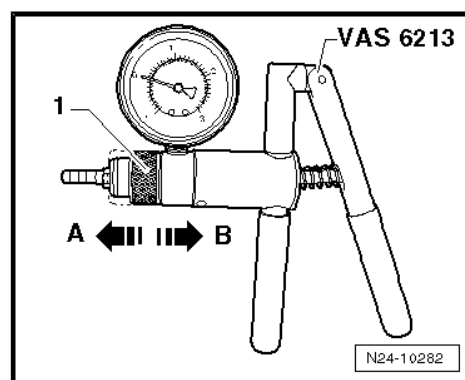
Test condition

- Activated charcoal filter solenoid valve 1 -N80- has been checked with vehicle diagnostic tester and is OK.
- Carefully pull off engine cover panel.

- Unplug connector -1- and detach breather line -3- from activated charcoal filter solenoid valve 1 -N80- -2-.



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



- Connect hand 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- .

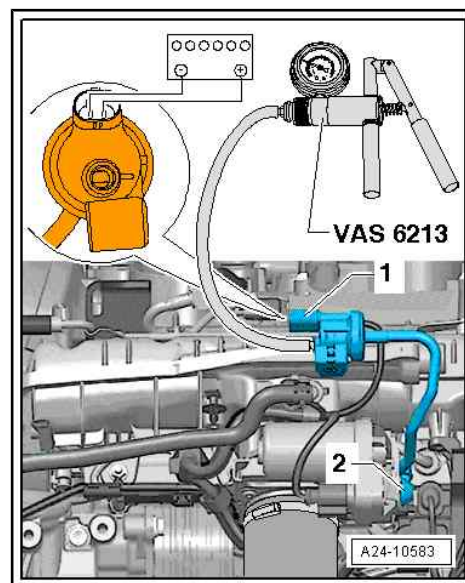
Then immediately operate hand vacuum pump -VAS 6213- several times.

- 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.



5 High-pressure pump

⇒ „5.1 Exploded view - high-pressure pump“, page 36

⇒ „5.2 Removing and installing high-pressure pump“, page 37

5.1 Exploded view - high-pressure pump

1 - High-pressure pump

- ☐ With fuel pressure regulating valve -N276-
- ☐ An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump at a pressure of approx. 6 bar
- ☐ 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; procedure for reducing fuel pressure ⇒ [page 2](#)
- ☐ Fuel lines must be free of tension when installed.
- ☐ Removing and installing ⇒ [page 37](#)

2 - O-ring

- ☐ Renew

3 - Connecting piece for fuel return line to fuel tank

- ☐ It is important to leave the old seal in the pump when replacing the threaded connection. When it is first installed at the supplier it becomes crushed and cannot be removed. For this reason, the threaded connection has a deformable sealing lip

4 - Connecting piece for fuel supply line to fuel rail

- ☐ Renew connecting piece
- ☐ Tighten connecting piece to 27 Nm
- ☐ Union nut for fuel supply line must be free of tension when installed

5 - High-pressure pipe

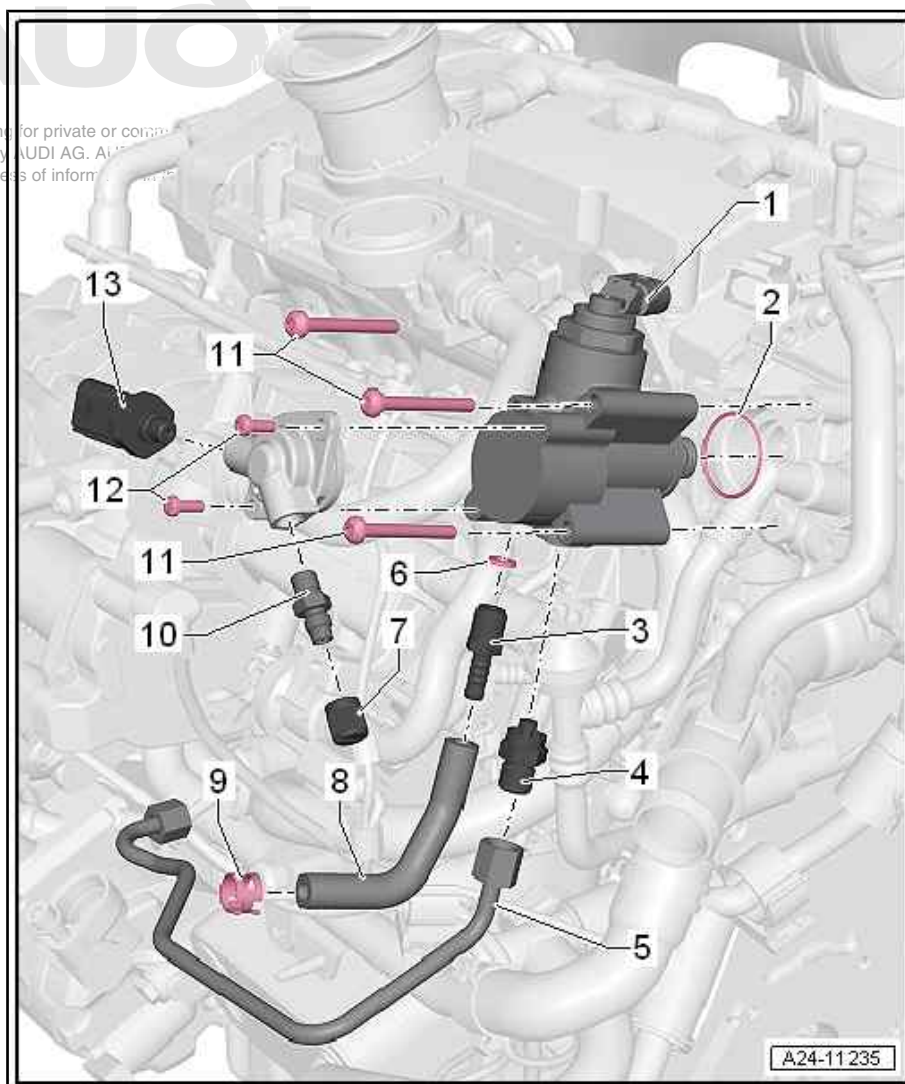
- ☐ Install so that parts are free of tension
- ☐ Check for damage and cracking

6 - Seal

- ☐ Renew

7 - Sealing cap

- ☐ Fuel discharge valve



8 - Fuel return line

- ☐ Connection for high-pressure pump has a deformable sealing lip
- ☐ Renew after removing

9 - Spring-type clip**10 - Fuel discharge valve**

- ☐ 15 Nm

11 - Securing bolts for high-pressure pump

- ☐ Tighten to 8 Nm in diagonal sequence, then turn 90° further
- ☐ Renew

12 - Bolts

- ☐ Cover with mountings for test adapter and fuel pressure sender for low pressure -G410-
- ☐ Hand-tighten to 8 Nm, then tighten 90° further
- ☐ Renew

13 - Fuel pressure sender for low pressure -G410-

- ☐ 15 Nm

5.2 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 2](#)

**Note**

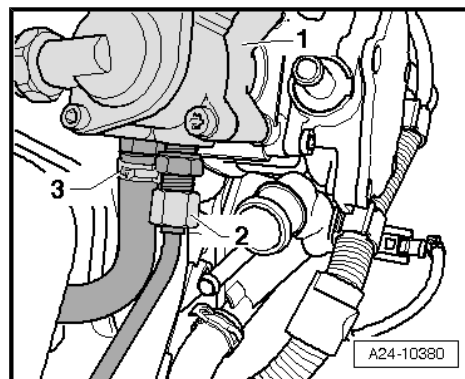
- ◆ *The high-pressure pump must only be removed when the engine is cold.*
- ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *Use a cloth to catch escaping fuel.*
- ◆ *The O-ring must always be renewed.*
- ◆ *Banjo bolt for fuel return line must always be renewed.*
- ◆ *Lubricate high-pressure fuel pipes lightly with engine oil and always ensure that pipes are free of tension when tightening the connections.*

Removing

- Remove engine cover panel.

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- Disconnect both fuel lines -2- and -3-.
- Unplug electrical connectors from fuel pressure sender for low pressure -G410- -1- and fuel pressure regulating valve -N276- -2-.



- Remove bolts -arrows-.
- Carefully pull out high-pressure pump.

Installing

- Renew O-ring for high-pressure pump.
- Turn crankshaft until roller tappet is positioned at lowest point.
- Carefully fit high-pressure pump in cylinder head opening.
- Tighten bolts hand-tight.

♦ Tightening torque

⇒ „5.1 Exploded view - high-pressure pump“, page 36 .

- Now tighten bolts in diagonal sequence to specified torque.

- Make sure that connecting pieces on high-pressure pump are tightened to specified torque before installing fuel lines

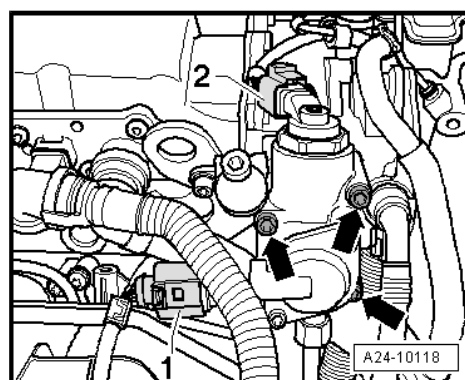
⇒ „5.1 Exploded view - high-pressure pump“, page 36 .

- Tighten union nut on fuel supply line hand-tight. Align so it is free of tension and tighten to specified torque ⇒ page 36 .
- Fit hose for fuel return line firmly onto connection (use hose clip) and align so that it is free of stress.
- Tighten union nut on fuel supply line hand-tight and align line so that it is free of stress.

♦ Tightening torque for fuel supply line

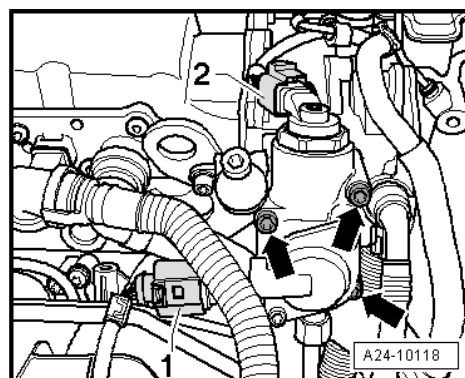
⇒ „5.1 Exploded view - high-pressure pump“, page 36

- Reattach electrical connectors for fuel pressure sender low pressure -G410- and fuel pressure regulating valve -N276- .
- Put back fuse if it has been removed.



Note

Check fuel system for leaks.



6 Injectors

⇒ „6.1 Removing and installing injectors“, page 39

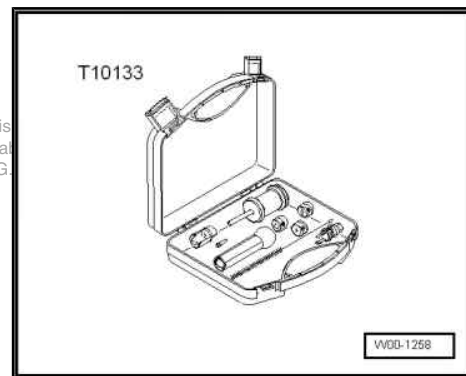
⇒ „6.2 Cleaning injectors“, page 44

6.1 Removing and installing injectors

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-

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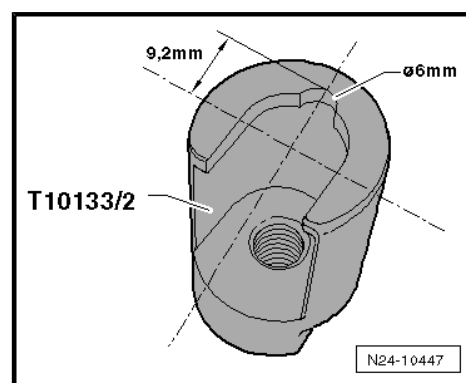
Note

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

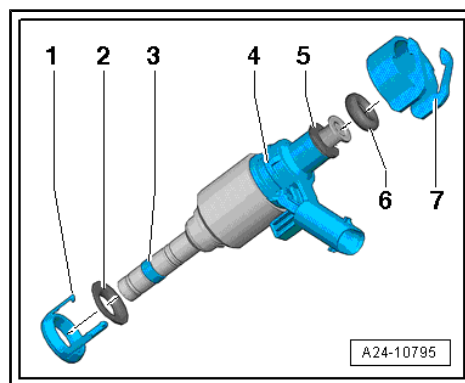
Special tools and workshop equipment required

- ◆ Round file, approx. 6 mm
- 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.



Injector

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



Removing

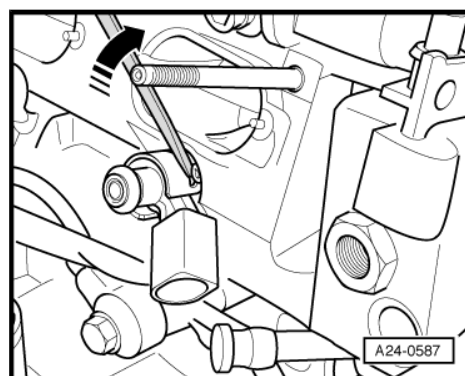
- Remove engine cover panel.
- Remove intake manifold and fuel rail ⇒ [page 25](#).

Removing injectors (from fuel rail)

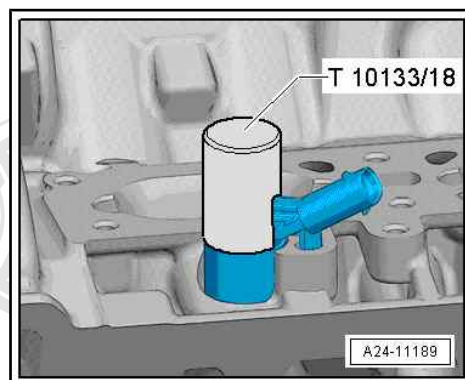
Carefully pull injectors out of fuel rail.

Removing injectors (from cylinder head)

- Cover open inlet ports with a clean cloth.
- Unplug electrical connector at injector that is to be removed.
- Use a screwdriver to bend retainer tabs of radial compensation element to side, and pull support ring off injector.



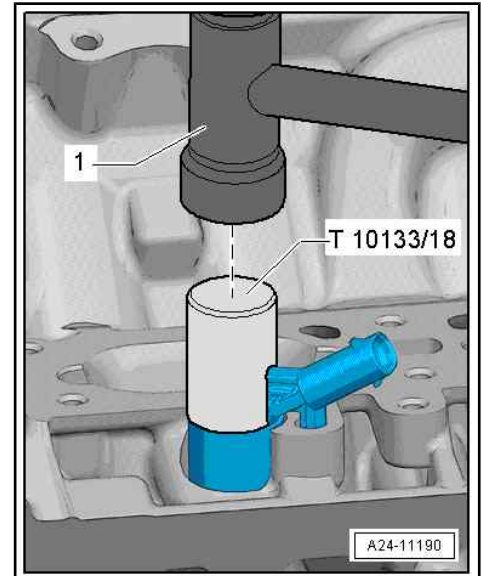
- Slide stop sleeve -T10133/18- over injector.



- Carefully knock against stop sleeve several times to loosen injector.

i Note

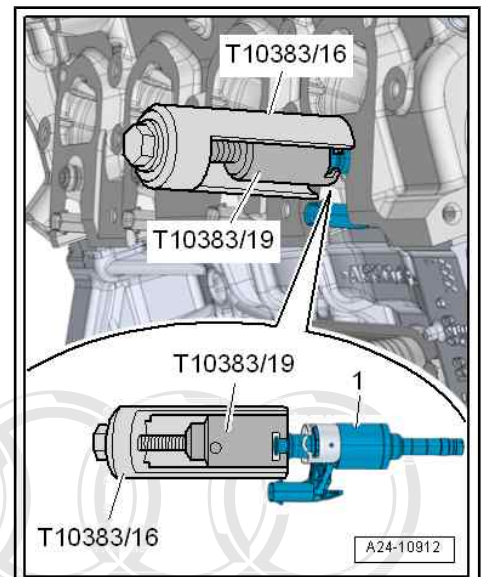
- ◆ Use a torque wrench to pull out injector.
- ◆ Adjust torque wrench to 5 Nm.



- Apply puller -T10133/19- to groove on injector.
- Attach removal tool -T10133/16- to puller.
- Pull out injector by screwing in bolt -1-.
- If injector does not come loose after limit torque of 5 Nm is reached, remove puller and repeat procedure using stop sleeve to loosen injector.
- Repeat procedure for each injector.

i Note

- ◆ Observe correct torque to avoid irreparable damage to injector.
- ◆ The combustion chamber ring seal must always be renewed before the injector is re-installed.



i Note

The combustion chamber ring seal must always be renewed prior to reinstalling the injector ⇒ [page 41](#).

6.1.1 Renewing combustion chamber ring seal (teflon ring seal)

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i Note

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

- Carefully remove old combustion chamber ring seal 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.

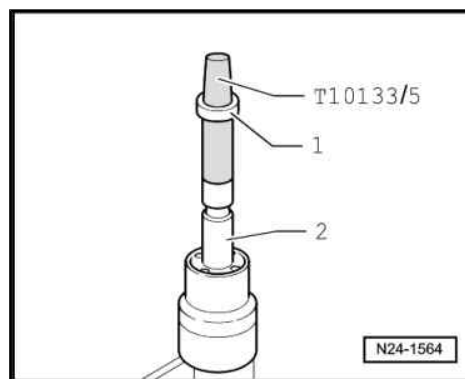
- Before new combustion chamber ring seal is fitted, any combustion residue must be removed from ring groove and injector stem using a clean cloth.



Note

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

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



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



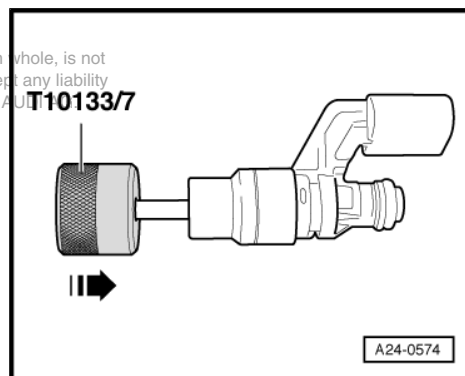
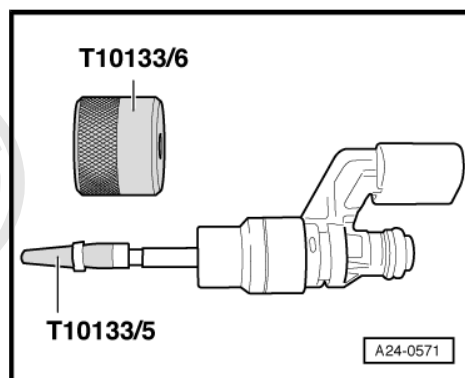
Note

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

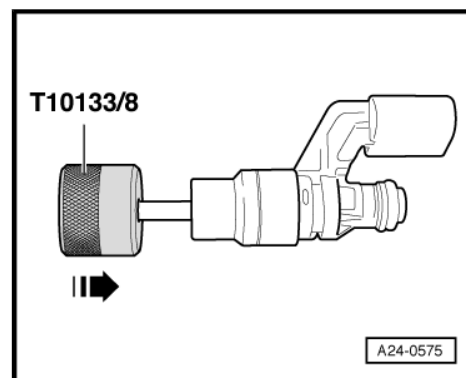
Step 1 of the calibration of the combustion chamber ring seal is performed with the calibration sleeve -T10133/7- .

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

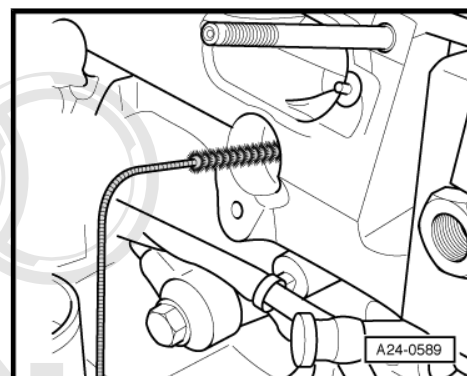
Step 2 of the calibration of the combustion chamber ring seal is performed with the calibration sleeve -T10133/8- .



- Slide calibration sleeve -T10133/8- onto injector as far as 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 combustion chamber ring seal must not be lubricated.

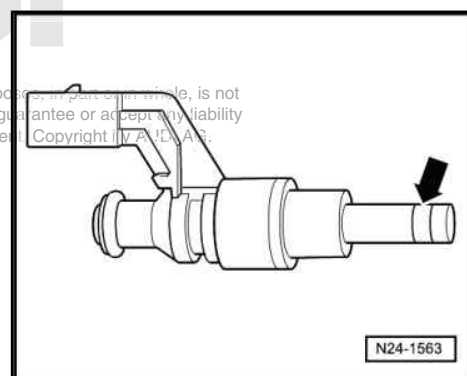


- Before installing injectors, thoroughly clean apertures for injectors in cylinder head using supplied nylon brush - T10133/4- .



Note

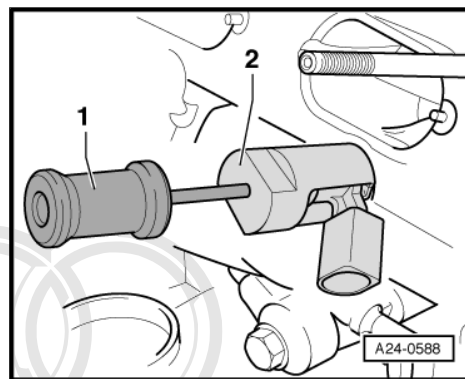
- ◆ *The combustion chamber ring seal on the injector must not be oiled or greased.*
- ◆ *Make sure that there is no cleaning fluid or oil in the holes in the cylinder head when installing the injectors.*
- Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.





Note

- ◆ It should be possible to insert the injector easily. If necessary, wait until the seal has contracted sufficiently.
- ◆ Note correct installation position and ensure that injectors are properly seated in cylinder head.
- ◆ If the injector cannot be pushed in by hand, use puller - T10133/2A- -2- with striker -T10133/3- to insert the injector.
- The remaining installation steps are carried out in the reverse sequence.



Important: the following points must always be observed:

- The combustion chamber ring 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.
- Coat O-rings of 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 25](#) .

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6.2 Cleaning injectors

Special tools and workshop equipment required

- ◆ Ultrasonic cleaning unit -VAS 6418-
- ◆ Mounting plate for injection modules -VAS 6418/1-
- ◆ Cleaning fluid ⇒ Electronic parts catalogue

Cleaning

- Remove injectors ⇒ [page 39](#) .



Note

Observe safety precautions and operating instructions for ultrasonic unit.

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

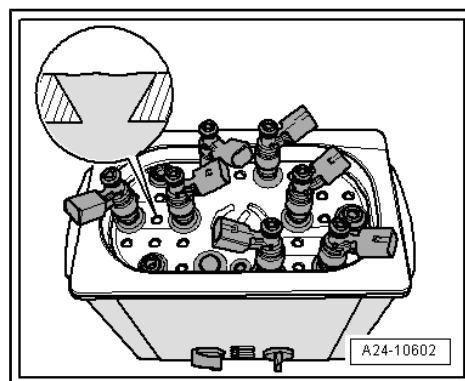


Note

- ◆ Ultrasonic unit must be filled with cleaning fluid up to top edge of apertures (see detail in illustration).
- ◆ Observe safety precautions and operating instructions for ultrasonic unit.

Cleaning

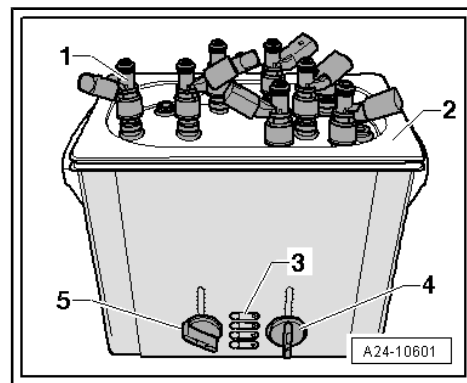
- Then remove injectors again ⇒ [page 39](#) .
- Insert injectors -1- all the way into mounting plate for injection modules -VAS 6418/1- -2-.



- Immerse injectors together with mounting plate for injection modules -VAS 6418/1- into cleaning fluid.
- 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 has been reached.



- After cleaning, always renew combustion chamber ring seal (teflon ring seal) for each injector [⇒ page 41](#) .
- Then re-install injectors [⇒ page 39](#) .



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7 Senders and sensors

⇒ „7.1 Removing and installing air mass meter G70“, page 46

⇒ „7.2 Removing and installing fuel pressure sender G247“, page 46

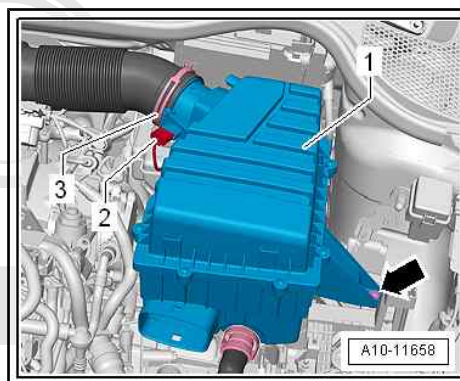
⇒ „7.3 Checking fuel pressure sender G247“, page 48

⇒ „7.4 Checking fuel pressure and residual pressure (up to high-pressure pump)“, page 50

7.1 Removing and installing air mass meter -G70-

Removing

- Detach electrical connector -2- for air mass meter -G70- .
- Loosen hose clip -3- and detach air intake hose.



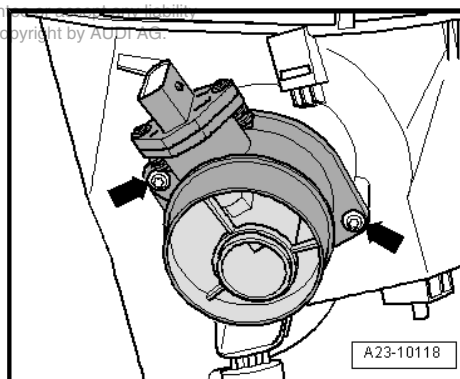
- Remove bolts -arrows- .
- Carefully pull air mass meter -G70- out of guide on air cleaner (top section).

Installing

- Tightening torque
⇒ „2.1 Exploded view - air cleaner“, page 17 .

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

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



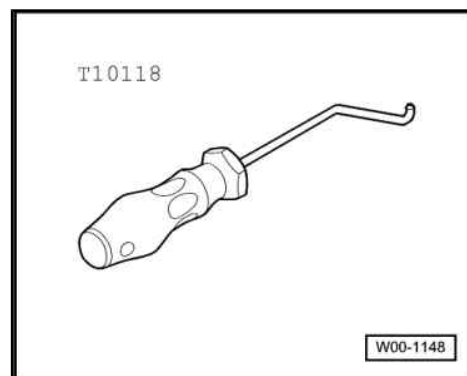
Note

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

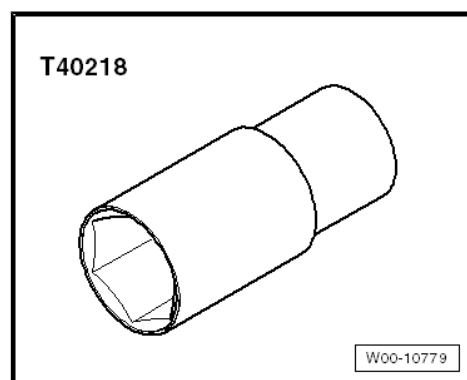
7.2 Removing and installing fuel pressure sender -G247-

Special tools and workshop equipment required

- ◆ Assembly tool -T10118-



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



Removing

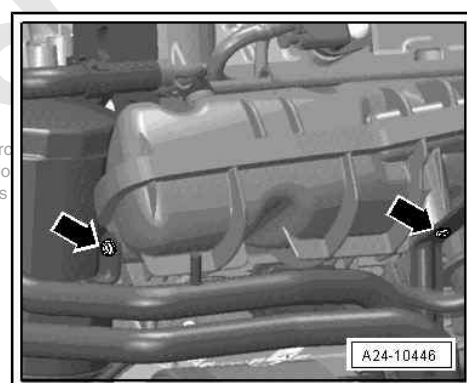
- Pull off top engine cover panel carefully.



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 2](#).

- Detach coolant pipe from intake manifold -arrows-.

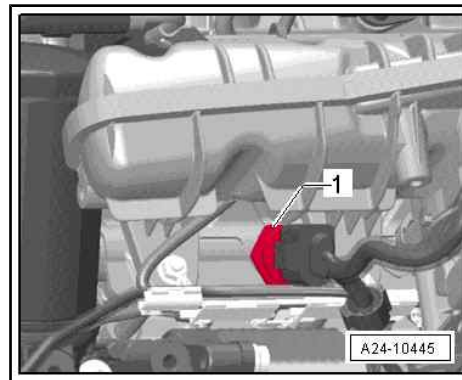


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- Release connector on fuel pressure sender -G247- using assembly tool -T10118- .
- Unscrew fuel pressure sender -G247- using bit, 27mm - T40218- .

Installing

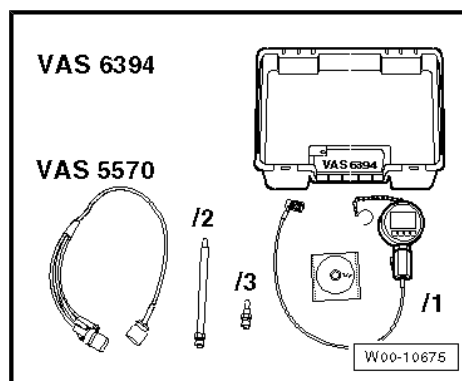
- Install in reverse order.
- Make sure that connecting piece is tightened to specified torque before installing fuel pressure sender -G247- .
- ◆ Tightening torque for connecting piece:
⇒ „4.2 Exploded view - fuel rail“, page 24
- ◆ Tightening torque for Fuel pressure sender -G247- :
⇒ „4.2 Exploded view - fuel rail“, page 24



7.3 Checking fuel pressure sender -G247-

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester
- ◆ Test instrument adapter/DSO (3-pin) -VAS 5570-



- ◆ Pressure sensor tester -VAS 6394-
- ◆ Socket, 27 mm (commercially available)

Procedure:

- Remove engine cover panel ⇒ [page 21](#) .



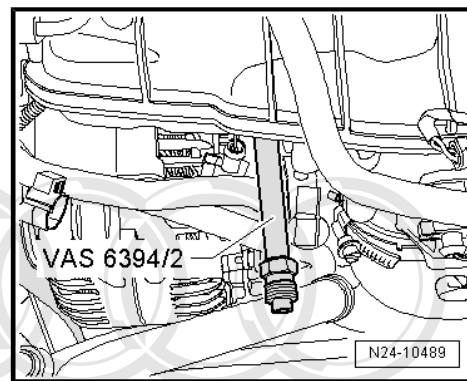
WARNING

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 2](#) .

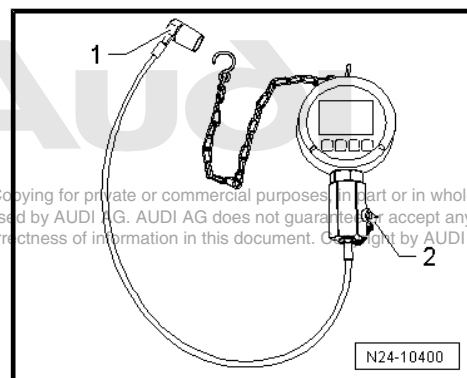
- Remove fuel pressure sender -G247- ⇒ [page 46](#) .

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- Screw in adapter -VAS 6294/2- in place of fuel pressure sender -G247- and tighten adapter with the same torque as that specified for fuel pressure sender -G247- .
- ◆ Tightening torque ⇒ [page 24](#)

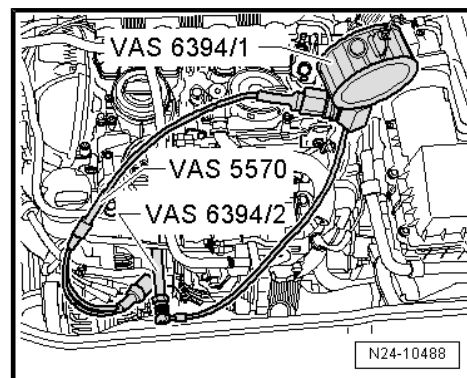


- Unscrew plug -2- and screw fuel pressure sender - G247- into pressure sensor tester -VAS 6394- .



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- Connect vehicle and fuel pressure sender - G247- electrically using test instrument adapter/DSO (3-pin) -VAS 5570- .



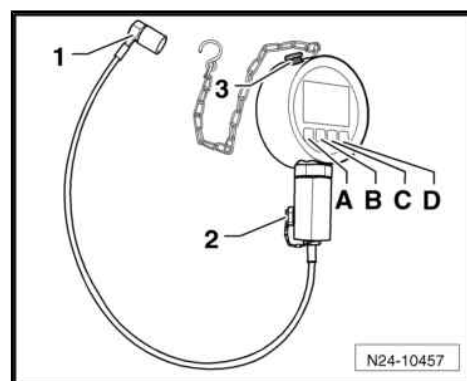
- Switch on tester -VAS 6394/1- by pressing button -A- once briefly.



Note

- ◆ *You can press and hold button -A- for 2 seconds to switch on the illumination for 20 seconds.*
- ◆ *If pressure gauge -VAS 6394/1- does not indicate 0 bar, zero the tester ⇒ Operating instructions .*

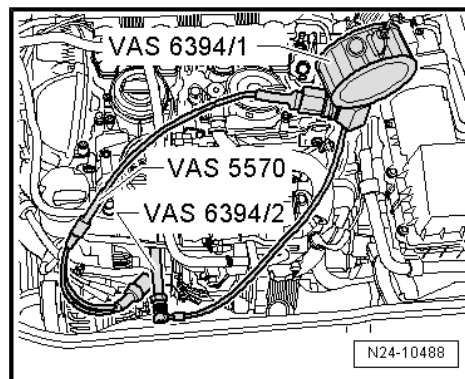
Pressure gauge -VAS 6394/1- should indicate 0 bar. If this is not the case, press button -C- once briefly to zero the tester.



- Connect pressure line of pressure gauge -VAS 6394/1- to adapter -VAS 6394/2- .
- Connect a vehicle diagnostic tester .
- Start engine and run at idling speed.
- Select „Engine electronics“ in vehicle self-diagnosis.
- Then select „Measured values“.
- Select measured value block 140.

Display zone 3 shows the actual pressure value being transmitted to the engine control unit by the fuel pressure sender -G247- .

- Compare the pressure indicated by pressure gauge -VAS 6394/1- with the actual pressure value on the vehicle diagnostic tester .
- The pressure readings must not deviate by more than 5 bar.
- If the deviation is more than 5 bar, test a new fuel pressure sender -G247- .



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 2](#) .

- Screw a new fuel pressure sender -G247- into the pressure gauge -VAS 6394/1- .
- Repeat the test with the new fuel pressure sender -G247- and compare the two pressure values.

If the two values still do not agree:

- Check the electrical connection between the fuel pressure sender -G247- and the engine control unit; refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

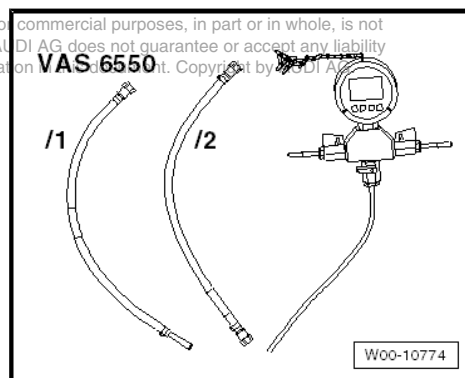
If the values agree:

- Install the new fuel pressure sender -G247- ⇒ [page 46](#) .

7.4 Checking fuel pressure and residual pressure (up to high-pressure pump)

Special tools and workshop equipment required

- ◆ Pressure tester -VAS 6550- with adapters -VAS 6550/1- and -VAS 6550/2-



- ◆ Fuel-resistant measuring container

Test conditions

- Battery voltage at least 12.5 V.
- Fuel filter OK.
- Fuel tank at least $\frac{1}{4}$ full.
- Fuel pump control unit -J538- OK; check.
- Ignition off.

Test sequence

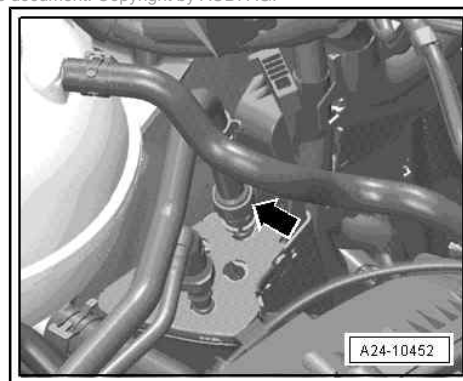


WARNING

Fuel system is pressurised (initial fuel pressure). Wear safety goggles and protective clothing to avoid possible injury and skin contact. Wrap a cloth around the connection before opening the fuel system. Then dissipate residual pressure by carefully detaching the connection.

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- Lift release tab and disconnect fuel supply line -arrow-.



- Connect pressure tester -VAS 6550- with adapters -VAS 6550/1- and -VAS 6550/2- to fuel supply line.
- Make sure that drain tap (centre hose) is closed and cut-off valves (left and right) are open.
- Switch on ignition.
- Fuel pump will run for approx. 5 seconds and build up fuel pressure.
- Read fuel pressure off pressure tester -VAS 6550- .
- Specification: 4.0 ... 7.0 bar

If specification is not obtained:

- Check delivery rate of fuel pump ⇒ Fuel supply system, petrol engines; Rep. gr. 20 .

Checking residual pressure:

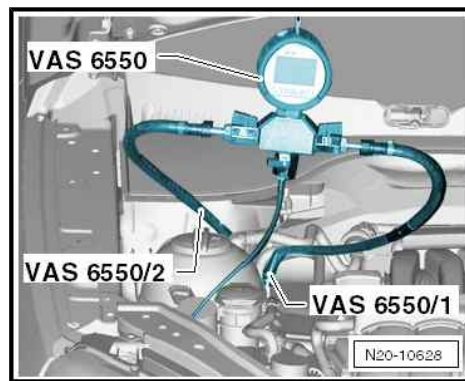
- Check system for leaks and check residual pressure by watching the drop in pressure on the pressure tester -VAS 6550- .
- After 10 minutes pressure should still be at least 3 bar.

If the residual pressure drops below 3 bar:

- ◆ Check union between pressure tester -VAS 6550- and fuel supply line for leaks.
- ◆ Check pressure tester -VAS 6550- for leaks.
- ◆ Check fuel lines and their connections for leaks.
- ◆ Renew fuel filter with integrated fuel pressure regulator ⇒ Fuel supply system, petrol engines; Rep. gr. 20 . Then repeat the test.
- ◆ If fuel filter is OK, renew fuel pump ⇒ Fuel supply system, petrol engines; Rep. gr. 20 .

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

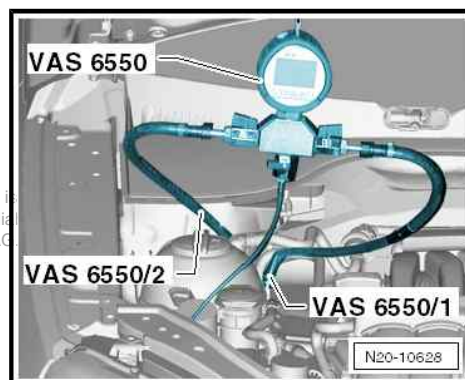
- The ignition must be switched off.



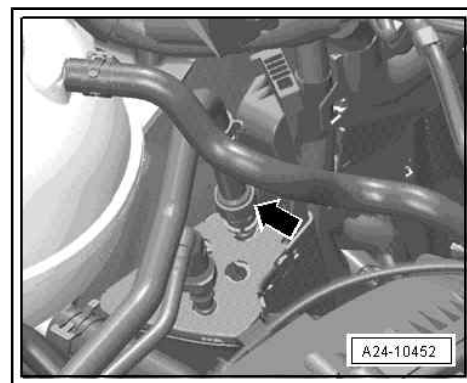
Note

Before removing the pressure tester, release the fuel pressure by opening the drain tap (centre hose). Hold end of hose into a measuring container.

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- Re-attach fuel supply line -arrow- (make sure that all parts are clean and that there are no leaks).



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8 Lambda probe

⇒ „8.1 Overview - Lambda probes“, page 54

⇒ „8.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter“, page 54

⇒ „8.3 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe heater after catalytic converter Z29“, page 55

8.1 Overview - Lambda probes

1 - Front exhaust pipe with catalytic converter and front silencer



Caution

Risk of damage to flexible joint:
Do not bend flexible joint more than 10°.

Install flexible joint so that it is not under tension.

Take care not to damage wire mesh on flexible joint.

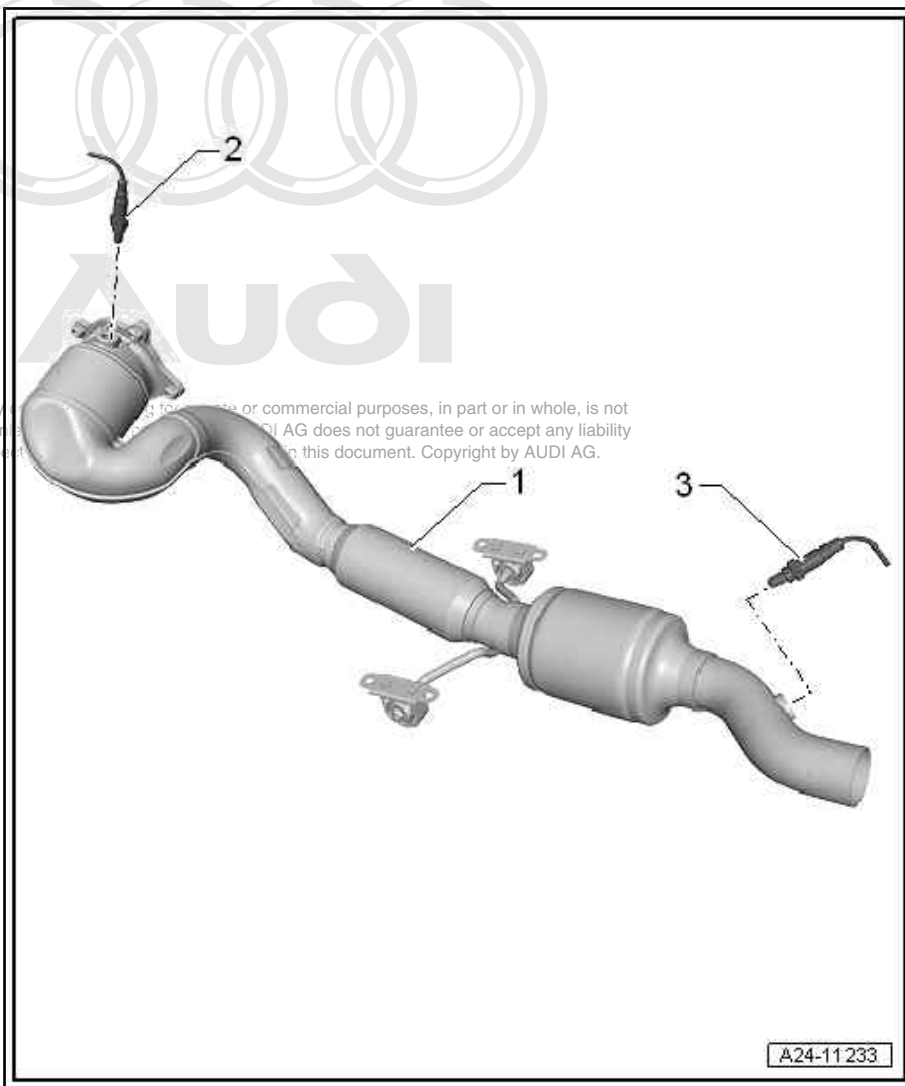
- ☐ Protect catalytic converter from damage by knocks and impact
- ☐ Removing and installing
⇒ Engine, mechanics;
Rep. gr. 26 ; Removing and installing front exhaust pipe
- ☐ Do not remove protective packaging from replacement part until you are ready to fit the flexible joint

2 - Lambda probe -G39- before catalytic converter

- ☐ Removing and installing
⇒ page 54
- ☐ 55 Nm

3 - Lambda probe -G130- after catalytic converter

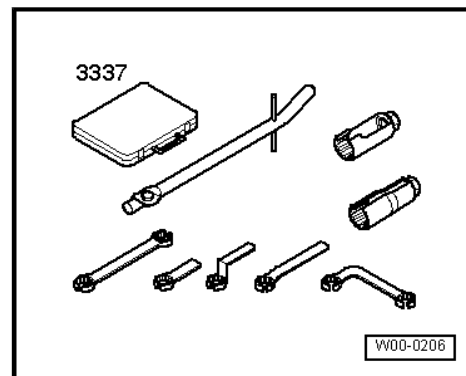
- ☐ Removing and installing ⇒ page 55
- ☐ 55 Nm



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

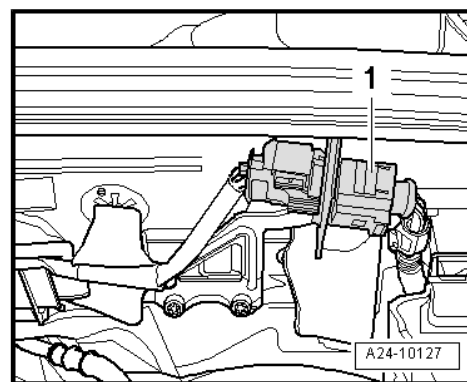
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing

- Remove engine cover panel [⇒ page 21](#) .
- Unplug electrical connector -1- for Lambda probe -G39- .

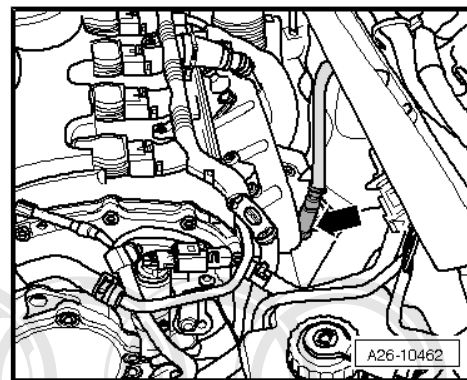


- Unscrew Lambda probe -G39- -arrow- using a tool from Lambda probe open ring spanner set -3337- .

Installing

When installing, note the following:

- Tightening torque
[⇒ „8.1 Overview - Lambda probes“, page 54](#)



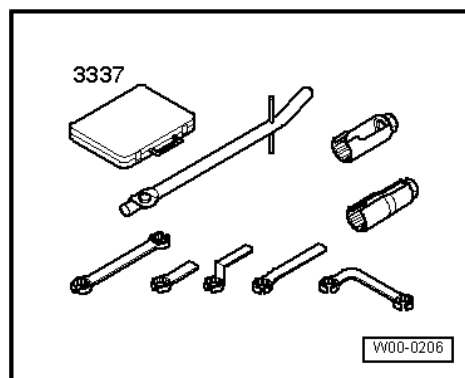
Note

- ◆ *New Lambda probes are coated with an assembly paste. The paste must not get into the slots on the Lambda probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic 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.*

8.3 Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe heater after catalytic converter -Z29-

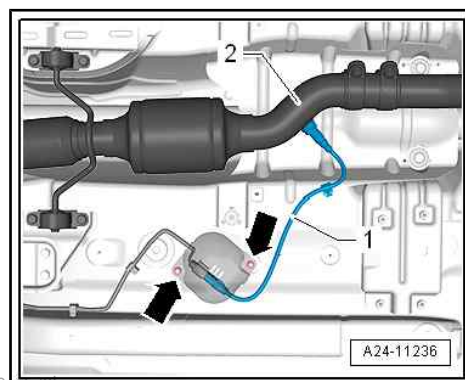
Special tools and workshop equipment required

◆ Lambda probe open ring spanner set -3337-

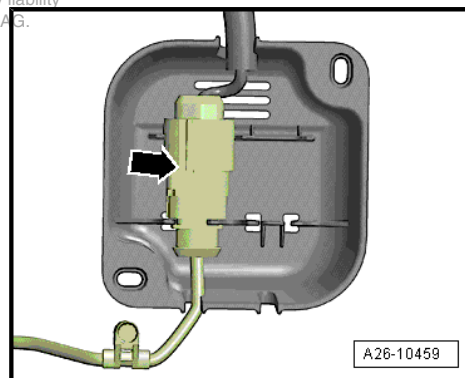


Removing

- Remove nuts -arrows- for cover.



- Detach cover and unplug electrical connector -arrow- for Lambda probe after catalytic converter -G130- and Lambda probe heater after catalytic converter -Z29-.



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

Installing

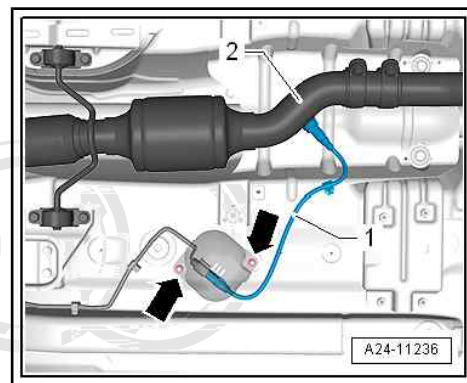
When installing, note the following:

- Tightening torque
⇒ „8.1 Overview - Lambda probes“, page 54



Note

- ◆ *New Lambda probes are coated with an assembly paste. The paste must not get into the slots on the Lambda probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic 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.*



9 Engine control unit

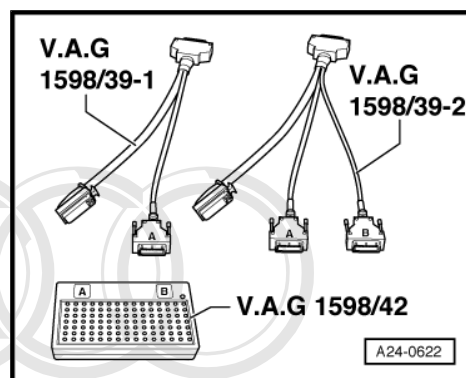
⇒ „9.1 Wiring and component check with test box V.A.G 1598/42 “, page 58

⇒ „9.2 Removing and installing engine control unit J623 “, page 60

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

Special tools and workshop equipment required

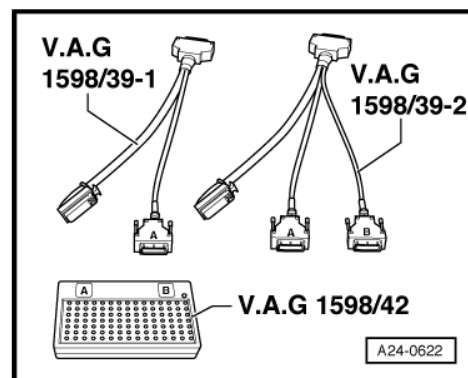
- ◆ Adapter cable -V.A.G 1598/39-1-
- ◆ Adapter cable -V.A.G 1598/39-2-
- ◆ Test box -V.A.G 1598/42-



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**Note**

- ◆ *The test box has 105 sockets. The connecting cable can be disconnected from the test box. This means that only the cable (and not the test box) has to be purchased for future engine control units with different types of connectors.*
- ◆ *The smaller of the two connectors on the engine control unit has the contacts 1 to 60. The larger of the two connectors has the contacts 1 to 94.*
- ◆ *To carry out tests on the 60-pin electrical 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 electrical wiring harness connector see ⇒ *Current flow diagrams, Electrical fault finding and Fitting locations.**
- ◆ *To carry out tests on the 94-pin electrical 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 electrical wiring harness connector see ⇒ *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 electrical 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.*
- ◆ *Always use auxiliary measuring set -V.A.G 1527 B- to connect test equipment (e.g. voltage tester -V.A.G 1526 C-, hand-held multimeter -V.A.G 1594 C- etc.).*

**WARNING**

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

The engine control unit has to be removed before multi-pin connectors can be unplugged from engine control unit ⇒ [page 60](#) .

- Connect test box -V.A.G 1598/42- to electrical 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.

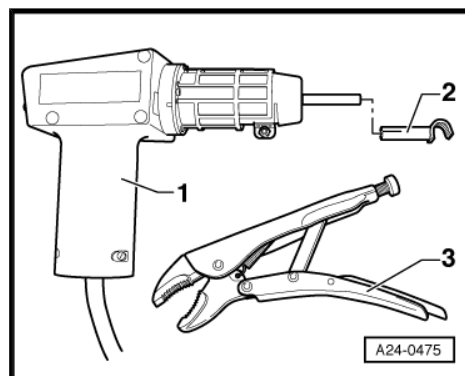
- After installation, the locking plate must be re-fitted on the control unit.
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.

- Interrogate event memory and erase if necessary.

9.2 Removing and installing engine control unit -J623-

Special tools and workshop equipment required

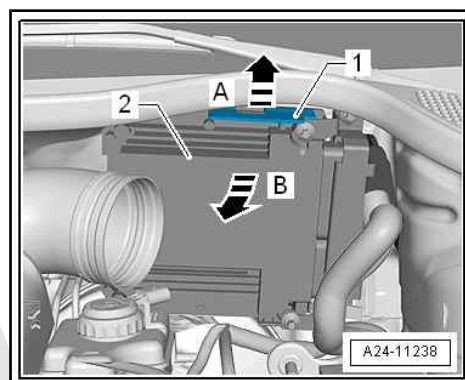
- ◆ Hot air blower -VAS 1978/14A- -item 1- with nozzle attachment
- 2- from wiring harness repair set -VAS 1978 B-



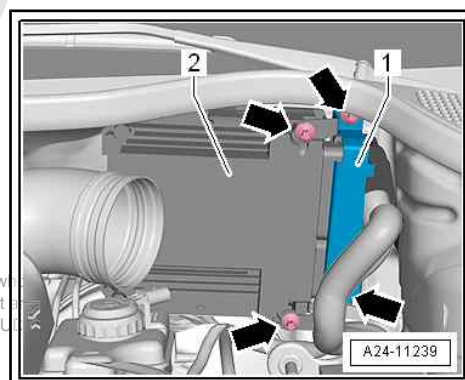
- ◆ Commercially available mole grips -3-
- ◆ Vehicle diagnostic tester

Removing

- To do so, activate engine control unit by selecting diagnosis object „Replace engine control unit“ in „Guided Functions“ mode of vehicle diagnostic tester .
- Switch off ignition and take out ignition key.
- Remove air cleaner housing ⇒ [page 20](#) .
- Push locking plate -1- upwards in direction of -arrow A-.
- Detach engine control unit -2- forwards in direction of -arrow B-.

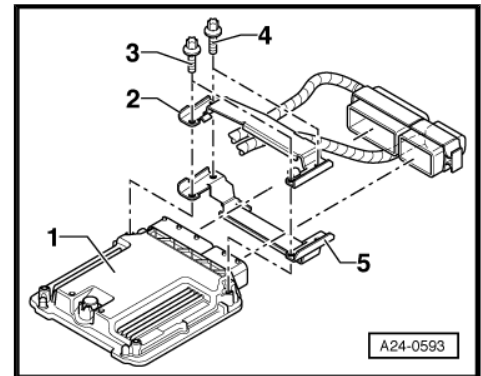


To help prevent unauthorised access to the connectors on the engine control unit, the control unit is secured by means of shear bolts to a locking plate or a metal casing.

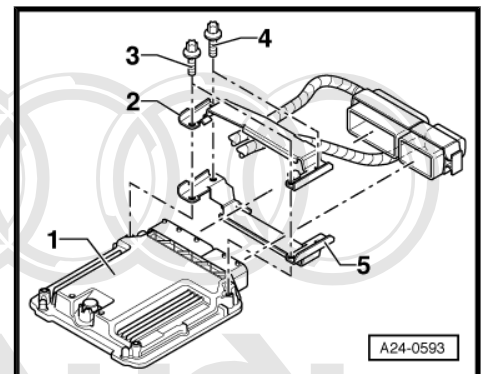


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The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.



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



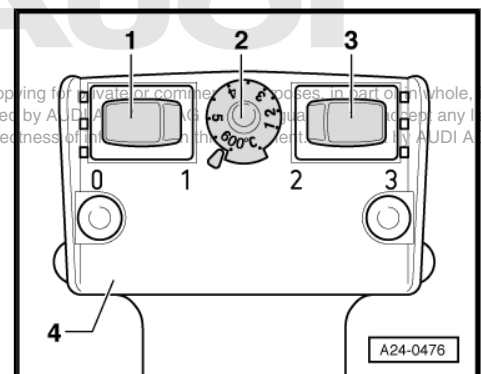
Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.



WARNING

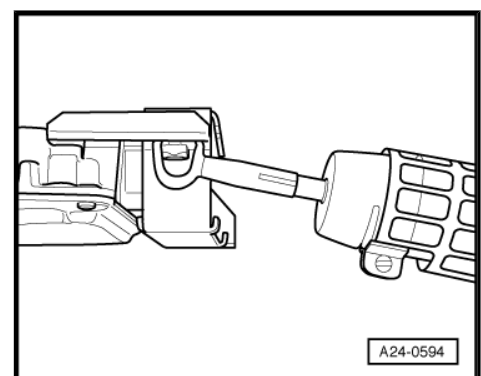
Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

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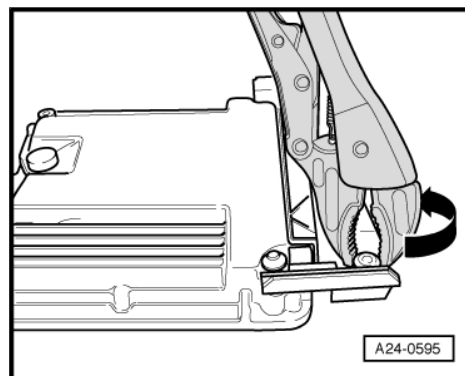


Apply heat to the threads of the shear bolts on the connector side as shown in the illustration.

To do so, switch on the hot air blower and heat the bolts for approximately 20 ... 30 seconds.



- Unscrew shear bolts (in direction of arrow) using suitable mole grips.
- The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
- Detach metal locking plate from connectors.
- Remove both bolts from bracket for engine control unit -J623- .

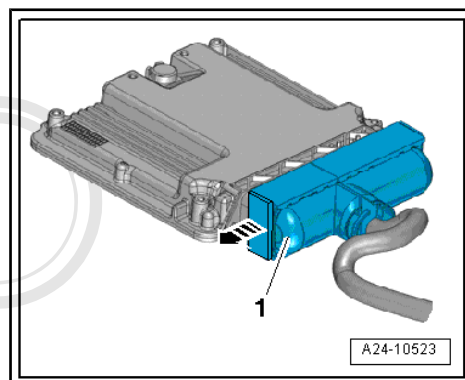


- Release and unplug connectors from engine control unit - J623- .
- Take out the old engine control unit -J623- and connect the new one.

Installing engine control unit:

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

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



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

- Activate engine control unit via a vehicle diagnostic tester in „Guided Functions“ mode. „Replace engine control unit“

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28 – Ignition system

1 Ignition system

⇒ „1.1 Exploded view - ignition system“, page 63

⇒ „1.2 Test data, spark plugs“, page 64

⇒ „1.3 Removing and installing ignition coils with output stages“, page 65

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⇒ „1.4 Removing and installing knock sensor 1 G61“, page 65

⇒ „1.5 Removing and installing knock sensor 2 G66“, page 66

⇒ „1.6 Removing and installing Hall sender G40“, page 69

⇒ „1.7 Removing and installing engine speed sender G28“, page 69

1.1 Exploded view - ignition system

1 - Ignition coil with output stage -N70-

- ☐ Removing and installing
⇒ page 65
- ☐ Cylinder 1
- ☐ Use puller -T40039- for removal

2 - Ignition coil with output stage -N127-

- ☐ Removing and installing
⇒ page 65
- ☐ Cylinder 2
- ☐ Use puller -T40039- for removal

3 - Ignition coil with output stage -N291-

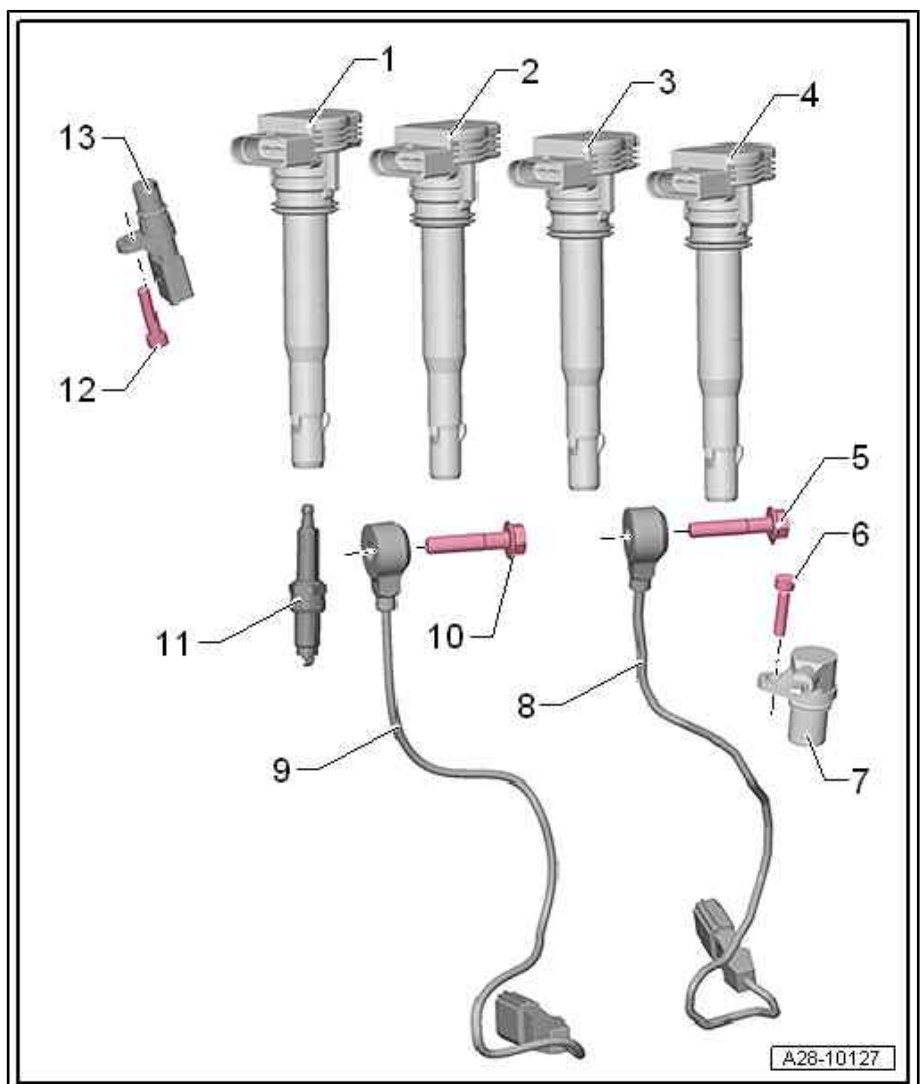
- ☐ Removing and installing
⇒ page 65
- ☐ Cylinder 3
- ☐ Use puller -T40039- for removal

4 - Ignition coil with output stage -N292-

- ☐ Removing and installing
⇒ page 65
- ☐ Cylinder 4
- ☐ Use puller -T40039- for removal

5 - Bolt

- ☐ Renew
- ☐ 20 Nm
- ☐ Tightening torque influences the function of the knock sensor



**6 - Bolt**

- ☐ Engine speed sender -G28-
- ☐ 4 Nm + turn 45° further
- ☐ Renew bolt

7 - Engine speed sender -G28-

- ☐ Removing and installing ⇒ [page 69](#)
- ☐ Lubricate seal with oil

8 - Knock sensor 1 -G61-

- ☐ Removing and installing ⇒ [page 65](#)
- ☐ Contacts gold-plated
- ☐ Before removing, remove coolant distributor housing

9 - Knock sensor 2 -G66-

- ☐ Removing and installing ⇒ [page 66](#)
- ☐ Not installed in all vehicles
- ☐ Contacts gold-plated

10 - Bolt

- ☐ Renew
- ☐ 20 Nm
- ☐ Tightening torque influences the function of the knock sensor

11 - Spark plug

- ☐ Removing and installing ⇒ Maintenance ; Booklet 808
- ☐ 30 Nm
- ☐ Use spark plug socket and extension -3122 B- for removal

12 - Bolt

- ☐ 10 Nm

13 - Hall sender -G40-

- ☐ Removing and installing ⇒ [page 69](#)
- ☐ Renew O-ring if damaged
- ☐ Contacts gold-plated



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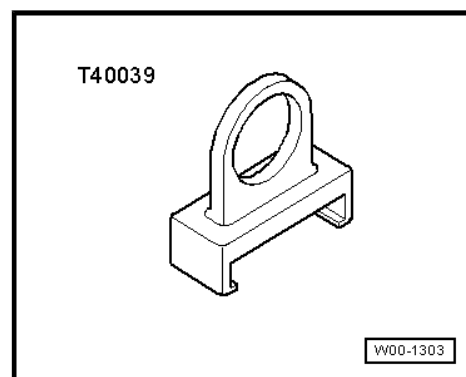
1.2 Test data, spark plugs

Engine data	2.0 ltr. 184 kW turbo FSI engine
Idling speed is not adjustable; controlled by the idling speed stabilisation	760 ±100 rpm
Engine speed limiter (deactivates injectors/closes throttle valve)	6800 ±100 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

1.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

- ◆ Puller -T40039-

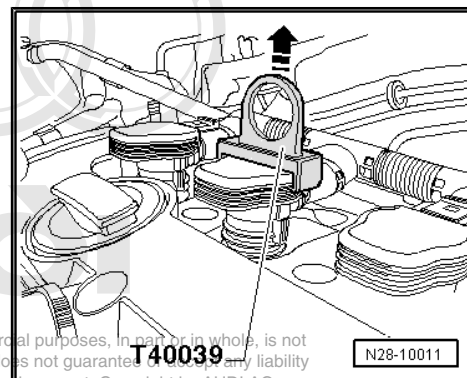


Removing:

- Release electrical connectors at all ignition coils and unplug all connectors from ignition coils simultaneously.
- Using puller -T40039-, pull all ignition coils out of spark plug holes.

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 any tools).



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1.4 Removing and installing knock sensor 1 -G61-

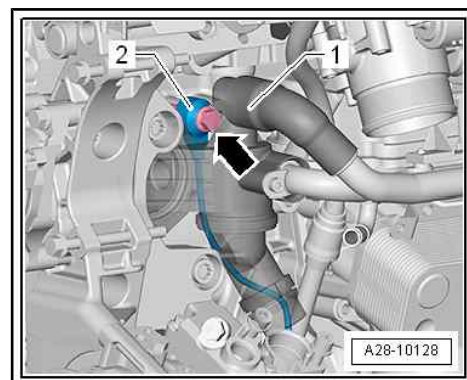


Note

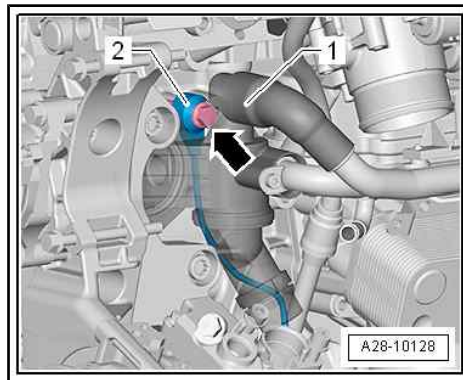
Knock sensor 1 -G61- -2- is located below the intake manifold and behind the thermostat -1-.

Removing

- Remove radiator cowl ⇒ Engine, mechanics; Rep. gr. 19 ; Removing and installing radiator cowl .
- Remove thermostat with housing ⇒ Engine, mechanics; Rep. gr. 19 .
- Unplug electrical connector for knock sensor 1 -G61- at coupling point.



- Unclip electrical wiring from retainers.
- Remove bolt -arrow- and detach knock sensor 1 -G61- -2-.



Installing

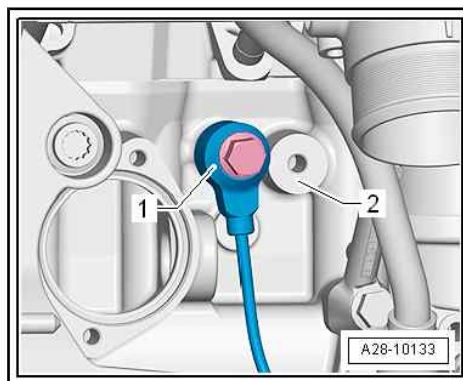
Installation is carried out in the reverse order; note the following:



Caution

Two threaded holes are provided. Knock sensor 1 -G61- is screwed into left threaded hole -1-.

Right threaded hole -2- is not used.



- Tightening torque: refer to exploded view of ignition system ⇒ [page 63](#).
- Tightening torque: thermostat with housing ⇒ Engine, mechanics; Rep. gr. 19
- Install radiator cowl ⇒ Engine, mechanics; Rep. gr. 19; Removing and installing radiator cowl ⇒ Rep. gr. 19

1.5 Removing and installing knock sensor 2 -G66-

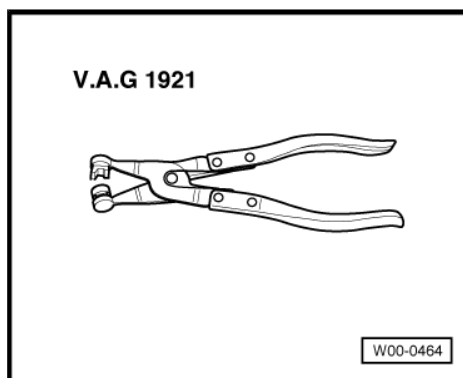


Note

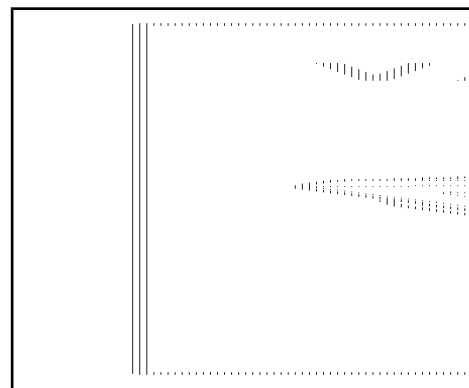
Knock sensor 2 -G66- is located below the intake manifold and behind the oil filter housing.

Special tools and workshop equipment required

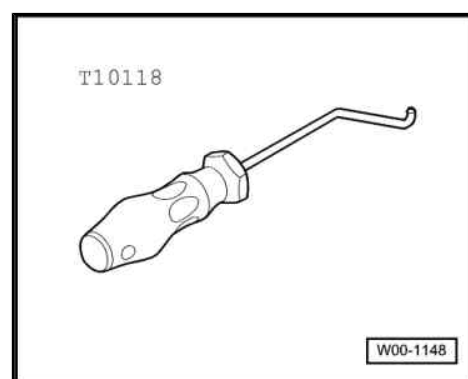
- ◆ Hose clip pliers -V.A.G 1921-



- ◆ Drip tray for workshop hoist -VAS 6208-

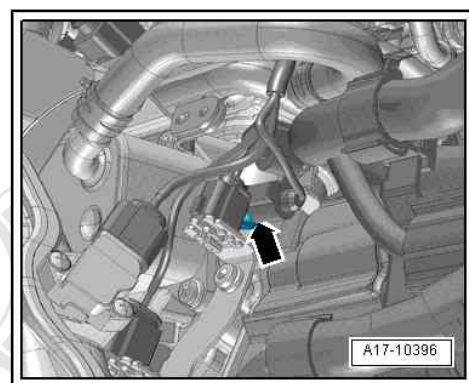


- ◆ Assembly tool -T10118-

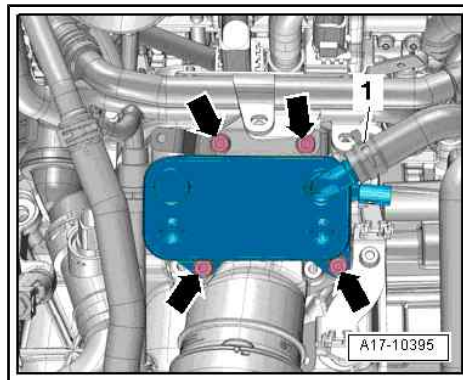


Removing

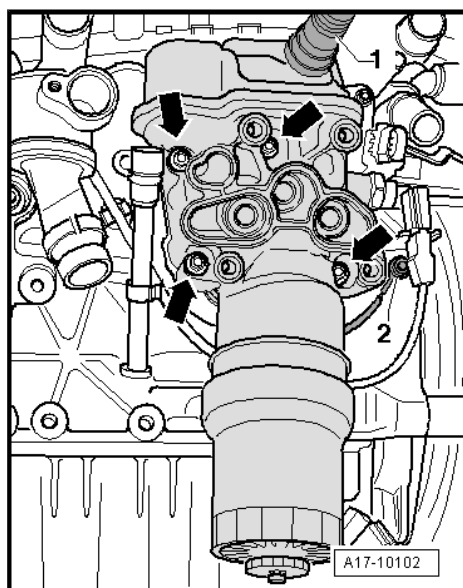
- Remove radiator cowl ⇒ Engine, mechanics; Rep. gr. 19 ; Removing and installing radiator cowl .
- Drain cooling system ⇒ Engine, mechanics; Rep. gr. 19 ; Draining and filling cooling system .
- Draining oil filter housing ⇒ Engine, mechanics; Rep. gr. 17 ; Draining oil filter housing .
- Use assembly tool -T10118- to release electrical connector -arrow- at oil pressure switch -F1- and knock sensor 2 -G66- and unplug.



- Place drip tray for workshop hoist -VAS 6208- beneath engine.
- Detach coolant hose -1-.



- Unscrew bolts -arrows- and detach engine oil cooler.
- Press release tabs and disconnect crankcase breather pipe -1-.
- Unscrew bolts -arrows- and remove oil filter bracket.



- Knock sensor 2 -G66- is located behind oil filter bracket -1-.
- Unscrew bolt -arrow- and remove knock sensor 2 -G66- -2-.

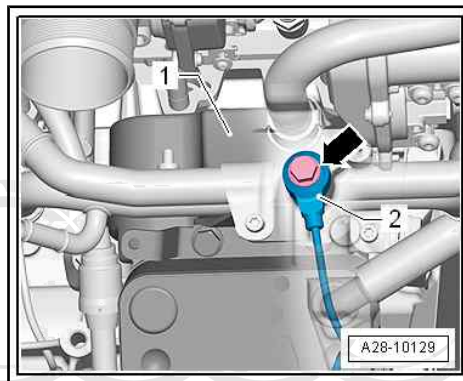
Installing

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



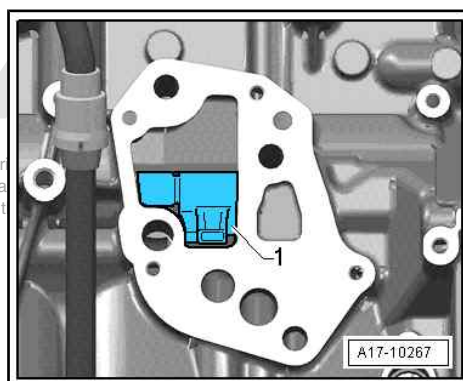
Note

- ◆ *Renew gaskets and seals.*
- ◆ *Secure all hose connections with clips (as original equipment)*
⇒ *Parts catalogue* .



Installation position of baffle plate

- Insert baffle plate -1- into cylinder block, as shown in illustration.
- Tightening torques ⇒ Engine, mechanics; Rep. gr. 17 ; Oil filter bracket and engine oil cooler - exploded view
- Tightening torques ⇒ Engine, mechanics; Rep. gr. 19 ; Radiator and radiator fans - exploded view



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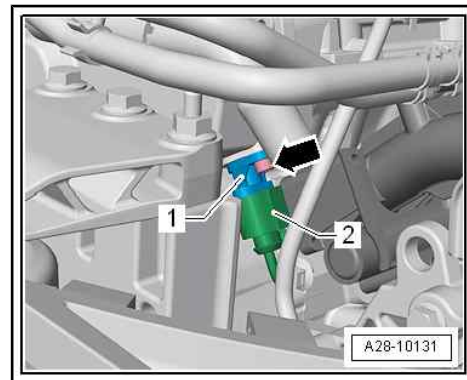
1.6 Removing and installing Hall sender - G40-

Removing

- Remove engine cover panel ⇒ [page 21](#) .
- Unplug electrical connector -2-.
- Unscrew bolt -arrow- and remove Hall sender -1-.

Installing

- Renew O-ring.
- Tightening torque ⇒ [page 63](#)



1.7 Removing and installing engine speed sender -G28-

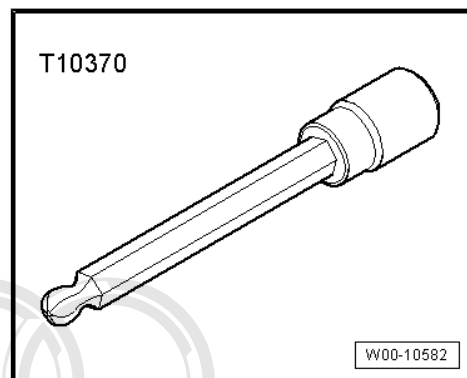


Note

Engine speed sender -G28- is located at the front (right-side, beside oil filter housing) between engine and gearbox.

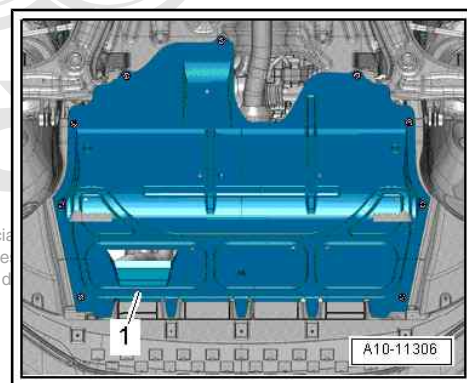
Special tools and workshop equipment required

- ◆ Socket, AF 4 mm -T10370-



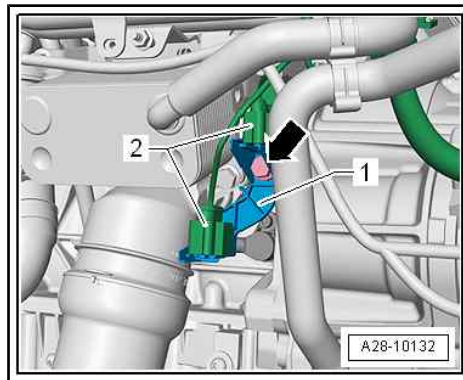
Removing

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



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- Unclip both connectors -2- from bracket -1-.
- Remove bolt -arrow- for bracket for coupling point -1- and detach bracket.



- Remove bolt -arrow- and detach engine speed sender -G28- -1-.

Installing

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

- Lubricate O-ring with clean engine oil.
- Carefully insert engine speed sender -G28- -1- into guide (do not knock in).
- Tightening torque of bolt for engine speed sender -G28-
⇒ [page 63](#)

